Pipe Calc Elite™

for iOS

CyberProdigy LLC

The Pipe Calc Elite™ is an advanced calculator designed specifically for pipe trade professionals. This app provides quick and reliable access to standard pipe data and dimensions for 7 different piping materials. In addition, Pipe Calc Elite™ makes solving complex pressure loss equations, linear and rolling offsets, cutbacks, and other calculations you might need on the jobsite a breeze. Pipe Calc Elite™ has a wide range of unit conversion capabilities and its ability to accept and manipulate fractions for all calculations is exceptional. Whether you're a plumber, pipe fabricator, or any other professional in the pipe trade you'll find this calculator a valuable tool to have on you at all times.

To purchase a copy of Pipe Calc Elite™ for your iOS device please search for 'Pipe Calc Elite' on Apple iTunes.

Table of Contents

Definitions of Basic Keys

[Clear] - Clear
Press once – clears display
Press twice – clears most stored values (does not clear user preferences)

[Shift] [+] - Clear All
Use to clear all register values and restore default settings. Preferences are not affected.

[Shift] - Secondary Function
Use to access secondary functions of other keys

[Store] - Memory Store
Use to store a value from display into memory

[Shift][Store] - Memory Recall
Use to list values stored in memory and to select/recall them from memory to the display.

[Shift][Conv] - Memory Recall Clear
Use to clear entries from memory.

[Shift][/] - % operator

Use this key to calculate a give percentage of a number or for working add-on, discount, or division percentage calculations. For example:

$$255 \times 15\% = 38.25$$
$$150 + 6\% = 159$$
$$240 - 3\% = 232.8$$
$$150 \div 50\% = 300$$

This key can also be used to change percentages to decimals (i.e. 25% = 0.25). In addition, the % operator can be used with units (i.e. 150 gallons + 6% = 159 gallons).

[Sin] - Sine
Use to calculate the sine of an angle given in degrees

[Shift][Sin] - ArcSine
Use to calculate ArcSine (angle will be in degrees)

[Cos] - Cosine
Use to calculate the cosine of an angle given in degrees

[Shift][Cos] - ArcCosine

Use to calculate ArcCosine (angle will be in degrees)

[Tan] - Tangent
Use to calculate the tangent of an angle given in degrees

[Shift][Tan] - ArcTangent
Use to calculate ArcTangent (angle will be in degrees)

[Circle] - Circle
Use to enter diameter of a circle. Subsequence presses of the Circle button will calculate the area of the circle as well as the circumference.

Setting Preferences

[Shift][X] - (Preferences) Set Preferences
Use to set calculator preferences including fractional resolution and Haptic Feedback.

Setting fractional resolution affects what resolution fractional inch results are rounded to. An exact decimal inch result can always be obtained by pressing [Inch] a second time when a fractional result is produced.

Fractional resolutions include:
-1/2
-1/4
-1/8
-1/16
-1/32
-1/64

'Haptic Feedback' is an option that causes your iOS device to vibrate slightly when pressing keys within the application. Haptic feedback is not supported on some devices including the iPod touch. 'Audio Feedback' provides a keyboard click sound each time a button is pushed.

When accessing preferences you will see this pop-up window:
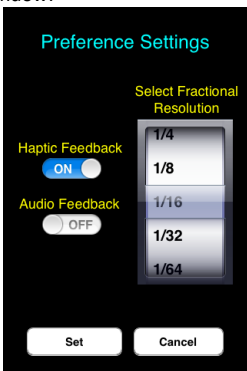
Click the 'Set' button at the bottom to save and close the preferences window.

Default Settings

When the calculator is first loaded onto your iOS device, or when you hit 'Clear All' [Shift][+], the following are default settings:

Description	Default Value
Weight/Volume (lbs/ft^3)	62.42796
Welder Gap	1/8"
Fraction Resolution	1/16"
Pipe Material	Steel
Pipe Type	Standard
Elbow Type	Butt Weld Long

Pipefitting Functions

The Pipe Calc Elite™ allows users to solve a wide variety of pipefitting problems. These calculations include, angle, slope, grade, take-out, inner, center, and outer arc lengths, welders gap, offset, run, travel, cutback, and rolling offset.

$$Slope = \frac{Rise}{Run}$$
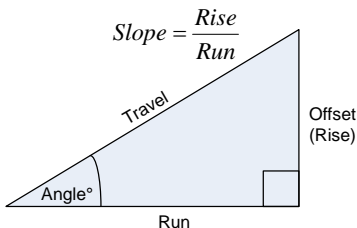
Key Definitions:

[Offset] - Offset
Use to enter or calculate a pipe Offset (Rise).

[Shift][Offset] – Take-Out
Use to enter or calculate pipe cut length Take-Outs.

[Angle] - Angle
Use to enter or calculate the angle for a pipefitting equation. The angle can be entered as a slope angle (in degrees), linear slope (entered as offset height - assumes 12 inches of run), or % grade (entered as %).

[Shift][Run] – Rolling Offset - Roll
Use to calculate rolling offset pipe length.

[Circle] – Circle
Use to enter diameter of a circle. Subsequent presses of the Circle button will calculate the area of the circle as well as the circumference.

[Shift][Circle] - Cutback
Use to calculate pipe cutback after a bend angle and pipe offset are entered.

[Run] - Run
Use to enter or calculate a pipe run.

[Shift][Angle] – Welder Gap
Use to enter welder gap which is subtracted from end-to-end pipe length calculations. The default welder gap is 1/8".

[Travel] - Travel
Use to enter or calculate the travel for a pipefitting equation.

[Shift][Travel] - Arc

Use to calculate inner, center, and outer arc lengths to mark fittings for field cuts.

