

Designing Gravity Pipe Networks

With the completion of parcel design, you're ready to move on to another major area of design: pipe design. One type of pipe design that you must address as a designer is the safe and efficient collection and conveyance of water that falls on a site during a rainstorm. This type of pipe design is part of a larger design process called *stormwater management*. Because the development of land often involves turning absorbent surfaces (soft grassy soil, trees, and forest floors) into impervious surfaces (pavement, concrete, and asphalt rooftops), rain that falls on a developed site will travel farther and much faster when compared to rain that fell on the site before it was developed. This water on the move can cause erosion or flooding, so it must be safely collected and placed in surface channels or underground pipes. The pipes and channels then carry the water to a safe place where it can be discharged without doing harm.

In this chapter, you'll learn to:

- ▶ Understand gravity pipe networks
- ▶ Create gravity pipe networks
- ▶ Edit gravity pipe networks

Understanding Gravity Pipe Networks

Pipe network design in the AutoCAD® Civil 3D® software is divided into two types: gravity networks and pressure networks. Because the performance requirements for these two types of systems are so different, the approach to designing and constructing them is also quite different. In this chapter, we'll cover gravity pipe network design.

For a gravity pipe network design to be a success, it must meet the following basic requirements:

- ▶ The pipes must be sloped enough for water to flow through them.
- ▶ The pipes must be large enough to allow the expected amount of water to pass.
- ▶ The pipes must be far enough underground to avoid being damaged by freezing or by activities on the site.
- ▶ The pipes must not be so far underground that it's cost prohibitive to install them.
- ▶ Structures must be provided that allow people to access the pipes to perform maintenance.
- ▶ In the case of stormwater management, structures must be provided that allow surface water to enter the pipes.

These requirements relate to two basic types of gravity pipe design components: structures and pipes. This chapter describes these components as well as their relationship to each other when represented in a Civil 3D pipe network.

Understanding Structures

Structures provide access to the pipes underground. This access can be for people, or it can be for rainwater that is flowing across the surface of the ground, also known as *runoff*. In the case of stormwater management design, structures called *inlets* or *catch basins* are placed on the site at locations that are best for collecting runoff. Typically, the runoff falls through a grate into a concrete chamber and then out through a pipe toward its final destination. For other types of pipelines, manholes and cleanouts are placed at predetermined increments so that workers can access the pipes to perform maintenance. Manholes are also used to create a bend in a pipeline when one pipe enters in one direction and a second pipe exits in another. Whatever the case, the placement of these structures is part of the pipe network design process, and it isn't done arbitrarily.

Understanding Pipes

Pipes are used to safely convey water to a predetermined destination. In the case of stormwater pipes, collected runoff commonly passes through one or more forms of onsite treatment and then empties into a nearby stream or ditch. In the case of a sanitary sewer, the journey can be much longer—connecting to a local

sewer main, and then merging with any number of larger and larger mains until the water reaches a treatment plant. In some cases, the length of that journey can be quite a few miles.

In these systems, the flow of water depends on gravity. This means part of your job as the designer is to ensure that all the pipes are pointing downhill. That may sound like an easy task by itself, but when you introduce other design requirements, it can become quite challenging. For example, you also need to ensure that the pipes are at a depth that is neither too shallow nor too deep. Another part of the design is to ensure that the pipes are large enough to convey the amount of water that is expected. This part is usually handled by a licensed engineer or trained designer and is beyond the scope of this book.

Exploring the Pipe Network

Civil 3D enables you to create objects that represent structures and pipes. It also establishes relationships between the structures and pipes as well as other important design elements such as surfaces, alignments, profiles, and profile views. The pipes, the structures, and their associated relationships are referred to as a Civil 3D *pipe network*. In Figure 14.1, a plan view of a few pipes and structures is shown on the left, and the same pipes and structures are shown in profile view on the top right and 3D view on the bottom right.

