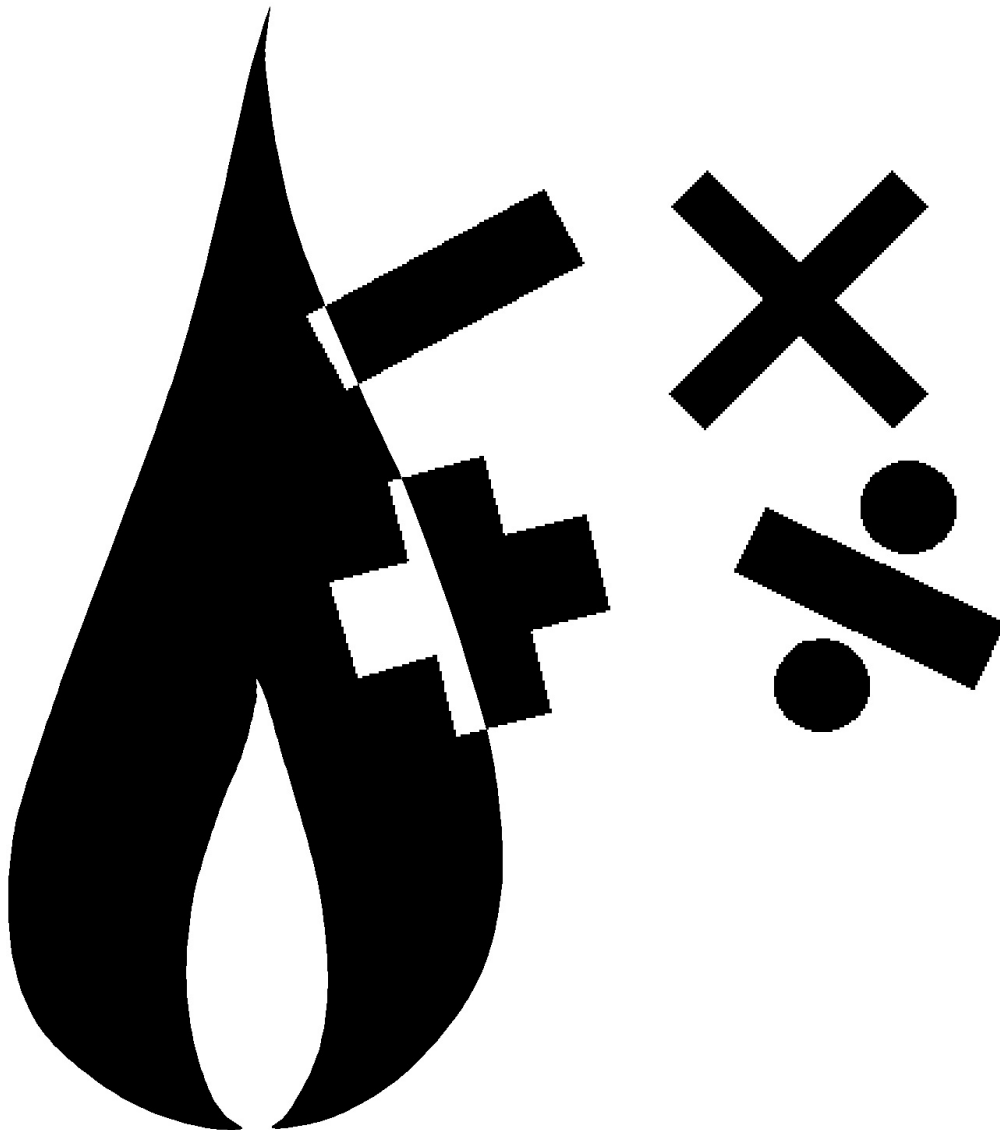


GASCalcTM 6.1

Demonstration Guide



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Thank you for your interest in our products and for taking the time to view our demonstration software. We hope you will be pleased with what you see during the demonstration. We are truly committed to providing products that ensure your success. If you have suggestions that might help improve GASCalc to better meet your needs - *please* let us know your ideas. Again, thank you for your interest.

A handwritten signature in black ink, appearing to read 'B3' with a stylized flourish.

Bradley B. Bean, PE
Managing Member

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Revision 012**

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General Information

The information in this guide is provided to allow you to install and use the demonstration version of the software. The demonstration software is a full-featured, time-limited version of GASCalc™. Working the example contained in this guide should give you a good introduction to the software's features and ease of use. If you wish to explore the software further, we suggest reviewing the examples contained in the individual calculation references.

System/Hardware Requirements

GASCalc will operate on any device configured to run Windows 8 through Windows 11 operating system.

The GASCalc software - Demonstration version will require a minimum of 75 MB of free hard disk space when installed.

Installing GASCalc

An appropriate version of Windows must be running in order to install GASCalc. If it is not, start Windows now, then proceed with the installation process described below.

Note...

On Windows Vista and newer devices, you will need to be logged on as the Full Administrator or use the “*Run as administrator*” option when executing the installation file.