Sample Calculations:

Solving for Simple Offset with Known Angle

For an 18" pipe offset using 45° factory made short radius butt weld elbows, solve for center-to-center travel.
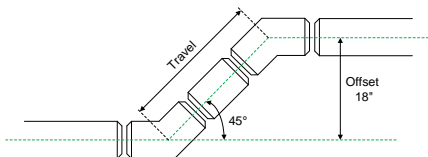
STEPS	KEYSTROKES	DISPLAY
Clear calculator	[Clear][Clear]	
Input Offset	[1][8][Inch][Offset]	Inch 18 Offset Length
Input Bend Angle	[4][5][Angle]	45° Slope Angle
Solve for Travel	[Travel]	Inch 25 -7/16 Travel

8

Solving for Simple Offset with Unknown Angle

Solve for center-to-center pipe travel and bend angle if pipe has a 24" offset and 31" run.
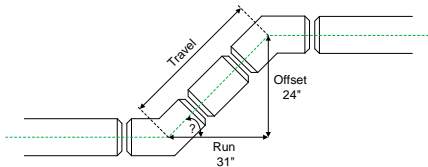
STEPS	KEYSTROKES	DISPLAY
Clear calculator	[Clear][Clear]	
Input Offset	[2][4][Inch][Offset]	Inch 24 Offset Length
Input Run	[3][1][Inch][Run]	Inch 31 Run
Solve for Travel	[Travel]	Inch 39 -3/16 Travel
Solve for Bend Angle	[Angle]	37.75° Slope Angle

Solving for Simple Offset Cut Length

A 4" Standard Brass pipe has an offset of 16" and a run of 20" and has an unknown bend angle. Long radius butt weld elbow fittings are used. Welders gap should be set to 1/8". Solve for the cut length of the pipe. Also, solve for fit angle, Take-Out, and arc lengths.
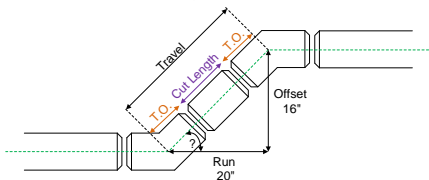
STEPS	KEYSTROKES	DISPLAY
Clear calculator	[Clear][Clear]	
Input Pipe Material	[Material]	Brass Pipe Material
Input Pipe Size	[4][Inch][PipeSize]	Inch 4 Pipe Size
Input Offset	[1][6][Inch][Offset]	Inch 16 Offset Length
Input Run	[2][0][Inch][Run]	Inch 20 Run
Check Welders Gap	[Shift][Angle]	Inch 1/8

		Welder's Gap
Solve for Travel	[Travel]	Inch 25-5/8 Travel
Solve for Cut Length	[Travel]	Inch 21-1/8 Cut Length
Solve for fit angle (bend angle)	[Angle]	38.66° Fitting Angle
Solve for Take-Out	[Shift][Offset]	Inch 2-1/8 Take-Out Length
Solve for Inside Arc Length	[Shift][Travel]	Inch 2-1/2 Inside Arc Length
Solve for Center Arc Length	[Travel]	Inch 4-1/16 Center Arc Length
Solve for Outside Arc Length	[Travel]	Inch 5-9/16 Out Arc Length

Solving for Rolling Offset with Known Angle

A 4" pipe has an 18" offset and a 6" roll. The rolling offset utilizes 45° factory made long radius butt weld elbows. Solve for center-to-center travel.

11
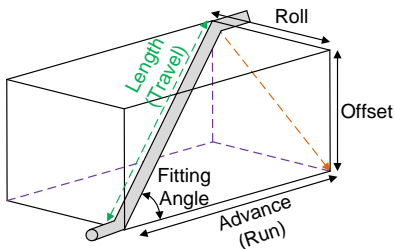
STEPS	KEYSTROKES	DISPLAY
Clear calculator	[Clear][Clear]	
Input Pipe Size	[4][PipeSize]	Inch 4 Pipe Size
Input Offset	[1][8][Inch][Offset]	Inch 18 Offset Length
Input Bend Angle	[4][5][Angle]	45° Slope Angle
Input Roll	[6][Inch][Shift][Run]	Inch 6 Roll Length
Solve for Take-Out	[Run]	Inch 2-1/2 Take-Out Length
Solve for Centerline Length	[Run]	Inch 26 -13/16 Centerline Length

Solve for Cut Length	[Run]	Inch
		21-9/16 Cut Length
Display fit angle (bend angle)	[Run]	Inch
		Fitting Angle 45°
Display Welders Gap	[Run]	Inch
		1/8 Welder's Gap
Solve for Advance	[Run]	Inch
		19 Advance(Run) Length
Display Offset	[Run]	Inch
		18 Offset Length
Display Roll	[Run]	Inch
		6 Roll Length

Solving for Rolling Offset with Unknown Angle

A given pipe has a 12" offset, 6" roll, and 25" advance. The elbow bend angle is not known. Solve for center-to-center travel and fit angle assuming long radius BW elbows will be used.
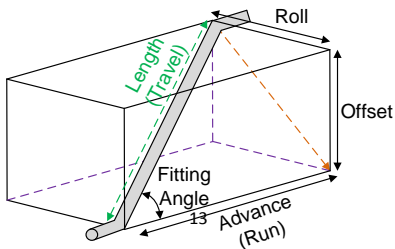
STEPS	KEYSTROKES	DISPLAY
Clear calculator	[Clear][Clear]	
Input Offset	[1][2][Inch][Offset]	Inch 12 Offset Length
Input Advance (Run)	[2][5][Inch][Run]	Inch 25 Run
Input Roll and	[6][Inch][Shift][Run]	Inch 6 Roll Length
Solve for Take-Out Length	[Run]	Inch 1-1/2 Take-Out Length
Solve for Centerline Length	[Run]	Inch 28 -3/8 Centerline Length
Solve for Cut Length	[Run]	Inch 25-1/8 Cut Length
Solve for fit angle (bend angle)	[Run]	28.22° Fitting Angle
Display Welders Gap	[Run]	Inch 1/8 Welder's Gap
Display Advance (Run) Length	[Run]	Inch 25 Advance (Run) Length

Display Offset	[Run]	Inch
		12
		Offset Length
Display Roll Length	[Run]	Inch
		6
		Roll Length

