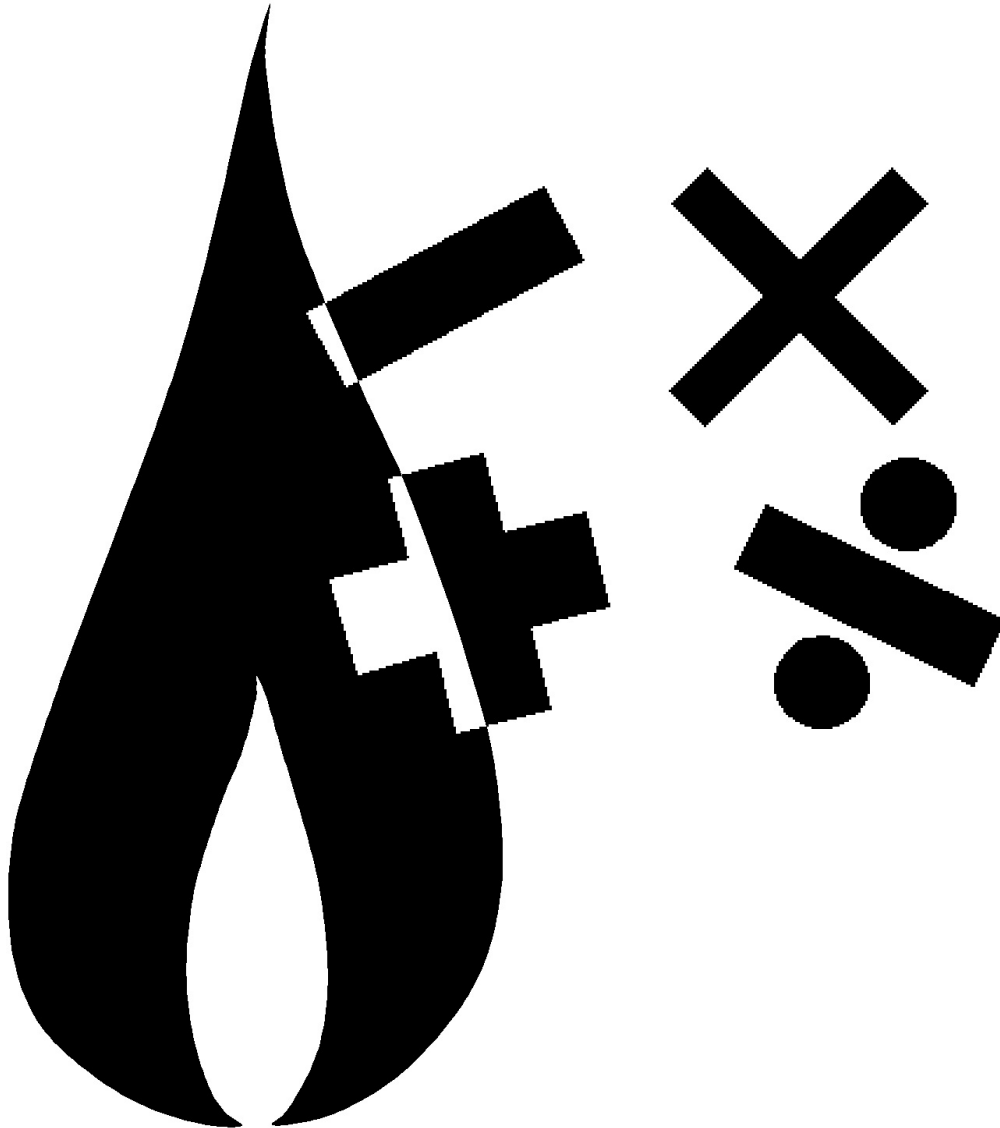


# **GASCalc<sup>TM</sup>**

## ***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 that 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 which 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' or similar, written in a cursive style.

Bradley B. Bean  
Managing Member

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Revision 009**

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## General Information

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The information contained 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

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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

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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](http://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 whether it 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.

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

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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 associated help file is referred to as 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 will need to open it directly in your PDF document viewer. Clicking the *Help* command button will not open an offline help document.

## The Help Menu

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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

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**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](mailto:help@b3pe.com)

**By Website** - [www.b3pellc.com](http://www.b3pellc.com)





## Example - US Dimensional Units

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The following example will guide you through the general steps involved with 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 two-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 we have calculated the pressure drop, we will determine the minimum pipe size or sizes required to maintain a specific outlet pressure. Start by 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

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- 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, for some items like pipe diameter, by selecting an item from the associated drop-down list. 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 colored 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 with the following settings:

- Base Conditions...**
  - Pressure: 14.73, Psi (Abs)
  - Temperature: 60, Fahrenheit
- Gas Properties...**
  - Use Gas Properties File: us\_common.prp
  - Specific Gravity: 0.6, Real Gas Value:
  - 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

Buttons at the bottom: Clear, Help, Cancel, Open, Save, Apply.