- Download the compressed folder (.zip) containing the setup executable file from our website (www.b3pelle.com) to your device. Navigate to the folder's location and open or explore it using Windows File Explorer.
- Double-click the setup file's name in the compressed folder. If a Windows Security warning appears, allow your device to execute the file.
- After the setup program has been started, several screens will be displayed during the installation process. Read the contents of each screen carefully and respond appropriately.

Note...

On the License Agreement screen, read the Terms Of Use Agreement carefully and select the “*I agree to...*” option. If you do not wish to accept the Terms Of Use Agreement, you will not be able to continue with the installation process.



- A message will be displayed when the installation process is complete. The message will indicate whether the installation was successful or failed. Select the appropriate option to clear the message.

Starting GASCalc

Note...

- An appropriate version of Windows must be running before GASCalc may be executed. If Windows is not running, begin its execution now.
- On Windows Vista and newer devices, you will need to be logged on as the Full Administrator or use the “Run as administrator” option the first time you execute the GASCalc software.

- From the Windows Desktop, double-click the *GASCalc Demo* shortcut icon.

- The GASCalc software will be started, and the Welcome screen will be displayed. Click the *Continue* command button.

- The Demonstration Notes screen will be displayed. Read carefully, then click the *Continue* command button. The Pipe Flow calculation screen will be displayed.



Note...

If the device is not connected to the internet, a message stating that the software is “Unable To Access Validation File” will be displayed. To proceed - connect the device to the internet, then click the *Retry* command button.

Once installed and executed, the use of GASCalc is virtually self-explanatory. To perform a calculation, choose the appropriate calculation routine from one of the menu lists; on the calculation screen, click the red or blue label for the item to be calculated so that it is underlined, enter the desired values in the data fields, then click the *Calculate* command button.

Using The Help System

The help documents are stored on the B3PE server. You must be connected to the internet to access the various GASCalc help and support documents.

The GASCalc “Help System” consists of various Portable Document Format (PDF) documents. A suitable PDF document viewer or reader is required to view and print the documents.

When associated with a calculation screen, the help file is called a “Calculation Reference.” To view a Calculation Reference from a calculation screen, open the desired calculation screen by selecting the appropriate menu item. When opened, click the *Help* command button or icon on the associated calculation screen.

Once a document is opened, it can be saved locally if you wish. If you save a help document to your machine for offline access, you must open it directly in your PDF document viewer. Clicking the *Help* command button will not open an offline help document.

The Help Menu

Access to the various help documents and information is provided in the *Help* menu. You can also view our contact information, send a help request, or visit our website. *Note* - Some of the features require an internet connection to work properly.

Contact Us

Hours - Our normal work hours are 8:00 A.M. to 5:00 P.M. Mountain Time, Monday through Friday. However, if you have a problem, please try at any time - we may be in.

By Telephone - (719) 578-9391

By Email - help@b3pe.com

By Website - www.b3pellc.com



Example - US Dimensional Units

The following example will guide you through the general steps of performing a GASCalc calculation. Although the example guides you through several pipe flow-related calculations, the general steps involved with the calculation can be applied to perform nearly any of the other calculations. Because of the length of this topic, it might be beneficial to print the topic before proceeding with the example.

For this example, we will start by determining the pressure drop associated with the flow of 10 mcfh through 1000 feet of a 2-inch plastic pipe. The inlet pressure to the pipe segment is 40 psi. The average geographic elevation of the line is 300 feet above sea level, and the average gas-flowing temperature is 60 Fahrenheit. We will neglect the effect of fittings for this first calculation. After calculating the pressure drop, we will determine the minimum pipe size or sizes required to maintain a specific outlet pressure. Start using the following steps to calculate the pressure drop associated with these conditions.

If GASCalc is not running, start it now.

Open The Pipe Flow Calculation Screen

- If the Pipe Flow calculation screen is not already displayed, from the *Pipe* menu, select the *Pipe Flow* item. The Pipe Flow calculation screen will be displayed. Click the *Clear* command button.

Note...

You will notice various data items, dimensional units, and calculated values listed on the screen. Data values are entered by typing the desired value into the associated data field or by selecting an item from the associated drop-down list for some items like pipe diameter. Dimensional units are set by selecting the desired item from the associated drop-down list. Several of the data values have a colored label next to them. For example, the labels for the Diameter, Length, Efficiency, Flow Rate, Inlet Pressure, and Outlet Pressure items are “red” on this calculation screen. These represent the individual data items that can be “unknown” or calculated. The “unknown” value will be underlined. To change the “unknown” value, click on the associated red label. Only one of the red item labels can be underlined per calculation.

Set The Base Conditions

Before performing most any pressure or flow-related calculation, the base conditions for the calculation must be established. This involves setting the base pressure, temperature, gas property values, and atmospheric pressure calculation method. Set the base conditions as follows:

- On the Pipe Flow calculation screen, click the *Base Conditions* command button. The Base Conditions screen will be displayed. Set the following data values:

Pressure = **14.73 Psi (Abs)**
 Temperature = **60 Fahrenheit**
 Use Gas Properties File = **us_common.prp**
 Atmospheric Pressure Method = **AGA**
 Compressibility Method = **None**

- Click the *Apply* command button to save the changes.