Solving for Rolling Offset Cut Length

A 8" Stainless Steel pipe has an offset of 26",
advance of 20", and roll of 9" and has an
unknown bend angle. Long radius butt weld
elbow fittings are used. Use welders gap of
3/16". Solve for the cut length of the pipe.
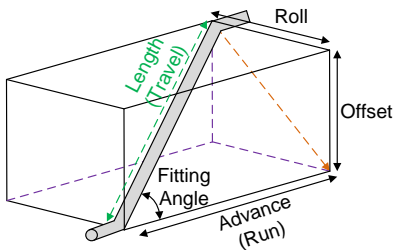
STEPS	KEYSTROKES	DISPLAY
Clear calculator	[Clear][Clear]	
Input Pipe Material	[Material]	Stainless Steel Pipe Material

Input Pipe Type	[Shift][Material]	Schedule 40S Pipe Type
Input Pipe Size	[8][Inch][PipeSize]	Inch 8 Pipe Size
Input Welders Gap	[3][/][1][6][Shift][Angle]	Inch 3/16 Welder's Gap
Input Offset	[2][6][Inch][Offset]	Inch 26 Offset Length
Input Advance (Run)	[2][0][Inch][Run]	Inch 20 Run
Input Roll	[9][Inch][Shift][Run]	Inch 9 Roll Length
Solve for Take-Out	[Run]	Inch 6-1/8 Take-Out Length
Solve for Centerline Length	[Run]	Inch 34 Centerline Length
Solve for Cut Length	[Run]	Inch 21-7/16 Cut Length
Solve for fit angle (bend angle)	[Run]	53.99° Fitting Angle
Display Welders Gap	[Run]	Inch 3/16 Welder's Gap
Display Advance	[Run]	Inch 20

		Advance (Run) Length
Display Offset	[Run]	Inch 26 Offset Length
Display Roll	[Run]	Inch 9 Roll Length
Solve for Inside Arc Length	[Shift][Travel]	Inch 7-1/4 Inside Arc Length
Solve for Center Arc Length	[Travel]	Inch 11-5/16 Center Arc Length
Solve for Outside Arc Length	[Travel]	Inch 15-3/8 Out Arc Length

Solving for Cutback (Concentric Pipes)

Concentric pipes are running with an 8" offset through a 30°bend. Solve for the pipe cutback.

Center-to-Center
Pipe Spacing

8"

30°
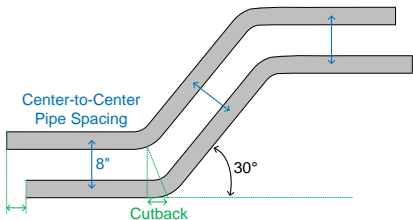
Cutback

STEPS	KEYSTROKES	DISPLAY
Clear calculator	[Clear][Clear]	
Input bend angle	[3][0][Angle]	30° Slope Angle
Input Offset	[8][Inch][Offset]	Inch 8 Offset Length
Solve for Cutback	[Shift][Circle]	Inch 2-1/8 Cutback Length

Solving for Take-Out and BW Cut Marks

Solve for inner, center, and outer arc lengths for a 16" steel pipe that needs cut to a bend angle of 30°. In addition, solve for Take-Out of the elbow fitting.
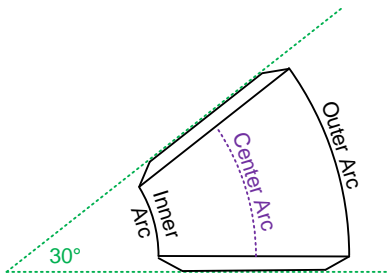
STEPS	KEYSTROKES	DISPLAY
Clear calculator	[Clear][Clear]	
Input Pipe Material	[Material]	Steel Pipe Material
Input Pipe Size	[1][6][Inch][PipeSize]	Inch 16 Pipe Size
Input Elbow Type	[Shift][PipeSize]	Butt Weld – Long Elbow Type
Input bend angle	[3][0][Angle]	30° Slope Angle
Solve for Inside Arc Length	[Shift][Travel]	Inch 8-3/8 Inside Arc Length
Solve for Center Arc Length	[Travel]	Inch 12-9/16 Center Arc Length

19

Solve for Outside Arc Length	[Travel]	Inch
		16-3/4
		Out Arc Length
Solve for Take-Out	[Shift][Offset]	Inch
		6-7/16
		Take-Out Length

Solving for Cut Length (with known Take-Out)

A 6" pipe has an offset of 10" and a bend angle of 45°. The pipe is Schedule 40 Aluminum with a known elbow Take-Out of 3-1/2". Override welder's gap and set to 0. Solve for the end-to-end cut length of the pipe.

STEPS	KEYSTROKES	DISPLAY
Clear calculator	[Clear][Clear]	
Input Pipe Material	[Material]	Aluminum Pipe
		Material
Input Pipe Type	[Shift][Material]	Schedule 40
		PipeType
Input Pipe Size	[6][Inch][PipeSize]	Inch
		6
		Pipe Size

Input Welders Gap	[0][Shift][Run]	Inch 0 Welder's Gap
Input Offset	[1][0][Inch][Offset]	Inch 10 Offset Length
Input Bend Angle	[4][5][Angle]	45° Slope Angle
Input Known Take-Out	[3][Inch][1][/][2] [Shift][Offset]	Inch 3-1/2 Take-Out Length
Solve for Travel	[Travel]	Inch 14-1/8 Travel
Solve for Cut Length	[Travel]	Inch 7-1/8 Cut Length
Display Take-Out	[Shift][Offset]	Inch 3-1/2 Take-Out Length
Display Welders Gap	[Shift][Angle]	Inch 0 Welder's Gap
Display Fit Angle (bend angle)	[Angle]	45° Fitting Angle

Solving for Slope

If a pipe drops 3 inches over 25 feet, solve for the slope of the pipe Run. In addition, solve for the slope angle and percentage grade.

STEPS	KEYSTROKES	DISPLAY
Clear calculator	[Clear][Clear]	
Input Run	[2][5][Feet][Run]	Feet 25 Run
Input Offset	[3][Inch][Offset]	Inch 3 Offset Length
Solve for Slope Angle	[Angle]	0.57° Slope Angle
Solve for % Grade	[Angle]	1 % Grade
Solve for Grade	[Angle]	0.01 Grade
Solve for Slope	[Angle]	Inch 1/8 Slope

Solving for Drop

If a drain pipe requires 1/8" of drop per foot,
how much drop is required over a 30 foot Run?