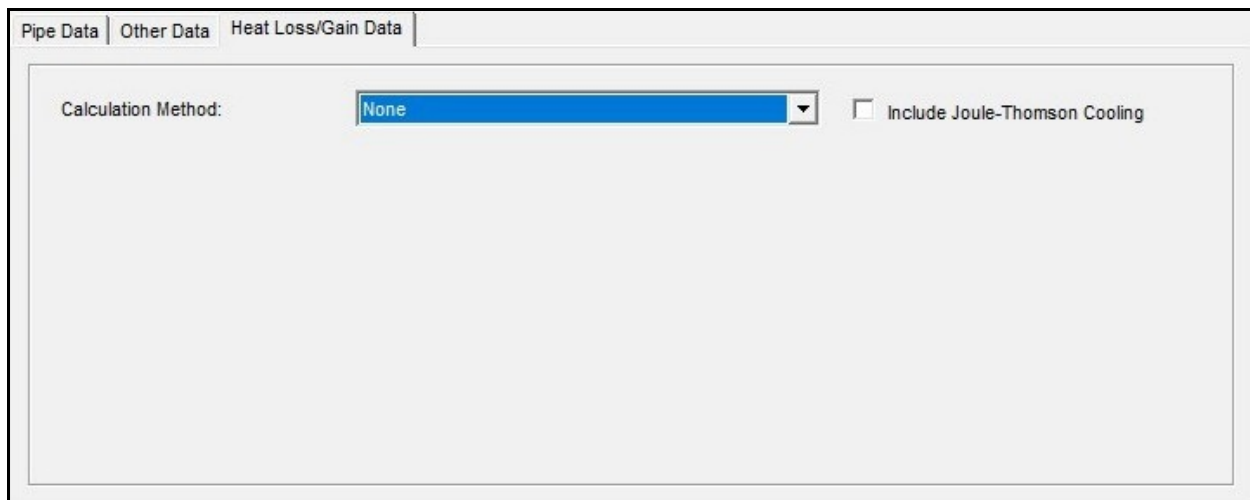
### Set The Heat Loss/Gain Data

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' dropdown menu is set to 'None'. The 'Include Joule-Thomson Cooling' checkbox is unselected.

## 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 on 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**

The screenshot shows the 'Pipe Flow...' software window with the following settings:

- Pipe Flow Equation:** Institute of Gas Technology - Improved
- Segment Data:**
  - Diameter: 2P-S11 (Inches)
  - Length: 1000 (Feet)
  - Efficiency: 0.95 (Decimal)
  - Roughness: 0.00006 (Inches)
  - Flow Rate: 10 (Mcfh)
- End Conditions:**
  - Inlet Pressure: 40 (Psi)
  - Outlet Pressure: (Yellow field)
  - 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: (Yellow field)
  - Min / Max Velocity: (Yellow field) (Feet/sec)
  - Compressibility (Flowing): (Yellow field)
  - Line Volume: (Yellow field)
  - Average Pressure: (Yellow field)

Buttons at the bottom include: 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:

Category	Parameter	Value	Unit
Segment Data...	Diameter	2P-S11	Inches
	Length	1000	Feet
	Efficiency	0.95	Decimal
	Roughness	0.00006	Inches
	Flow Rate	10	Mcfh
	Pipe Flow Equation...	Institute of Gas Technology - Improved	
End Conditions...	Inlet Pressure	40	Psi
	Outlet Pressure	37.02	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	2.98	Psi
	Min / Max Velocity	36.4 / 38.5	Feet/sec
	Compressibility (Flowing)	1.000000	
	Line Volume	0.074	Mcf
	Average Pressure	38.53	Psi

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 is to 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.

Pipe Data	Other Data	Heat Loss/Gain Data
Pipe Flow Equation... Institute of Gas Technology - Improved		
Segment Data...		End Conditions...
Diameter: ?	2P-S11	Inches
Length:	1000	Feet
Efficiency:	0.95	Decimal
Roughness:	0.00006	Inches
Flow Rate:	10	Mcfh
Inlet Pressure:	40	Psi
Outlet Pressure:	35	Psi
Inlet Elevation:	300	Feet
Outlet Elevation:	300	Feet
Inlet Temperature:	60	Fahrenheit
Outlet Temperature:	60	Fahrenheit

**Note...**

When calculating a *Diameter* value, GASCalc will calculate both an exact *Inside Diameter* value, and will 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 that GASCalc can select size/types from. This is done using the *Pipe Material* item on the *Other Data* tab. The Pipe Property Table lists information about the various pipes available for use in the 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 will limit the velocity of the gas 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 shows the 'Other Data' tab selected in the software interface. The 'Pipe Sizing Data...' section is visible, containing the following settings:

- Pipe Material: Plastic - MDPE (selected in a dropdown menu)
- Allowable Velocity: 55 Feet/sec
- Use A Single Pipe Size Only (unchecked)

The 'Compressibility Factor...' section is also visible, with the following settings:

- Base: 1
- Flowing: 1

Other visible elements include the 'Additional Components...' section with 'Add', 'Delete', 'Insert', and 'Clear' buttons, and an 'Additional Length' field set to 0 Feet with an 'Ignore Components' checkbox.