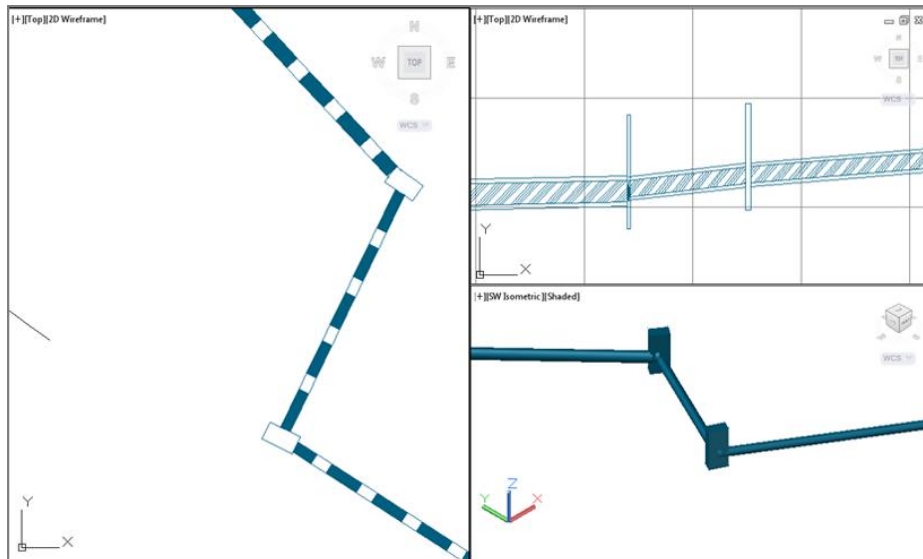


FIGURE 14.1 A pipe network shown in plan view (left), profile view (top right), and 3D view (bottom right)

In Prospector, gravity systems are listed under Pipe Networks, and pressure systems (covered in Chapter 15, “Designing Pressure Pipe Networks”) are listed under Pressure Networks.

Each component of a pipe network is shown in Prospector. From here, you can right-click each component to access various context commands for it. You can also use the item view at the bottom of Prospector to edit information about each component. Figure 14.2 shows the contents of a pipe network in Prospector.

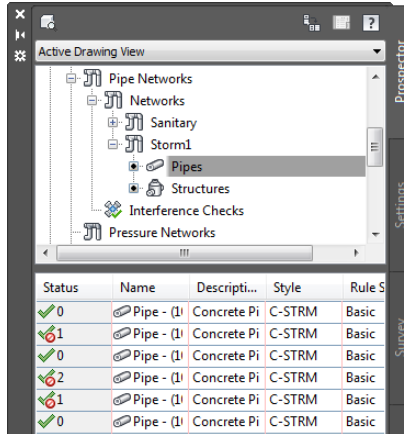


FIGURE 14.2 A pipe network shown in Prospector

The shape, dimensions, and behavior of a pipe network component are determined by the *part* that represents it. Parts are stored in a *parts list*, which is a kind of library from which you can select parts for the different components in your pipe network. Most companies have several parts lists, each one containing parts for a certain type of system such as storm, sanitary, or water. Parts lists can be stored in a template file so they are available in each new drawing that is created from that template. Figure 14.3 shows an example of a very basic parts list that would be used for storm sewer design.

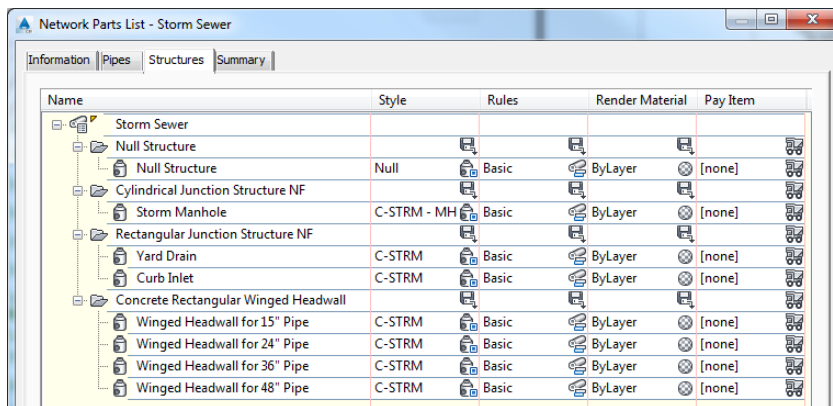


FIGURE 14.3 A parts list configured for storm sewer design

Creating Gravity Pipe Networks

Gravity pipe networks can be created in two basic ways. The first is to create a pipe network from one or more objects that have been drawn beforehand, such as lines, arcs, or a polyline. With this approach, all the pipes and structures are created at once. The other approach is to create the pipes and structures one by one. This is referred to as creating a pipe network by layout.