STEPS	KEYSTROKES	DISPLAY
Clear calculator	[Clear][Clear]	
Input Slope (drop)	[1][/][8][Angle]	Inch 1/8 Slope
Input Run	[30][Feet][Run]	Feet 30 Run

Solve for Drop	[Offset]	Inch
		3-3/4
		Offset Length

Elbow Type

The Pipe Calc Elite™ allows users to select
between long or short radius elbows. When the
"Elbow Type" button is pressed, the following
screen will pop up to allow the user to select
elbow type:
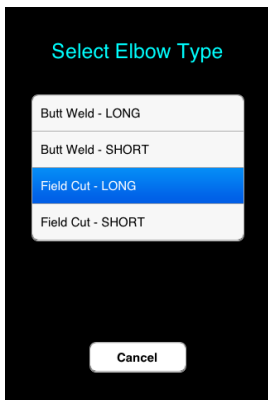
"Butt Weld (BW) – Long" is the default elbow
type. Elbow selection impacts Take-Out

calculations because long and short elbows have different radii. Also, factory cut 45° BW elbows have a different Take-Out than field cut 45° elbows.

Butt Weld - Long:
For 90° long radius BW elbow (or odd-angle fittings cut in the field from the 90°) or factory 45° long radius BW elbow.

Butt Weld - Short:
For 90° short radius BW elbow (or odd-angle fittings cut in the field from the 90°) or factory 45° short radius BW elbow.

Field Cut - Long:
For long radius BW elbow or odd-angle fittings cut in the field from the 90° (including 45°).

Field Cut - Short:
For short radius BW elbow or odd-angle fittings cut in the field from the 90° (including 45°).

Key Definitions:

[Shift][PipeSize] – Elbow Type
Use to select Elbow Type (additional screen will appear to make selection)

Pipe Data

The Pipe Calc Elite™ allows users to enter a pipe material, pipe type, and pipe size and the calculator will display a screen of useful pipe data related to those entries. The pipe data includes: outside diameter, inside diameter, wall thickness, dry/empty pipe weight per foot, filled pipe weight per foot, cross-sectional area, volume per foot, and fill weight per foot.

Key Definitions:

[Material] – Pipe Material
Use to select pipe material for pipe data look-ups. Pipe material also defines which pipe types and sizes are available as well as sets the surface roughness factor for use in pressure loss calculations. When the Pipe Material button is pressed the following screen will appear to allow user to select the desired pipe material.

Select Pipe Material

- Steel
- Stainless Steel
- Cast Iron
- Aluminum
- Brass

Pipe material selections include:
-Steel (default)
-Stainless Steel
-Cast Iron
-Aluminum
-Brass
-PVC
-Copper

[Shift][Material] – Pipe Type
Once pipe material is selected, use this button to select pipe type. The available pipe types are dependent on pipe material selected. When the Pipe Type button is pressed the following screen will appear to allow user to selected desired pipe type.

Select Pipe Type

- **Schedule 80**
- **Schedule 100**
- Schedule 120
- **Schedule 140**
- **Schedule 160**
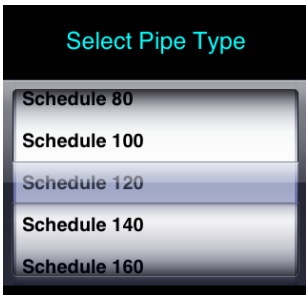
Pipe types available for each material:

Steel, Brass Aluminum, Cast Iron
-Schedule 10
-Schedule 20
-Schedule 30
-Standard
-Schedule 40
-Schedule 60
-Extra Strong
-Schedule 80
-Schedule 100
-Schedule 120
-Schedule 140
-Schedule 160
-Extra Extra Strong

Stainless Steel
-Schedule 40S
-Schedule 80S
-Schedule 160S
-Schedule 5S

-Schedule 10S

PVC
 -Schedule 40
 -Schedule 80
 -Schedule 120
 -SDR 21 (Standard Dimension Ratio)
 -SDR 26
 -SDR 32.5
 -SDR 41

Copper
 -Type L
 -Type K
 -Type M
 -Type DWV (Drain-Waste-Vent)
 -Medical Type L
 -Medical Type K
 -ACR Annealed (Air Conditioning & Refrig)
 -ACR Drawn

[PipeSize] – Pipe Size

Once pipe material and pipe type are selected, use to enter a pipe size. Available pipe sizes are dependent on material and pipe type selected and are based on industry standards. Enter the pipe diameter (typically in inches) and press the pipe size button. The size will be shown on the main display if it is valid. Pressing the pipe size button a second time will bring up a pipe data screen showing a wide range of information on

the pipe configuration selected. An example is shown below.

Pipe Material: Steel
Type: Schedule 10
Size: 4"

Inside Diameter: 4.26"

Internal Area (in^2): 14.25309

Outside Diameter: 4.5"

Wall Thickness: 0.12"

Pipe Volume / foot (ft^3): 0.0989798
Dry Pipe Weight / foot (lbs): 5.613411
Filled Pipe Weight / foot (lbs): 11.79252
Fill Weight/ Volume (lbs/ft^3): 62.42796

OK
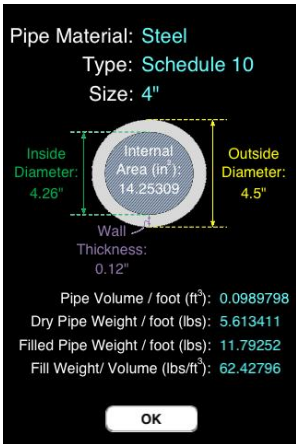
Sample Calculations:

Solving for Pipe Data

Solve for the wall thickness and weight of a 12"
Schedule 40 Aluminum pipe.

STEPS	KEYSTROKES	DISPLAY
Clear calculator	[Clear][Clear]	
Input Pipe Material	[Material]	Aluminum Pipe Material
Input Pipe Type	[Shift][Material]	Schedule 40 Pipe Type
Input Pipe Size	[1][2][Inch][PipeSize]	Inch 12 Pipe Size
Solve for pipe data	[PipeSize]	'New screen will pop-up with data' Thickness: 0.406" Weight: 18.73 lb/ft Outside Diam: 12.75 Inside Diam: 11.938 Etc.