- 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 following data:

Category	Parameter	Value	Unit
Segment Data...	Diameter	1.751 - (Dp Sized)	Inches
	Length	1000	Feet
	Efficiency	0.95	Decimal
	Roughness	0.00006	Inches
	Flow Rate	10	Mcfh
	Equation	Institute of Gas Technology - Improved	
End Conditions...	Inlet Pressure	40	Psi
	Outlet Pressure	35	Psi
	Inlet Elevation	300	Feet
	Outlet Elevation	300	Feet
	Inlet Temperature	60	Fahrenheit
	Outlet Temperature	60	Fahrenheit
Calculated Values...	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	
Selected Pipe Sizes:		2P-S11 - Could Not Calculate Composite - Velocity Criteria Could Not Be Met By Smaller Size	
Average Pressure		37.54 Psi	

Buttons at the bottom: Calculate, Swap Pressures, Base Conditions, Clear, Help, Notes, Cancel, Open, Save, Print, 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 with 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 with a note stating that the next smaller size of the specified *Pipe Material* cannot meet the allowable velocity criteria. The note means that 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 shows the 'Other Data' tab of the GASCalc software. The 'Pipe Sizing Data...' section is active, showing 'Pipe Material' set to 'Plastic - MDPE' and 'Allowable Velocity' set to '130 Feet/sec'. There is an unchecked checkbox for 'Use A Single Pipe Size Only'. 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'. The 'Additional Length' is set to '0 Feet' 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 '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. The bottom of the dialog features 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, which is why the smaller pipe size could not be selected in the previous calculation.

### **Conclusion**

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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 of the other calculation routines.

## Example - Metric Dimensional Units

---

The following example will guide you through the general steps involved with 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 m<sup>3</sup>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 we have calculated the pressure drop, we will determine the minimum pipe size or sizes required to maintain a specific outlet pressure. Start by 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, for some items like pipe diameter, by selecting an item from the associated drop-down list. 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 colored 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.

The screenshot shows the 'Base Conditions...' dialog box with the following settings:

- 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 checkbox is unchecked)
  - 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

Buttons at the bottom: Clear, Help, Cancel, Open, Save, Apply.

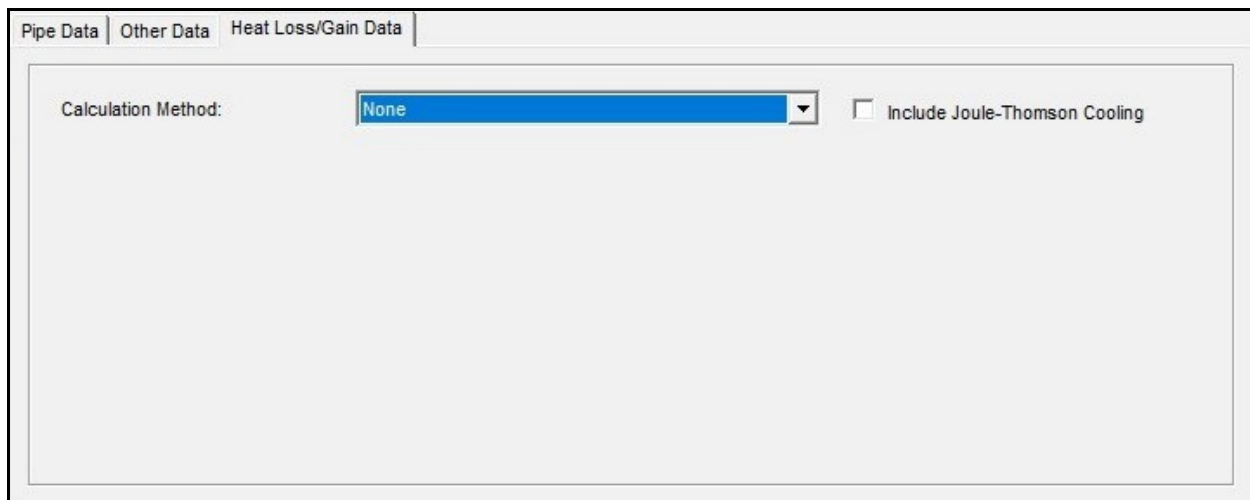
### Set The Heat Loss/Gain Data

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 unselected.