The screenshot shows the 'Base Conditions...' dialog box. It is organized into three main sections:

- Base Conditions...**
 - Pressure: 14.73, Psi (Abs)
 - Temperature: 60, Fahrenheit
- Gas Properties...**
 - Use Gas Properties File: us_common.prp
 - Specific Gravity: 0.6, with an unchecked 'Real Gas Value' checkbox
 - Viscosity: 0.000007, Lbm/ft-sec
 - Specific Heat Ratio: 1.3
 - Heating Value: 1000, Btu/cf
- Other...**
 - Atmospheric Pressure Method: AGA
 - Compressibility Factor Method: None
 - ☐ Apply Conditions To All Calculations

At the bottom, there are two rows of buttons: 'Clear' and 'Help' in the first row; 'Cancel', 'Open', 'Save', and 'Apply' in the second row.

Set The Heat Loss/Gain Data

For this example, we will not be performing any temperature calculations. Ensure that the temperature calculation methods are turned off. To check the settings:

- On the Pipe Flow calculation screen, select the *Heat Loss/Gain Data* tab. Set the following values:

Calculation Method = **None**

Include Joule-Thomson Cooling = **Unselect**

The screenshot shows the 'Heat Loss/Gain Data' tab selected in the software interface. The 'Calculation Method' is set to 'None' in a dropdown menu, and the 'Include Joule-Thomson Cooling' checkbox is unchecked.

Tab	Calculation Method	Include Joule-Thomson Cooling
Pipe Data		
Other Data		
Heat Loss/Gain Data	None	☐

Set The Other Data

- If the *Other Data* tab has a number following the label, it indicates that fittings or additional pipe segments are attached. If a number is shown, select the *Other Data* tab and click the *Clear* command button to remove the attached fittings or segments.

Enter The Pipe Data

- Return to the *Pipe Data* tab by clicking the data tab heading.
- In the *End Conditions* section, indicate that the *Outlet Pressure* value is to be calculated by clicking on the red *Outlet Pressure* label until it is underlined.
- In the *Pipe Flow Equation* section, set the following values:

Pipe Flow Equation = **Institute of Gas Technology - Improved**

- In the *Segment Data* section, set the following values:

Diameter = **2P-S11 Inches**

Length = **1000 Feet**

Efficiency = **0.95 Decimal**

Flow Rate = **10 Mcfh**



- In the *End Conditions* section, set the following values:

Inlet Pressure = **40 Psi**
 Inlet Elevation = **300 Feet**
 Outlet Elevation = **300 Feet**
 Inlet Temperature = **60 Fahrenheit**
 Outlet Temperature = **60 Fahrenheit**

- In the *Calculated Values* section, set the following values:

Min / Max Velocity Units = **Feet/sec**

Pipe Flow...

Pipe Data | Other Data | Heat Loss/Gain Data

Pipe Flow Equation...
 Institute of Gas Technology - Improved

Segment Data...

Diameter: 2P-S11 Inches i
 Length: 1000 Feet
 Efficiency: 0.95 Decimal
 Roughness: 0.00006 Inches
 Flow Rate: 10 Mcfh

End Conditions...

Inlet Pressure: 40 Psi
 Outlet Pressure: Psi
 Inlet Elevation: 300 Feet
 Outlet Elevation: 300 Feet
 Inlet Temperature: 60 Fahrenheit
 Outlet Temperature: 60 Fahrenheit

Calculated Values...

Inside Diameter: 1.943 Inches
 Pressure Drop:
 Min / Max Velocity: Feet/sec
 Compressibility (Flowing):
 Line Volume:
 Average Pressure:

*** Calculate *** Swap Pressures Base Conditions Clear Help Notes
 Cancel Open Save Print Close

Calculate The Outlet Pressure Value & The Pressure Drop

- Click the *Calculate* command button. The results should look similar to the following image.

The screenshot shows the 'Pipe Flow...' dialog box with the following data:

Pipe Data		Other Data		Heat Loss/Gain Data	
Pipe Flow Equation... Institute of Gas Technology - Improved					
Segment Data...			End Conditions...		
Diameter:	2P-S11	Inches	Inlet Pressure:	40	Psi
Length:	1000	Feet	Outlet Pressure:	37.02	Psi
Efficiency:	0.95	Decimal	Inlet Elevation:	300	Feet
Roughness:	0.00006	Inches	Outlet Elevation:	300	Feet
Flow Rate:	10	Mcfh	Inlet Temperature:	60	Fahrenheit
			Outlet Temperature:	60	Fahrenheit
Calculated Values...					
Inside Diameter:	1.943 Inches	Compressibility (Flowing):	1.000000	Line Volume:	0.074 Mcf
Pressure Drop:	2.98 Psi	Average Pressure:	38.53 Psi		
Min / Max Velocity:	36.4 / 38.5	Feet/sec			

Buttons: Calculate, Swap Pressures, Base Conditions, Clear, Help, Notes, Cancel, Open, Save, Print, Close.