Unit Conversion Functions (and Entering Dimensions)

The Pipe Calc Elite™ allows users to convert units
using the build-in convert function. In addition,
users can enter dimensions such as length in

inches, feet, meters, or millimeters. The calculator supports arithmetic operations with the dimensions as well (i.e. 5 inches * 5 inches = 25 square inches). Arithmetic operations can also be performed on other units found in the conversion menus (i.e. 55 gallons + 3 cu ft = 77.4 gallons). The examples in this section illustrate the unit conversion capabilities of the Pipe Calc Elite™.

Key Definitions:

[Feet] - Feet
Use to enter length in feet. Subsequent presses of the button will change dimensions to square feet and cubic feet. If fractional feet and inches are entered, pressing the button will convert to decimal feet. Pressing the [feet] button when metric dimensions are on the display will convert values on the display to the feet and inch equivalent values.

[Inch] - Inch
Use to enter length in inches. Subsequent presses of the button will change dimensions to square inches and cubic inches. If fractional inches are entered, pressing the button will convert to decimal inches. Pressing the [inch]

button when metric dimensions are on the display will convert values on the display to the equivalent inch value.

[m] - Meters

Use to enter length in meters. Subsequent presses of the button will change dimensions to square meters and cubic meters. Pressing the meters button when feet or inch dimensions are on the display will convert values on the display to the metric equivalent values.

[mm] - Millimeters

Use to enter length in millimeters. Subsequent presses of the button will change dimensions to square millimeters and cubic millimeters. Pressing the millimeters button when feet or inch dimensions are on the display will convert values on the display to the metric equivalent values.

[/] - Fraction

Use this key to enter fractions in combination with inch and feet buttons.

[Shift][6] – Weight/Volume

Use to enter weight per volume to be used in conversions between units of weight and volume

and for use in pipe data results: weight of filled pipe per foot. The default weight/volume is 62.42796 lbs/cubic foot (weight of water) and this value is restored whenever a clear all is pressed ([Shift][+]). To store a custom weight/volume, enter a value and then press [shift][6]. Continue to pressed the [6] button to select desired unit. Available units include lbs/gal, Kg/m^3, Kg/L, lbs/ft^3, and lbs/in^3.

[Convert]- Convert or Enter Units
Use to add dimensional units to a value that has been entered or calculated. If dimensional units are already set, the convert button displays a list of dimensions that the current value can be converted to along with the associated values for each unit. A pop-up window similar to that shown below will be seen when the convert button is pressed.
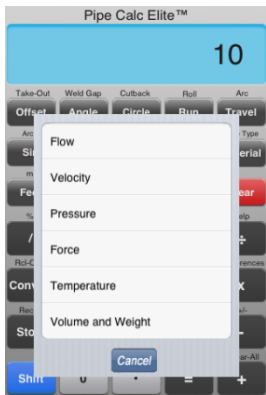
Unit conversions are available for the following:

Flow:
-Gallons per Minute (gpm)
-Cubic Feet per Minute (cfm)
-Cubic Feet per Second (cfs)
-Cubic Meters per Seconds (cms)
-Liters per Second (lps)

Velocity:
-Feet per Second (fps)
-Feet per Minute (fpm)
-Meters per Second (mps)
-Centimeters per Second (cmps)

Pressure:
-Pounds per Square Inch (psi)
-Pounds per Square Foot (psf)
-Inches of Mercury (inHg)
-Feet of Head (fthd)
-bars
-Kilopascals (kpa)

Force
-Pound-Force (lbf)
-Newtons
-Gram-Force (gf)
-Ounce-Force (ozf)

Temperature
-Celsius (C)
-Fahrenheit (F)
-Kelvin (K)

Volume and weight (uses wt/vol setting)
-Gallons (gal)
-Liters (L)
-Cubic Inch (in^3)
-Cubic Feet (ft^3)
-Cubic Meter (m^3)
-Cubic Millimeter (mm^3)
-Pound (lbs)
-Kilogram (kg)

Sample Calculations:

Converting Linear Units

Convert 6 feet 3-1/2 inches to decimal inches and also to meters and millimeters.

Note: Units should be entered in order from largest to smallest (ie enter feet, then inches, then fractional inch).

STEPS	KEYSTROKES	DISPLAY
Clear calculator	[Clear][Clear]	
Input length	[6][Feet][3][Inch][1][/][2]	Feet 6 Inch 3-1/2
Convert to decimal inches	[Inch][Inch]	Inch 75.5
Convert to meters	[m]	Meter 1.9177
Convert to mm	[mm]	Miliimeter 1917.7

Converting Area and Volume

Convert 90 square inches to square meters. Enter in 10 cubic feet.

STEPS	KEYSTROKES	DISPLAY
Clear calculator	[Clear][Clear]	
Input Area	[9][0][Inch][Inch]	Square Inch 90

36

Convert to square meters	[m]	Square Meter 0.058064
Input 10 cubic ft	[1][0][Feet][Feet][Feet]	Cubic Feet 10

Math using dimensional Units

Divide 25 feet 4 inches by 6.

STEPS	KEYSTROKES	DISPLAY
Clear calculator	[Clear][Clear]	
Input Length	[2][5][Feet][4][Inch]	Feet 25 Inch 4
Divide by 6	[÷][6][=]	Feet 4 Inch 2-11/16

Multiply 25 feet 4 inches by 3 feet 3 inches.

STEPS	KEYSTROKES	DISPLAY
Clear calculator	[Clear][Clear]	
Input Length	[2][5][Feet][4][Inch]	Feet 25 Inch 4
Multiply by 3ft 3 in	[x][3][Feet][3][Inch][=]	Square Feet 82.3333

Add 3 cubic feet and 20 gallons.