## 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 on 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**

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

- Pipe Flow Equation...:** Institution of Gas Engineers Recommendation 3 - Medium Pressure
- Segment Data...:**
  - Diameter: 63P-S11 (Millimetres)
  - Length: 305 (Metres)
  - Efficiency: 0.95 (Decimal)
  - Roughness: 0.00150 (Inches)
  - Flow Rate: 250 (m3h)
- End Conditions...:**
  - Inlet Pressure: 2760 (Millibar)
  - Outlet Pressure: (Empty)
  - 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: (Empty)
  - Min / Max Velocity: (Empty) (Metres/sec)
  - Compressibility (Flowing): (Empty)
  - Line Volume: (Empty)
  - Average Pressure: (Empty)

Buttons at the bottom: \*\*\* 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:

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

Buttons at the bottom: 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, 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 is to 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.

Pipe Data   Other Data   Heat Loss/Gain Data		
Pipe Flow Equation... Institution of Gas Engineers Recommendation 3 - Medium Pressure		
Segment Data...		
<u>Diameter</u> :	83P-S11	Millimetre
Length:	305	Metres
Efficiency:	0.95	Decimal
Roughness:	0.00006	Inches
Flow Rate:	250	m3h
End Conditions...		
Inlet Pressure:	2760	Millibar
Outlet Pressure:	2410	Millibar
Inlet Elevation:	90	Metres
Outlet Elevation:	90	Metres
Inlet Temperature:	15	Celsius
Outlet Temperature:	15	Celsius

### Note...

When calculating a *Diameter* value, GASCalc will calculate both an exact *Inside Diameter* value, and will 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* that GASCalc can select size/types from. This is done using the *Pipe Material* item on the *Other Data* tab. The Pipe Property Table lists information about the various pipes available for use in the 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 will limit the velocity of the gas 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 software. The interface is divided into several sections:

- Pipe Data** (selected tab)
- Heat Loss/Gain Data**
- Additional Components...**: A large empty box with buttons for 'Add', 'Delete', 'Insert', and 'Clear'. Below it, 'Additional Length' is set to '0 Metres' and 'Ignore Components' is unchecked.
- Pipe Sizing Data...**: 'Pipe Material' is set to 'Plastic - PE', 'Allowable Velocity' is '20 Metres/sec', and 'Use A Single Pipe Size Only' is unchecked.
- Compressibility...**: 'Base' is set to '1' and 'Flowing' is 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...' software window with the following data:

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

Segment Data...	
Diameter:	42.142 - (Dp Sized) Millimetre
Length:	305 Metres
Efficiency:	0.95 Decimal
Roughness:	0.00006 Inches
Flow Rate:	250 m3h

End Conditions...	
Inlet Pressure:	2760 Millibar
Outlet Pressure:	2410 Millibar
Inlet Elevation:	90 Metres
Outlet Elevation:	90 Metres
Inlet Temperature:	15 Celsius
Outlet Temperature:	15 Celsius

Calculated Values...	
Inside Diameter:	*Not Found*
Pressure Drop:	350.00 Millibar
Min / Max Velocity:	9.2 / 10.1 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
Average Pressure:	2587.84 Millibar

Buttons: Calculate, Swap Pressures, Base Conditions, Clear, Help, Notes, Cancel, Open, Save, Print, 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 with 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 with a note stating that the next smaller size of the specified *Pipe Material* cannot meet the allowable velocity criteria. The note means that 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. The 'Pipe Sizing Data...' section contains the following settings:

- Pipe Material: Plastic - PE
- 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 includes buttons for 'Add', 'Delete', 'Insert', and 'Clear'. Below these buttons, the 'Additional Length' is set to 0 Metres, and the 'Ignore Components' checkbox is unchecked.

- 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) Millimetre), Length (305 Metres), Efficiency (0.95 Decimal), Roughness (0.00006 Inches), and Flow Rate (250 m3h). The 'End Conditions...' section includes: Inlet Pressure (2760 Millibar), Outlet Pressure (2410 Millibar), Inlet Elevation (90 Metres), Outlet Elevation (90 Metres), Inlet Temperature (15 Celsius), and Outlet Temperature (15 Celsius). The 'Calculated Values...' section shows: Inside Diameter (\*Not Found\*), Pressure Drop (350.00 Millibar), Min / Max Velocity (9.2 / 39.6 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 features 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, which is why the smaller pipe size could not be selected in the previous calculation.



### **Conclusion**

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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 of the 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 and all 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 whether 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**



