

Introduction

The following provides instructions for creating a model from a set of shapefiles (SHP). A shapefile is used to exchange geographic and attribute information between a geographic information system (GIS) and other applications. The shapefile format specification is published by Environmental Systems Research Institute (ESRI).

Two shapefiles are required to create a complete GASWorkS model - an arc type shapefile containing the linework for the main line pipes, and a point type shapefile containing the meter locations. The model is created by first importing the main features, and then importing the customer features. The customer service lines can either be assigned based on information in the shapefile or automatically assigned by GASWorkS. The main linework and the customer service lines often require some clean-up after importing and assignment.

A shapefile actually consists of several files which contain information about a geographic feature. The files are generally created by exporting data from a GIS, but can be created by other applications as well. At a minimum, the files associated with a shapefile will include a file containing the location (xy) information, a file containing attribute information, and an index file which links the two files. The xy file ends in a “.shp” extension. This file is saved in a binary (machine language) format as described in the shapefile specification. The attribute file ends in a “.dbf” extension. This file is saved in a dBase III format. The contents of this file varies. The index file ends in a “.shx” extension. Similar to the SHP file, this file is saved in a binary (machine language) format as described in the shapefile specification published by ESRI. Other files may also be included, but are not used by GASWorkS.

A shapefile can contain only one type of geographic feature. For example, only line/arc style features, only point style features, only polygon style features, or only annotation features. A shapefile cannot contain a combination of features. For example, it cannot contain both mains and meter locations.

Only a pipe shapefile is required to create a basic GASWorkS model. At a minimum, the pipe attribute file should contain at least a field for the pipe size/type value. It can also contain other information, including but not limited to an identification number and actual length. If a unique identification number is included, it can be used to link the GASWorkS results back to the GIS data. When a pipe shapefile is imported, the hydraulic length is calculated based on the coordinate locations contained in the shapefile. Sometimes the geographic length does not actually represent the hydraulic length (however, in most cases it does). If the geographic and hydraulic lengths are not the same, the computed value can be manually overwritten by the User after the import is complete. Or, if an actual length field is included in the attribute file, the computed length can be replaced by the attribute value.



If a customer shapefile is available, it can be used to create customer features in GASWorkS. At a minimum, the customer attribute file should contain a unique identification number. This number can be used to link a billing or “load” file to assign the customer usage values. The attribute file can also contain other information including load/usage values, address, and ID number of the supplying main. If the supply main ID is included, the customer will automatically be assigned to the main with a matching ID number during the Import routine. If no pipe ID is included, the customers will be assigned to the nearest mains when the model is first opened.

Summary

In this example, a model will be created from a set of shapefiles. The shapefiles consist of a pipe shapefile to create the piping network, and a customer shapefile to create the customer features. The system contains one supply point and several regulators. We won't try to solve model.

Steps

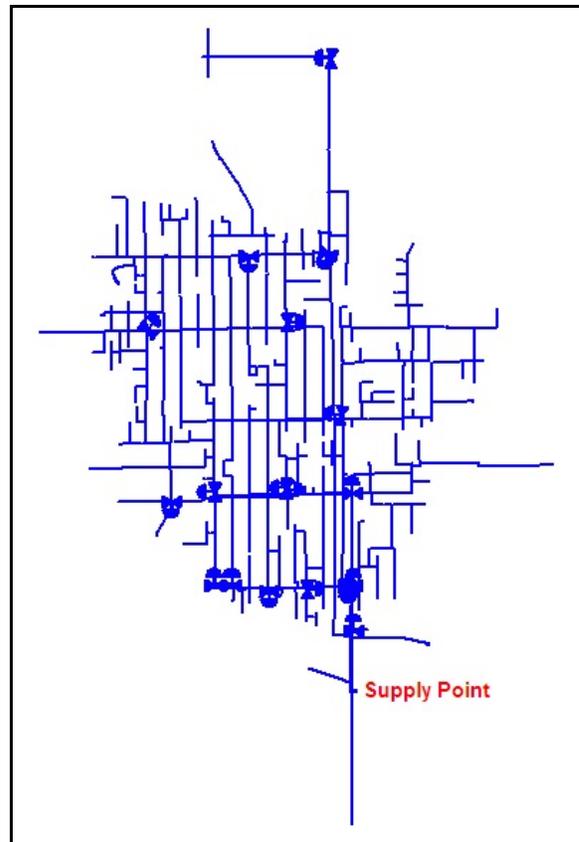
The following assumes that GASWorkS has already been started. If a model is already open, close it by selecting the *Close* menu item from the *File* menu list. Use the following procedure to work this example...