STEPS	KEYSTROKES	DISPLAY
Clear calculator	[Clear][Clear]	

Input 3 cuft	[3][Feet][Feet][Feet]	Cubic Feet 3
Add 20 gallons	[+][2][0][Convert] 'Select gallons'	20 Gallons
Solve	[=]	Cubic Feet 5.6736

Converting Volume

Convert 55 gallons to cubic feet.

STEPS	KEYSTROKES	DISPLAY
Clear calculator	[Clear][Clear]	
Input 55 gallons	[5][5][Convert] Select 'Gallon'	55 Gallons
Convert to cubic ft	[Convert] Select 'Cubic Feet'	Cubic Feet 7.35243

Converting Weight

Convert 210 pounds to Kilograms.

STEPS	KEYSTROKES	DISPLAY
Clear calculator	[Clear][Clear]	
Input 210 pounds	[2][1][0][Convert] Select 'Pounds'	210 Pounds
Convert to Kilograms	[Convert] Select 'Kilograms'	95.2544 Kilograms

Converting Weight/Volume

How many pounds does 55 gallons of water weigh?

Note: Default weight/volume for water can be used at 62.42796 lbs/cubic foot

STEPS	KEYSTROKES	DISPLAY
Clear calculator	[Clear][Clear]	
Input 55 gallons	[5][5][Convert] Select 'Gallon'	55 Gallons
Convert to pounds	[Convert] Select 'Pounds'	458.997 Pounds

How many pounds does 55 gallons of gasoline weigh?

Note: Weight/volume for gasoline is approximately 6.073 lbs/gallon.

STEPS	KEYSTROKES	DISPLAY
Clear calculator	[Clear][Clear]	
Set weight/volume for gas	[6][.][0][7][3][Shift][6]	6.073 Pounds per Gallon
Input 55 gallons	[5][5][Convert] Select 'Gallon'	55 Gallons
Convert to pounds	[Convert] Select 'Pounds'	334.015 Pounds

Converting Temperature

Convert 200°F to C°.

STEPS	KEYSTROKES	DISPLAY
Clear calculator	[Clear][Clear]	
Input 200°F	[2][0][0][Convert] Select 'Fahrenheit'	200 Fahrenheit
Convert to °C	[Convert] Select 'Celsius'	93.3333 Celsius

Converting Flow Rates

Convert 50 cubic feet per second to gallons per minute.

STEPS	KEYSTROKES	DISPLAY
Clear calculator	[Clear][Clear]	
Input 50 cubic feet	[5][0][Convert] Select 'cfs'	50 Cubic Feet per Second
Convert to gallons per minutes	[Convert] Select 'gpm'	22441.6 Gallons per Minute

Converting Pressure

Convert 115psi to pounds per square foot.

STEPS	KEYSTROKES	DISPLAY
Clear calculator	[Clear][Clear]	

| Input 115 psi | [1][1][5][Convert]
Select 'psi' | 115
Pounds per
Square Inch |
| Convert to pounds
per square foot | [Convert]
Select 'psf' | 16560
Pounds per
Square Foot |

D:M:S Conversion

The Pipe Calc Elite™ allows users to convert
between decimal degrees and
degrees:minutes:seconds format.

Key Definitions:

[Shift][4] – D:M:S <-> Decimal Degrees
Press to convert between decimal degrees and
degrees:minutes:seconds format.

Sample Calculations:

Converting from decimal degree to D:M:S

Convert 62.125° to degrees:minutes:seconds
format.

STEPS	KEYSTROKES	DISPLAY
Clear calculator	[Clear][Clear]	

| Input decimal degrees and convert to DMS | [6][2][.][1][2][5] [Shift][4] | 62.07.30 DMS |

Converting from D:M:S to decimal degrees

Convert 42° 15′ 30″ to decimal degrees.

STEPS	KEYSTROKES	DISPLAY
Clear calculator	[Clear][Clear]	
Input DMS and convert to decimal degrees	[4][2][.][1][5][.][3][0] [Shift][4]	42.26 °

Circle Diameter, Area, Circumference Function

The Pipe Calc Elite™ allows users to enter a diameter and solve for area and circumference of a circle.

Key Definitions:

[Circle] – Circle
Use to enter diameter of a circle and then calculate the area and circumference.

42

Sample Calculations:

Solve for Area and Circumference of Circle

Solve for the area and circumference of a circle if the diameter of the circle is 0.5 meters.

STEPS	KEYSTROKES	DISPLAY
Clear calculator	[Clear][Clear]	
Input diameter	[0][.][5][Shift]{Feet}[Circle]	Meter 0.5 Diameter
Solve for Area	[Circle]	Square Meter 0.19635 Area of Circle
Solve for Circumference	[Circle]	Meter 1.571 Circumference

Flow Rate Function

The Pipe Calc Elite™ allows users to calculate flow rate based on Area and Velocity. Area can be entered directly or be obtained by entering a pipe size which generates a cross-sectional area.

Key Definitions:

[Shift][7] – Flow
Use to enter or calculate volumetric flow rate through a pipe.

Sample Calculations:

Solve for Flow Rate in pipe

A 12" cast iron schedule 40 pipe has fluid moving at 3 feet per second. Solve for the flow rate in gallons per minute.

STEPS	KEYSTROKES	DISPLAY
Clear calculator	[Clear][Clear]	
Input pipe material	[Material] Select 'Cast Iron'	Cast Iron Pipe Material
Input pipe type	[Shift][Material] Select 'Schedule 40'	Schedule 40 Pipe Type
Input pipe size	[1][2][Inch][PipeSize]	Inch 12 Pipe Size
Input velocity	[3][Shift][8]	3 Feet per Second
Solve for flow	[Shift][7]	1046.63 Gallons per Minute

Solve for Flow Rate (with known area)

Given a velocity of 6 feet per minute and area of 4.3 square feet, solve for flow in gallons per minute.

STEPS	KEYSTROKES	DISPLAY
Clear calculator	[Clear][Clear]	
Input velocity	[6][Shift][8][8]	6 Feet per Minute
Input Area	[4][.][3][Feet][Feet] [Shift][9]	Square Feet 4.3 Area
Solve for flow	[Shift][7]	192.997 Gallons per Minute

Velocity Function

The Pipe Calc Elite™ allows users to calculate velocity based on Area and Flow Rate. Area can be entered directly or be obtained by entering a pipe size which generates a cross-sectional area.