Note... The results indicate that the *Pressure Drop* for these conditions is approximately 3 psi, resulting in an *Outlet Pressure* of about 37 psi. For illustration purposes, let's say that it is acceptable for the *Outlet Pressure* to be as low as 35 psi, then let's calculate the pipe size required to produce that value, with the other specified conditions remaining the same.

Calculate The Pipe Size

- In the *Segment Data* section, indicate that the *Diameter* value will be calculated (“unknown”) by clicking on the *Diameter* label until it is underlined. In the *End Conditions* section, set the *Outlet Pressure* to 35 Psi.

The screenshot shows the GASCalc 6.1 software interface with the 'Pipe Data' tab selected. The 'Pipe Flow Equation...' dropdown is set to 'Institute of Gas Technology - Improved'. The 'Segment Data...' section contains the following values: 'Diameter' is set to '?' (highlighted in yellow), 'Length' is 1000, 'Efficiency' is 0.95, 'Roughness' is 0.00006, and 'Flow Rate' is 10. The 'End Conditions...' section contains the following values: 'Inlet Pressure' is 40, 'Outlet Pressure' is 35, 'Inlet Elevation' is 300, 'Outlet Elevation' is 300, 'Inlet Temperature' is 60, and 'Outlet Temperature' is 60.

Note...

When calculating a *Diameter* value, GASCalc will calculate an exact *Inside Diameter* value and select a combination of pipe size/types that will produce the exact *Outlet Pressure* value. The pipe size selection requires the User to indicate the pipe material from which GASCalc can select size/types. This is done using the *Pipe Material* item on the *Other Data* tab. The Pipe Property Table lists the various pipes available for pipe-related calculations. The values and settings in the Pipe Property Table can be modified by the User by selecting the *Edit Pipe Properties* item from the *Pipe* menu. For this example, we will use the standard settings.

- Select the *Other Data* tab. In the *Pipe Sizing Data* section, set the following values:

Pipe Material = **Plastic - MDPE**
 Allowable Velocity = **55 Feet/sec**
 Use A Single Pipe Size Only = **Unselect**

Note... For various reasons, sometimes specific design criteria limit the gas velocity in a pipe segment. When calculating a *Diameter* value, GASCalc initially calculates the size based on the specified *Inlet* and *Outlet Pressure* values; it then checks whether the pressure-based size meets the specified allowable velocity criteria. If it does not, the size is recalculated based on the specified *Allowable Velocity* value.

The screenshot shows the 'Other Data' tab in the GASCalc 6.1 software. The 'Pipe Sizing Data' section is active, displaying the following settings:

- Pipe Material:** Plastic - MDPE (selected from a dropdown menu)
- Allowable Velocity:** 55 Feet/sec
- Use A Single Pipe Size Only:** ☐ (unselected)

The 'Compressibility Factor...' section shows:

- Base:** 1
- Flowing:** 1

The 'Additional Components...' section includes a list box (currently empty), buttons for 'Add', 'Delete', 'Insert', and 'Clear', and an 'Additional Length' of 0 Feet. There is also an 'Ignore Components' checkbox which is unselected.

- Return to the *Pipe Data* tab. Click the *Calculate* command button. The results should look similar to the following image.

The screenshot shows the 'Pipe Flow...' dialog box with the 'Pipe Data' tab selected. The 'Pipe Flow Equation...' is set to 'Institute of Gas Technology - Improved'. The 'Segment Data...' section includes: Diameter: 1.751 - (Dp Sized) Inches, Length: 1000 Feet, Efficiency: 0.95 Decimal, Roughness: 0.00006 Inches, and Flow Rate: 10 Mcfh. The 'End Conditions...' section includes: Inlet Pressure: 40 Psi, Outlet Pressure: 35 Psi, Inlet Elevation: 300 Feet, Outlet Elevation: 300 Feet, Inlet Temperature: 60 Fahrenheit, and Outlet Temperature: 60 Fahrenheit. The 'Calculated Values...' section shows: Inside Diameter: *Not Found*, Pressure Drop: 5.00 Psi, Min / Max Velocity: 36.4 / 40.1 Feet/sec, Compressibility (Flowing): 1.000000, Line Volume: 0.059 Mcf, Average Pressure: 37.54 Psi, and Selected Pipe Sizes: 2P-S11 - Could Not Calculate Composite - Velocity Criteria Could Not Be Met By Smaller Size. The bottom of the dialog has buttons for Calculate, Swap Pressures, Base Conditions, Clear, Help, Notes, Cancel, Open, Save, Print, and Close.

Note...

- The *Diameter* value represents the required inside pipe diameter to produce the specified pressure drop (difference in inlet and outlet pressure). The *Selected Pipe Sizes* item represents the sizes of the specified *Pipe Material* whose *Inside Diameter* is closest to but not less than the calculated *Inside Diameter* value. In this case, only one size is shown, and a note stating the next smaller size of the specified *Pipe Material* cannot meet the allowable velocity criteria. The note means the velocity is too high in the next smaller pipe size.
- In some cases, more than one size will be shown for the *Selected Pipe Sizes*. Let's increase the allowable velocity and see if a combination of sizes can be selected.