Certification
Objective

Creating a Pipe Network from Objects

At times, you'll find it easier to start with AutoCAD® commands to sketch your pipe network using basic entities. This approach works well because Civil 3D provides a command that converts these basic entities to pipe networks: the Create Pipe Network From Object command. This command creates pipe networks from Civil 3D alignments and feature lines as well. One disadvantage to this method is that the same parts are used for pipes and structures throughout the entire network.

Exercise 14.1: Create a Pipe Network from Objects

In this exercise, you'll use the Create Pipe Network From Object command to create several sanitary sewer networks from polylines provided in the drawing.

1. Open the drawing named *Creating Pipe Networks From Objects.dwg* located in the Chapter 14 class data folder.
2. In the left viewport, zoom in to the beginning of the Jordan Court alignment at the north end of the project.
Note the heavy green polyline marked SAN that has been sketched in to represent the location of a new sanitary sewer pipeline.
3. On the Home tab of the ribbon, click Pipe Network > Create Pipe Network From Object. 
4. Click the green polyline with the SAN label on it. Press Enter to accept the current flow direction.
5. In the Create Pipe Network From Object dialog box, do the following:
 - a. For Network Name, enter Sanitary.
 - b. For Network Parts List, select Sanitary Sewer.
 - c. For Surface Name, select Road FG.

If you haven't already done so, download and install the files for Chapter 14 according to the instructions in this book's Introduction.

Make sure your screen background color is set to white before continuing this exercise.

Some black arrows appear that point toward the south. These arrows indicate the assumed flow direction of the pipes.

This surface will be used to automatically set the top elevations of the structures.

By referencing an alignment, you'll be able to express the locations of pipes and structures using station and offset values.

Note the green polyline that starts near Madison Lane station 2+50 (0+080) and ends near Jordan Court station 21+50 (0+660).

Some black arrows should appear that point toward the south. These arrows indicate the assumed flow direction of the pipes.

- d. For Alignment Name, select Jordan Court.
- e. Check the box next to Erase Existing Entity.
- f. Click OK.

A new pipe network is created in place of the polyline.

6. In the bottom-right viewport, zoom in to one of the manholes. In plan view, the entities look simple, but in this view you see that they are actually 3D pipe and structure objects (see Figure 14.4).