1) Import The Pipe Shapefile

- From the *Utilities* menu list, select the *Import* menu item. The File Selection screen will be displayed. Enter a *Filename* for the new model, then select the *Continue* command button.

- The Import screen will be displayed. From the *File Type* list, select **SHP (ESRI Shapefile) File - Pipe**. Select the *Import* command button.

- The File Selection screen will be displayed. Use the *Drives* and *Directories* lists to navigate to the directory containing the desired file - **SHP_MAIN.shp**. Select the file, then select the *Continue* command button.



- The SHP Import Specifications screen will be displayed. Select the *Clear Data Field Assignments* command button. At the “Really Clear...” message, select the *Yes* command button. Set the following values:

Data Field Assignments -

Database Field Item = GASWorkS Data Item

SIZE_TYPE = Size/Type Code

HYD_TYPE = Hydraulic Type

LINK_ID = Link ID Number

Fuzzy Tolerance = **1**

Shapefile Coordinate Units = **Feet**

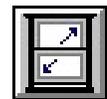
Model Coordinate Units = **Feet**

Scale Factor = **1**

Origin Shift: **X = 0 Y = 0**

Note - We are not going to try to solve this model, if we were, we would normally set the default data to appropriate values before continuing further. If you were going to set the default values, you would select the *Set Default Values* command button before proceeding with the import.

- Select the *Continue* command button to import the data.
- On the Import screen, the status of the process will be displayed in the *Import Log* section. When the process is successfully completed, 974 new pipes and 949 new nodes should be created.
- Select the *Close* command button to close the Import screen.
- The Graphic Data Interface (GDI) Window will be displayed. *Note* - If the GDI Window is not automatically displayed, select the *View/Edit* menu item from the *Graphics* menu list to display the GDI Window.
- Resize the GDI Window using the *Maximize GDI Window* icon from the *GDI Window Controls Toolbar*.



Use the various *Zoom* and *Pan* commands to review the model configuration. You will notice that several regulators are included in the model. This system has a number of pressure zones which are separated by the regulator stations.



Note - If this were a model that we eventually intended to solve, we would need to check the model for scale, check the pipe size assignments, and check for connectivity errors - correcting any issues that we discovered. We would also need to enter a set pressure for each regulator station.

2) Set The Graphic Settings

Let's set a few graphics display settings to make the model more viewable.

- From the *Graphics* menu list, select the *Settings* menu item. The Graphic Settings screen will be displayed.
 - In the *Settings* section, set the following values:
 - Customer Symbol Size = **2 % Of Display Width**
 - Node Symbol Size = **1 % Of Display Width**
 - *Set the remaining values and options as appropriate.
- Select the *Close* command button to close the screen and save the changes.

3) Merge The Customer Shapefile

- From the *Utilities* menu list, select the *Merge* menu item. The Merge screen will be displayed.
 - From the *File Type* list, select **SHP (ESRI Shapefile) File - Customer**, then select the *Merge* command button.
 - The File Selection screen will be displayed. Use the *Drives* and *Directories* lists to navigate to the directory containing the desired file - **SHP_CUST.shp**. Select the file, then select the *Continue* command button. At the "Really Merge..." message, select the *Yes* command button to continue.
 - The SHP Import Specifications screen will be displayed. Select the *Clear Data Field Assignments* command button. At the "Really Clear..." message, select the *Yes* command button. Set the following values:

Data Field Assignments -

Database Field Items = GASWorkS Data Item

LINK_ID = Link ID Number

TOTAL_Q = Load Per Unit

Fuzzy Tolerance = **1**

Shapefile Coordinate Units = **Feet**

Model Coordinate Units = **Feet**



Scale Factor = 1
Origin Shift: X = 0 Y = 0

- Select the *Continue* command button.
- At the “Assign Supply Main Connection...” message, select the *No* command button.
- On the Merge screen, the status of the process will be displayed in the *Merge Log* section. When the process is successfully complete 2129 New Customers should be created.
- Select the *Close* command button to close the Merge screen.