Re-Calculate The Pipe Size

- Select the *Other Data* tab. In the *Pipe Sizing Data* section, set the following values:

Allowable Velocity = **130 Feet/sec**

The screenshot displays the 'Other Data' tab in the GASCalc 6.1 software. The 'Pipe Sizing Data' section is active, showing 'Pipe Material' set to 'Plastic - MDPE', 'Allowable Velocity' set to '130 Feet/sec', and 'Use A Single Pipe Size Only' checked. The 'Compressibility Factor' section shows 'Base' and 'Flowing' both set to '1'. The 'Additional Components' section is empty, with buttons for 'Add', 'Delete', 'Insert', and 'Clear', and an 'Additional Length' field set to '0 Feet'.

- Return to the *Pipe Data* tab. Click the *Calculate* command button. The results should look similar to the following image.

The screenshot shows the 'Pipe Flow...' dialog box with the 'Pipe Data' tab selected. The 'Pipe Flow Equation...' is set to 'Institute of Gas Technology - Improved'. The 'Segment Data...' section includes: Diameter: 1.751 - (Dp Sized) Inches, Length: 1000 Feet, Efficiency: 0.95 Decimal, Roughness: 0.00006 Inches, and Flow Rate: 10 Mcfh. The 'End Conditions...' section includes: Inlet Pressure: 40 Psi, Outlet Pressure: 35 Psi, Inlet Elevation: 300 Feet, Outlet Elevation: 300 Feet, Inlet Temperature: 60 Fahrenheit, and Outlet Temperature: 60 Fahrenheit. The 'Calculated Values...' section shows: Inside Diameter: *Not Found*, Pressure Drop: 5.00 Psi, Min / Max Velocity: 36.4 / 64.3 Feet/sec, Selected Pipe Sizes: 2P-S11 - 694 Feet, 1-1/2P-S11 - 307 Feet, Compressibility (Flowing): 1.000000, Line Volume: 0.059 Mcf, and Average Pressure: 37.54 Psi. At the bottom, there are buttons for Calculate, Swap Pressures, Base Conditions, Clear, Help, Notes, Cancel, Open, Save, Print, and Close.

Note...

Notice that the calculated *Diameter* value is the same as in the previous calculation; however, the *Selected Pipe Sizes* item now shows two pipe sizes. The value shows a combination of pipe sizes and associated lengths, which, if used, would result in the specified *Outlet Pressure* for the specified conditions. Notice that the calculated *Maximum Velocity* value is greater than the previously specified allowable value, so the smaller pipe size could not be selected in the previous calculation.

Conclusion

The last step concludes this example. The entered data can be saved by clicking the *Save* command button. A previously saved calculation can be retrieved by clicking the *Open* command button. The calculation data and results can be printed by clicking the *Print* command button. To exit the calculation screen without saving the changes made during the example as the default data, click the *Cancel* command button. To exit the calculation screen and save the changes made during the example as the default data, click the *Close* command button.

The skills used in this example - entering data, setting dimensional units, selecting the unknown item, moving between data tabs, and performing the calculations - can be used to perform nearly any other calculation routines.



Example - Metric Dimensional Units

The following example will guide you through the general steps of performing a GASCalc calculation. Although the example guides you through several pipe flow-related calculations, the general steps involved with the calculation can be applied to perform nearly any of the other calculations. Because of the length of this topic, it might be beneficial to print the topic before proceeding with the example.

For this example, we will start by determining the pressure drop associated with the flow of 250 m³/h through 305 metres of 63-millimetre plastic pipe. The inlet pressure to the pipe segment is 2760 millibar. The average geographic elevation of the line is 90 metres above sea level, and the average gas-flowing temperature is 15 Celsius. We will neglect the effect of fittings for this first calculation. After calculating the pressure drop, we will determine the minimum pipe size or sizes required to maintain a specific outlet pressure. Start using the following steps to calculate the pressure drop associated with these conditions.

If GASCalc is not running, start it now.

Open The Pipe Flow Calculation Screen

- If the Pipe Flow calculation screen is not already displayed, from the *Pipe* menu, select the *Pipe Flow* item. The Pipe Flow calculation screen will be displayed. Click the *Clear* command button.

Note...

You will notice various data items, dimensional units, and calculated values listed on the screen. Data values are entered by typing the desired value into the associated data field by selecting an item from the associated drop-down list for some items like pipe diameter. Dimensional units are set by selecting the desired item from the associated drop-down list. Several of the data values have a colored label next to them. For example, the labels for the Diameter, Length, Efficiency, Flow Rate, Inlet Pressure, and Outlet Pressure items are “red” on this calculation screen. These represent the individual data items that can be “unknown” or calculated. The “unknown” value will be underlined. To change the “unknown” value, click on the associated red label. Only one of the red item labels can be underlined per calculation.