Key Definitions:

[Shift][8] – Velocity
Use to enter or calculate velocity

Sample Calculations:

Solve for Velocity in pipe

An 8" steel schedule 40 pipe has a flow rate of 18 gpm. Solve for fluid velocity in feet per second.

STEPS	KEYSTROKES	DISPLAY
Clear calculator	[Clear][Clear]	
Input pipe material	[Material] Select 'Steel'	Steel Pipe Material
Input pipe type	[Shift][Material] Select 'Schedule 40'	Schedule 40 Pipe Type
Input pipe size	[8][Inch][PipeSize]	Inch 8 Pipe Size
Input flow	[1][8][Shift][7]	18 Gallons per minute
Solve for velocity	[Shift][8]	0.115438 Feet per Second

Pressure Loss Function

The Pipe Calc Elite™ allows users to calculate pressure loss in a pipe based on pipe material and size, flow/velocity, and length of the pipe. Cross-sectional area of the pipe can also be manually entered using the area button rather than defining the pipe size. If length is not

entered, pressure loss will be calculated as
pressure loss per foot.

To accurately calculate pressure loss a Reynolds
number is computed to determine which
equation is appropriate for the flow type in the
pipe. The Reynolds number is defined by:

$$Re_D = \frac{\rho v D}{\mu}$$

where v=velocity, D=internal pipe diameter,
ρ=density (default is 1000 kg/m^3 for water but
can be set with wt/vol button), and μ=dynamic
viscosity (set to 0.001 Pascal-seconds for water).

The general equation used for pressure loss in a
pipe is as follows (derived from the Darcy
formula):

$$\Delta p = \frac{\rho f L v^2}{2D}$$

where ρ=density, f=friction coefficient, L=pipe
length, v=velocity, D= internal pipe diameter

Laminar Method

If Reynolds number <3,000, the flow is considered to be laminar and the friction coefficient is determined by:

$$f = \frac{64}{Re}$$

Smooth Pipe Method

If the Reynolds number >3,000 and pipe roughness < boundary layer thickness a smooth pipe is assumed and the friction coefficient is determined by:

$$f = \frac{0.3164}{\sqrt[4]{Re}}$$

Pipe roughness is dependent on pipe material and is defined as follows:

Material	Absolute Surface Roughness (inches)
Steel	0.0026520
Stainless Steel	0.0005904
Brass	0.0000588
Alum	0.0000588
Cast Iron	0.0102000
PVC	0.0001872
Copper	0.0000588

Boundary layer thickness can be calculated based on the Prandtl equation as:

$$\delta = 62.7 \frac{D}{Re^{7/8}}$$

Where δ=boundary layer thickness, D=internal pipe diameter, and Re=Reynolds number

Prandtl Equation Method

If the Reynolds number <100,000 and pipe roughness > boundary layer thickness the flow is assumed to be turbulent and the Prandtl equation is used. In this case the friction coefficient is determined by:

$$\frac{1}{\sqrt{f}} = -2\log\left[\frac{2.51}{Re * \sqrt{f}} + \frac{k}{D} * 0.269\right]$$

Where f =friction coefficient, Re=Reynolds number, k=Absolute Roughness (defined in previous table), D=internal pipe diameter

Karman Equation Method

For all other conditions (turbulent flow with Reynold>100,000), the Karman equation is used to solve for the friction coefficient as follows:

$$f = \left(2.0log\frac{D}{k} + 1.14\right)^{-2.0}$$

Where f =friction coefficient, k=Absolute
Roughness (defined in previous table),
D=internal pipe diameter

Key Definitions:

[Shift][m] – Pressure
Use to enter or calculate pressure or pressure
loss.

Sample Calculations:

Solve for Pressure Loss

A ½" Schedule 40 PVC pipe has water moving at
0.5 feet per second. Solve for the pressure loss
in 100 inches of pipe.

STEPS	KEYSTROKES	DISPLAY
Clear calculator	[Clear][Clear]	
Input pipe material	[Material] Select 'PVC'	PVC Pipe Material
Input pipe type	[Shift][Material] Select 'Schedule 40'	Schedule 40 Pipe Type
Input pipe size	[1][/][2][Inch][PipeSize]	Inch 0.5 Pipe Size

Input velocity	[0][.][5][Shift][8]	0.5 Feet per Second
Input run length	[1][0][0][Inch][Run]	Inch 100 Run
Solve for pressure loss	[Shift][m]	0.007198 Pounds per Square Inch
Solve for Square Foot	[m]	1.03649 Pounds per Square Foot
Solve for Feet of Head	[m]	0.016603 Feet of Head
Solve for Inches of Mercury	[m]	0.014657 Inches of Mercury
Solve for Kilopascals	[m]	0.049627 Kilopascals
Solve for bars	[m]	0.000496 Bars
Display Reynolds number	[m]	2407.737 Reynolds Number
Display Friction Coefficient	[m]	0.026581 Friction Coefficient
Display Method for Calculating Pressure Loss	[m]	Laminar Flow Method

A 4" Schedule 40 Steel pipe has water flowing at 150 gpm. Solve for the pressure loss in 300 feet of pipe.

51

STEPS	KEYSTROKES	DISPLAY
Clear calculator	[Clear][Clear]	
Input pipe material	[Material] Select 'Steel'	Steel Pipe Material
Input pipe type	[Shift][Material] Select 'Schedule 40'	Schedule 40 Pipe Type
Input pipe size	[4][Inch][PipeSize]	Inch 4 Pipe Size
Input Flow	[150][Shift][7]	150 Gallons per minute
Input run length	[3][0][0][Feet][Run]	Feet 300 Run
Solve for pressure loss	[Shift][m]	1.470276 Pounds per Square Inch
Solve for Pounds per Square Foot	[m]	211.72 Pounds per Square Foot
Solve for Feet of Head	[m]	3.39142 Feet of Head
Solve for Inches of Mercury	[m]	2.99386 Inches of Mercury
Solve for Kilopascals	[m]	10.1372 Kilopascals
Solve for bars	[m]	0.101372 Bars
Display Reynolds number	[m]	117830 Reynolds Number
Display Friction Coefficient	[m]	0.017077 Friction

		Coefficient
Display Method for Calculating Pressure Loss	[m]	Smooth Pipe Method

A ¾" Schedule 40 Steel pipe has water flowing at 22 gpm. Solve for the pressure loss per foot.