4) Assign The Customer Service Lines

Use the various *Zoom* and *Pan* commands to review the customer locations. If the customer symbols are not displayed, check that the symbols are turned “on” with the *Display Customer Symbols* command..



It is possible to assign the supply main connections (customer “service lines”) during the Import process. In this example we choose not to do that. Let’s assign them now...

- Select the *Assign Customer Service Lines* item from the GDI Command List.
 - At the “Assign Service Lines...” message, select the *Yes* command button.
 - For the *Maximum Service Line Length*, type **200** and press the *Enter* key.
 - A message will be displayed when the process is complete. Select *OK* to clear the message.

Each customer should now have a “service line” connecting it to the nearest main.

Use the various *Zoom* and *Pan* commands to review the assignments.

Note - If this were a model that we eventually wanted to solve, we would need to check the service line assignment for each customer and correct them as appropriate.



Notes & Considerations

- In addition to the GASWorkS Import routine, it also provides a Merge routine. The Import routine creates a new GASWorkS model from the imported data, and the Merge routine adds data to or updates data in an existing GASWorkS model.
- When a shapefile is imported into GASWorkS, the features maintain the same coordinate location values as in the original file. If the original coordinates are expressed in latitude and longitude (or some other non-planar system), it is generally best to project the data to a plane system, such as the state plane coordinate system before importing into GASWorkS. A consistent coordinate system needs to be maintained, if other data is to be added to the original model.
- When a shapefile is imported into GASWorkS, all of the features contained in the file are converted to the designated GASWorkS feature. It is important that a shapefile only contains information that represents the associated data feature. For example, a pipe shapefile should only contain linework representing the piping system. Linework associated with details or other drawn features should not be included in the pipe shapefile. A customer shapefile should not contain extraneous point locations.
- When a pipe shapefile is imported into GASWorkS, a node is automatically created at each pipe end. If a node already exists within the “Fuzzy Tolerance” of a pipe end, the existing node is used. This allows slightly “dirty” linework to be imported so that the pipe ends are “snapped” together. Although GASWorkS provides tools for cleaning up the data after it has been imported, it is best that the source linework be topologically correct in the data system. That is that the line ends should be snapped together, short segments should be joined as appropriate, and lines should be broken at lateral connections.
- GASWorkS uses a third party (Microsoft) database management software to handle the dBase attribute data files. For some operating systems, a requirement of this software is that the filename must be less than eight characters. In cases where a shapefile has a name longer than eight characters, it must be renamed before it can be imported into GASWorkS. Remember to change the name of all the files in the shape “set”.
- Similar to the filename requirement, the Data Field names should not contain spaces. Underscores are commonly used to represent spaces in the Data Field names. If an ID field is included in a customer shapefile, and it is used to link to a load or billing file, it is especially important that the field name not contain spaces in either the attribute file or the linked file.
- The attribute file associated with a shapefile can be opened and manipulated by many database or spreadsheet applications. There is one record in the attribute file for each record in the location file. If you manipulate the file with an outside application be careful not to add, delete, or reorder the records in the file.



- GASWorkS uses a pipe Size/Type Code to establish the pipe diameters. GASWorkS maintains a table of pipe properties - the Pipe Property Table. The Pipe Property Table lists the Inside Diameter values (and other values) associated with each Size/Type Code. When a diameter is required, the Size/Type Code is looked up in the Pipe Property Table. If a match is found, the diameter from the table is used. If the Size/Type Code is not found, the code is converted to a numeric value, and that value is used as the inside diameter value. The Size/Type Codes included in the shape attribute file should correspond to the values contained in the Pipe Property Table. If they do not, either the Pipe Property Table can be revised, or the values can be changed using the Mass Update routine after the file has been imported.