Set The Base Conditions

Before performing most any pressure or flow-related calculations, the base conditions for the calculation must be established. This involves setting the base pressure, temperature, gas property values, and atmospheric calculation method. Set the base conditions as follows:

- On the Pipe Flow calculation screen, click the *Base Conditions* command button. The Base Conditions screen will be displayed. Set the following data values:

Pressure = **1013.25 mBar (Abs)**

Temperature = **15 Celsius**

Use Gas Properties File = **uk_common.prp**

Atmospheric Pressure Method = **AGA**

Compressibility Method = **None**

- Click the *Apply* command button to save the changes.

Base Conditions...

Base Conditions...

Pressure: 1013.25 mBar (Abs)

Temperature: 15 Celsius

Gas Properties...

Use Gas Properties File: uk_common.prp

Specific Gravity: 0.6 ☐ Real Gas Value

Viscosity: 0.01038 Centipoise

Specific Heat Ratio: 1.3

Heating Value: 39 MJoules/m3

Other...

Atmospheric Pressure Method: AGA

Compressibility Factor Method: None

☐ Apply Conditions To All Calculations

Clear Help

Cancel Open Save Apply

Set The Heat Loss/Gain Data

For this example, we will not be performing any temperature calculations. Ensure that the temperature calculation methods are turned off. To check the settings:

- On the Pipe Flow calculation screen, select the *Heat Loss/Gain Data* tab. Set the following values:

Calculation Method = **None**

Include Joule-Thomson Cooling = **Unselect**

The screenshot shows the 'Heat Loss/Gain Data' tab selected in the software interface. The 'Calculation Method' is set to 'None' in a dropdown menu, and the 'Include Joule-Thomson Cooling' checkbox is unchecked.

Set The Other Data

- If the *Other Data* tab has a number following the label, it indicates that fittings or additional pipe segments are attached. If a number is shown, select the *Other Data* tab and click the *Clear* command button to remove the attached fittings or segments.

Enter The Pipe Data

- Return to the *Pipe Data* tab by clicking the data tab heading.
- In the *End Conditions* section, indicate that the *Outlet Pressure* value is to be calculated by clicking on the red *Outlet Pressure* label until it is underlined.
- In the *Pipe Flow Equation* section, set the following values:

Pipe Flow Equation = **Institution of Gas Engineers Recommendation 3 - Medium Pressure**

- In the *Segment Data* section, set the following values:

Diameter = **63P-S11 Millimetres**

Length = **305 Metres**

Efficiency = **0.95 Decimal**

Flow Rate = **250 m3h**

- In the *End Conditions* section, set the following values:

Inlet Pressure = **2760 Millibar**
 Inlet Elevation = **90 Metres**
 Outlet Elevation = **90 Metres**
 Inlet Temperature = **15 Celsius**
 Outlet Temperature = **15 Celsius**

- In the *Calculated Values* section, set the following values:

Min / Max Velocity Units = **Metres/sec**

Pipe Flow...

Pipe Data | Other Data | Heat Loss/Gain Data

Pipe Flow Equation...
 Institution of Gas Engineers Recommendation 3 - Medium Pressure

Segment Data...

Diameter: 63P-S11 Millimetres i
 Length: 305 Metres
 Efficiency: 0.95 Decimal
 Roughness: 0.00150 Inches
 Flow Rate: 250 m3h

End Conditions...

Inlet Pressure: 2760 Millibar
 Outlet Pressure: Millibar
 Inlet Elevation: 90 Metres
 Outlet Elevation: 90 Metres
 Inlet Temperature: 15 Celsius
 Outlet Temperature: 15 Celsius

Calculated Values...

Inside Diameter: 1292.860 Millimetres
 Pressure Drop:
 Min / Max Velocity: Metres/sec
 Compressibility (Flowing):
 Line Volume:
 Average Pressure:

*** Calculate *** Swap Pressures Base Conditions Clear Help Notes
 Cancel Open Save Print Close

Calculate The Outlet Pressure Value & The Pressure Drop

- Click the *Calculate* command button. The results should look similar to the following image.

The screenshot shows the 'Pipe Flow...' dialog box with the following data:

Pipe Data		Other Data		Heat Loss/Gain Data	
Pipe Flow Equation... Institution of Gas Engineers Recommendation 3 - Medium Pressure					
Segment Data...			End Conditions...		
Diameter:	63P-S11	Millimetre	Inlet Pressure:	2760	Millibar
Length:	305	Metres	Outlet Pressure:	2622.57	Millibar
Efficiency:	0.95	Decimal	Inlet Elevation:	90	Metres
Roughness:	0.00006	Inches	Outlet Elevation:	90	Metres
Flow Rate:	250	m3h	Inlet Temperature:	15	Celsius
			Outlet Temperature:	15	Celsius
Calculated Values...					
Inside Diameter:	50.900 Millimetre	Compressibility (Flowing):	1.000000	Line Volume:	2.264 M3
Pressure Drop:	137.44 Millibar	Average Pressure:	2691.71 Millibar		
Min / Max Velocity:	9.2 / 9.5	Metres/sec			

Buttons: Calculate, Swap Pressures, Base Conditions, Clear, Help, Notes, Cancel, Open, Save, Print, Close.