STEPS	KEYSTROKES	DISPLAY
Clear calculator	[Clear][Clear]	
Input pipe material	[Material] Select 'Steel'	Steel Pipe Material
Input pipe type	[Shift][Material] Select 'Schedule 40'	Schedule 40 Pipe Type
Input pipe size	[3][/][4][Inch][PipeSize]	Inch 0.75 Pipe Size
Input Flow	[2][2][Shift][7]	22 Gallons per minute
Solve for pressure loss	[Shift][m]	0.48335 Pounds per Square Inch per Foot
Solve for pressure loss	[m]	69.6025 Pounds per Square Foot per Foot
Solve for Feet of Head	[m]	1.11492 Feet of Head per Foot
Solve for Inches of Mercury	[m]	0.984224 Inches of

		Mercury per Foot
Solve for Kilopascals	[m]	3.33258 Kilopascals per Foot
Solve for bars	[m]	0.033326 Bars per Foot
Display Reynolds number	[m]	84437.2 Reynolds Number
Display Friction Coefficient	[m]	0.02812 Friction Coefficient
Display Method for Calculating Pressure Loss	[m]	Prandtl Method

A 6" Schedule 40 Steel pipe has water moving at 20 feet per second. Solve for the pressure loss in 100 feet of pipe.

STEPS	KEYSTROKES	DISPLAY
Clear calculator	[Clear][Clear]	
Input pipe material	[Material] Select 'Steel'	Steel Pipe Material
Input pipe type	[Shift][Material] Select 'Schedule 40'	Steel Schedule 40
Input pipe size	[6][Inch][PipeSize]	Inch 6 Pipe Size
Input velocity	[2][0][Shift][8]	20 Feet per second
Input run length	[1][0][0][Feet][Run]	Feet 100

		Run
Solve for pressure loss	[Shift][m]	8.633968 Pounds per Square Inch
Solve for Pounds per Square Foot	[m]	1243.29 Pounds per Square Foot
Solve for Feet of Head	[m]	19.9156 Feet of Head
Solve for Inches of Mercury	[m]	17.581 Inches of Mercury
Solve for Kilopascals	[m]	59.5291 Kilopascals
Solve for bars	[m]	0.595291 Bars
Display Reynolds number	[m]	939095 Reynolds Number
Display Friction Coefficient	[m]	0.016193 Friction Coefficient
Display Method for Calculating Pressure Loss	[m]	Karman Method

Pressure/Force Function

The Pipe Calc Elite™ allows users to calculate pressure based on known force and Area. Area can be entered directly or be obtained by

55

entering a pipe size which generates a cross-sectional area.

Key Definitions:

[Shift][m] – Pressure
Use to enter or calculate pressure or pressure loss.

Sample Calculations:

Solve for Pressure (with known force)

If 50 Newtons of force are applied to an area of 10 square inches, solve for pressure in pounds per square inch.

STEPS	KEYSTROKES	DISPLAY
Clear calculator	[Clear][Clear]	
Input force	[5][0][Shift][mm][mm]	50 Newtons
Input area	[1][0][Shift][9]	Square Inch 10 Area
Solve for pressure	[Shift][m]	1.12404 Pounds per Square Inch

Area Function

The Pipe Calc Elite™ allows users to calculate
Area based on known force/pressure or
flow/velocity. The area button can also be used
to display the cross-sectional area of a pipe that
has been defined.

Key Definitions:

[Shift][9] – Area
Use to enter for use in flow, velocity, pressure
and force equations or calculate area based on
known force/pressure or flow/velocity.

Sample Calculations:

Solve for Area (with known force/pressure)

If 60 Newtons of force are present and pressure
is known to be 5 psi, solve for area in square
inches.

STEPS	KEYSTROKES	DISPLAY
Clear calculator	[Clear][Clear]	
Input force	[6][0][Shift][mm][mm]	60 Newtons
Input pressure	[5][Shift][m]	5 Pounds per

		Square Inch
Solve for area	[Shift][9]	Square Inch
		2.69771
		Area

#### Solve for Area (with known flow/velocity)

If water in a pipe has a flow of 10 cubic feet per minute and is moving at 60 feet per minute, solve for the cross-sectional area of the pipe in square inches.

STEPS	KEYSTROKES	DISPLAY
Clear calculator	[Clear][Clear]	
Input flow	[1][0][Shift][7][7]	10
		Cubic Feet per
		Minute
Input velocity	[6][0][Shift][8][8]	60
		Feet per minute
Solve for area	[Shift][9]	Square Inch
		24
		Area

Memory Storage

The Pipe Calc Elite™ allows users to store numbers or calculated results by pressing the [Store] button. You can store as many values/results as you like and the calculator will put them in a list. Values can be viewed and

recalled from a popup window by pressing the [Shift][Store] (Recall) button as shown below:

Stored Values

5 - 4 FEET INCH	
35.00 ° Slope Angle	
10 INCH Offset Length	
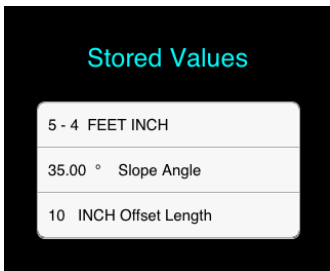
Values can be cleared from memory by pressing [Shift][Convert] (Rcl-Clear) and selecting the entry to be cleared.

Values stored in memory are persistent and stay saved when the program is closed and reopened. The entire memory storage can be cleared with the clear all command, [Shift][+].

Technical Support:

Email: techsupport@cyberprodigy.com

Legal:

Software copyrighted by Cyberprodigy LLC, 2013.

Pipe Calc Elite™ is a trademark of Cyberprodigy LLC.

http://www.cyberprodigy.com/pipecalcelite