Note... The results indicate that the *Pressure Drop* for these conditions is approximately 138 millibar, resulting in an *Outlet Pressure* of about 2620 millibar. For illustration purposes, let's say that it is acceptable for the *Outlet Pressure* to be as low as 2410 millibar, and then let's calculate the pipe size required to produce that value with the other specified conditions remaining the same.

Calculate The Pipe Size

- In the *Segment Data* section, indicate that the *Diameter* value will be calculated (“unknown”) by clicking on the *Diameter* label until it is underlined. In the *End Conditions* section, set the *Outlet Pressure* to 2410 Millibar.

The screenshot shows the GASCalc 6.1 software interface with the 'Pipe Data' tab selected. The 'Pipe Flow Equation...' dropdown is set to 'Institution of Gas Engineers Recommendation 3 - Medium Pressure'. The 'Segment Data...' section contains the following values: 'Diameter' is set to '?' (indicated by a red underline), 'Length' is 305, 'Efficiency' is 0.95, 'Roughness' is 0.00006, and 'Flow Rate' is 250. The 'End Conditions...' section contains the following values: 'Inlet Pressure' is 2760, 'Outlet Pressure' is 2410, 'Inlet Elevation' is 90, 'Outlet Elevation' is 90, 'Inlet Temperature' is 15, and 'Outlet Temperature' is 15.

Note...

When calculating a *Diameter* value, GASCalc will calculate an exact *Inside Diameter* value and select a combination of pipe size/types that will produce the exact *Outlet Pressure* value. The pipe size selection requires the User to indicate the *Pipe Material* from which GASCalc can select size/types. This is done using the *Pipe Material* item on the *Other Data* tab. The Pipe Property Table lists the various pipes available for pipe-related calculations. The values and settings in the Pipe Property Table can be modified by the User by selecting the *Edit Pipe Properties* item from the *Pipe* menu. For this example, we will use the standard settings.

- Select the *Other Data* tab. In the *Pipe Sizing Data* section, set the following values:

Pipe Material = **Plastic - PE**

Allowable Velocity = **20 Metres/sec**

Use A Single Pipe Size Only = **Unselect**

Note...

For various reasons, sometimes specific design criteria limit the gas velocity in a pipe segment. When calculating a *Diameter* value, GASCalc initially calculates the size based on the specified *Inlet* and *Outlet Pressure* values; it then checks whether the pressure-based size meets the specified allowable velocity criteria. If it does not, the size is then recalculated based on the specified *Allowable Velocity* value.

The screenshot displays the 'Other Data' tab of the GASCalc 6.1 software. The interface is divided into several sections:

- Pipe Data** (selected tab)
- Other Data** (active sub-tab)
- Heat Loss/Gain Data** (inactive sub-tab)

Within the 'Other Data' section:

- Additional Components...**: A large empty box for listing components, with buttons for 'Add', 'Delete', 'Insert', and 'Clear' below it. Below these buttons is a field for 'Additional Length' set to '0' Metres, and an unchecked checkbox for 'Ignore Components'.
- Pipe Sizing Data...**: Contains a dropdown for 'Pipe Material' set to 'Plastic - PE', a text field for 'Allowable Velocity' set to '20' Metres/sec, and an unchecked checkbox for 'Use A Single Pipe Size Only'.
- Compressibility...**: Contains two text fields, 'Base' and 'Flowing', both set to '1'.

- Return to the *Pipe Data* tab. Click the *Calculate* command button. The results should look similar to the following image.

The screenshot shows the 'Pipe Flow...' dialog box with the 'Pipe Data' tab selected. The 'Pipe Flow Equation...' dropdown is set to 'Institution of Gas Engineers Recommendation 3 - Medium Pressure'. The 'Segment Data...' section includes: Diameter (42.142 - (Dp Sized) in Millimetre), Length (305 in Metres), Efficiency (0.95 in Decimal), Roughness (0.00006 in Inches), and Flow Rate (250 in m3h). The 'End Conditions...' section includes: Inlet Pressure (2760 in Millibar), Outlet Pressure (2410 in Millibar), Inlet Elevation (90 in Metres), Outlet Elevation (90 in Metres), Inlet Temperature (15 in Celsius), and Outlet Temperature (15 in Celsius). The 'Calculated Values...' section shows: Inside Diameter (*Not Found*), Pressure Drop (350.00 Millibar), Min / Max Velocity (9.2 / 10.1 in Metres/sec), Selected Pipe Sizes (63P-S11 - Could Not Calculate Composite - Velocity Criteria Could Not Be Met By Smaller Size), Compressibility (Flowing) (1.000000), Line Volume (1.509 M3), and Average Pressure (2587.84 Millibar). At the bottom are buttons for Calculate, Swap Pressures, Base Conditions, Clear, Help, Notes, Cancel, Open, Save, Print, and Close.

Note...

- The *Diameter* value represents the required inside pipe diameter to produce the specified pressure drop (difference in inlet and outlet pressure). The *Selected Pipe Sizes* item represents the sizes of the specified *Pipe Material* whose *Inside Diameter* is closest to but not less than the calculated *Inside Diameter* value. In this case, only one size is shown, and a note stating that the next smaller size of the specified *Pipe Material* cannot meet the allowable velocity criteria. The note means the velocity is too high in the next smaller pipe size.
- In some cases, more than one size will be shown for the *Selected Pipe Sizes*. Let's increase the *Allowable Velocity* and see if a combination of sizes can be selected.

Re-Calculate The Pipe Size

- Select the *Other Data* tab. In the *Pipe Sizing Data* section, set the following values:

Allowable Velocity = **40 Metres/sec**

The screenshot shows the 'Other Data' tab selected in the software interface. The 'Pipe Sizing Data' section contains the following settings:

- Pipe Material: Plastic - PE (selected from a dropdown)
- Allowable Velocity: 40 Metres/sec
- ☐ Use A Single Pipe Size Only

The 'Compressibility...' section contains the following settings:

- Base: 1
- Flowing: 1

The 'Additional Components...' section is empty, with buttons for 'Add', 'Delete', 'Insert', and 'Clear'. Below these buttons, the 'Additional Length' is set to 0 Metres, and there is an unchecked checkbox for 'Ignore Components'.

- Return to the *Pipe Data* tab. Click the *Calculate* command button. The results should look similar to the following image.

The screenshot shows the 'Pipe Flow...' dialog box with the 'Pipe Data' tab selected. The 'Pipe Flow Equation...' is set to 'Institution of Gas Engineers Recommendation 3 - Medium Pressure'. The 'Segment Data...' section includes: Diameter (42.142 - (Dp Sized) in Millimetre), Length (305 in Metres), Efficiency (0.95 in Decimal), Roughness (0.00006 in Inches), and Flow Rate (250 in m3h). The 'End Conditions...' section includes: Inlet Pressure (2760 in Millibar), Outlet Pressure (2410 in Millibar), Inlet Elevation (90 in Metres), Outlet Elevation (90 in Metres), Inlet Temperature (15 in Celsius), and Outlet Temperature (15 in Celsius). The 'Calculated Values...' section shows: Inside Diameter (*Not Found*), Pressure Drop (350.00 Millibar), Min / Max Velocity (9.2 / 39.6 in Metres/sec), Selected Pipe Sizes (63P-S11 - 287 Metres, 32P-S11 - 18 Metres), Compressibility (Flowing) (1.000000), Line Volume (1.509 M3), and Average Pressure (2587.84 Millibar). The bottom of the dialog has buttons for Calculate, Swap Pressures, Base Conditions, Clear, Help, Notes, Cancel, Open, Save, Print, and Close.

Note... Notice that the calculated *Diameter* value is the same as in the previous calculation; however, the *Selected Pipe Sizes* item now shows two pipe sizes. The value shows a combination of pipe sizes and associated lengths, which, if used, would result in the specified outlet pressure for the specified conditions. Notice that the calculated *Maximum Velocity* value is greater than the previously specified allowable value, so the smaller pipe size could not be selected in the previous calculation.

Conclusion

The last step concludes this example. The entered data can be saved by clicking the *Save* command button. A previously saved calculation can be retrieved by clicking the *Open* command button. The calculation data and results can be printed by clicking the *Print* command button. To exit the calculation screen without saving the changes made during the example as the default data, click the *Cancel* command button. To exit the calculation screen and save the changes made during the example as the default data, click the *Close* command button.

The skills used in this example - entering data, setting dimensional units, selecting the unknown item, moving between data tabs, and performing the calculations - can be used to perform nearly any other calculation routines.



Additional Example Calculations

The GASCalc help documentation is stored on the GASCalc server. If you are connected to the internet, you may view and explore the examples for any of GASCalc's calculation methods. To view a document, click the *Help* command button on the associated calculation screen.

Uninstalling GASCalc

If, after using the GASCalc software, you wish to remove it, select the *Uninstall GASCalc* item from the *GASCalc* menu list.

- After the Uninstall Program has been started, read the contents of each screen carefully and respond appropriately.

Note...

If the Uninstall Program asks to remove any shared system files, click the *No* command button.

- A message will be displayed when the Uninstall routine is complete. The message will indicate whether the routine was successful or it failed. Select the appropriate option to clear the message.

Note...

- On some devices, the Uninstall routine will not be able to remove any directory or file that has been created after the initial installation.

- Some of the files and/or folders created by GASCalc after the installation may include files in the initialization directory (ini), files in the default calculation file directory (files), and/or files in the application directory (app).

- To remove these files and/or folders, use Windows File Explorer to find and delete the remaining files and folders. An example of the path for the initialization folder is shown below. The other folders have similar path locations.

- 32-bit machines - **C:\Program Files\GASCalc Demo\ini**
- 64-bit machines - **C:\Program Files (x86)\GASCalc Demo\ini**