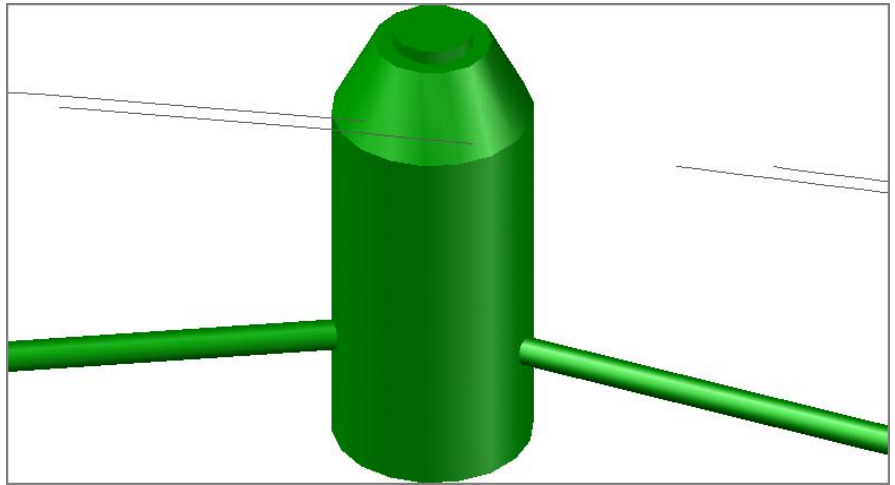


FIGURE 14.4 A 3D view of a pipe object and structure object

7. In the left viewport, pan southward until you can see Madison Lane.
8. On the Home tab of the ribbon, click Pipe Network > Create Pipe Network From Object.
9. Click the green polyline somewhere along Madison Lane.
10. Press Enter to accept the flow direction indicated by the black arrows.
11. In the Create Pipe Network From Object dialog box, do the following:
 - a. For Network Name, enter Sanitary-2.
 - b. For Network Parts List, select Sanitary Sewer.
 - c. For Surface Name, select Road FG.



- d. For Alignment Name, select Madison Lane.
 - e. Check the box next to Erase Existing Entity.
 - f. Click OK.
12. Repeat steps 8–11 with the remaining polyline that begins at the Madison Lane cul-de-sac. This time, use a Network Name of Sanitary-3.
 13. Pan and zoom in the lower-right viewport to inspect the pipes and structures in 3D.
 14. Save and close the drawing.

You can view the results of successfully completing this exercise by opening `Creating Pipe Networks from Objects - Complete.dwg`.

Creating a Pipe Network by Layout

If you haven't sketched the pipe design, or when you want more control of the design as you go, the best choice is to create a pipe network by layout. This is done by using the Pipe Network Creation Tools command. After you launch this command and enter some information about the pipe network, you're presented with the Network Layout Tools toolbar (see Figure 14.5). This is similar to the toolbars you have used for other layout designs, such as creating alignments by layout or profiles by layout.



FIGURE 14.5 The Network Layout Tools toolbar

From the Network Layout Tools toolbar, you can choose pipes and structures from a parts list and then use commands on the toolbar to insert those parts into the drawing. You can change parts at any time and apply different types and sizes as you go. As you draw pipes and structures, special icons next to the cursor inform you when you're connecting parts to one another. For example, Figure 14.6 shows a pipe being drawn between two inlets. The yellow icon indicates that the pipe will be connected to the inlet when the user clicks the mouse.

Now all the sketch polylines have been converted to sanitary sewer pipes and structures.

Notice that one of the pipes along Madison Lane is located at a much lower elevation than the others. This will be addressed later in this chapter.

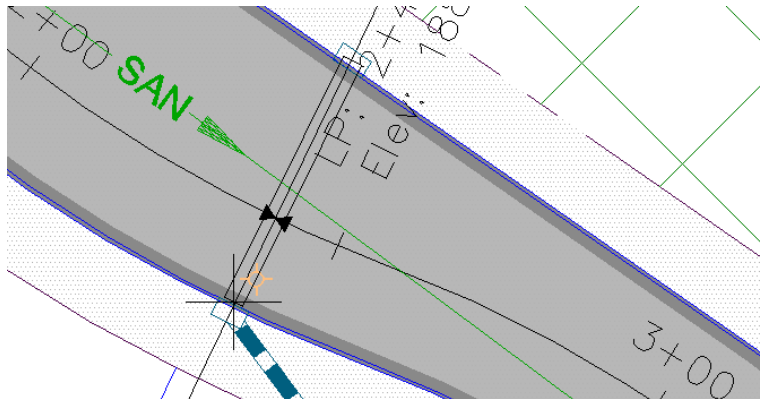


FIGURE 14.6 Icon indicating a connection between a pipe and a structure

If you haven't already done so, download and install the files for Chapter 14 according to the instructions in this book's Introduction.

Exercise 14.2: Create a Pipe Network by Layout

In this exercise, you'll create part of the storm system using the Pipe Network Creation Tools command.

1. Open the drawing named *Creating Pipe Networks By Layout.dwg* located in the Chapter 14 class data folder.

In this drawing, red circles have been provided that indicate the locations of inlets. If you study the placement of these inlets, you'll notice that some of them have been placed at low points, as indicated by the alignment labels. To prevent the inlets at the low points from being overloaded, additional inlets have been placed between low points and high points to collect some of the runoff. Figure 14.7 further illustrates inlet placement in the drawing.

2. On the Home tab of the ribbon, click **Pipe Network** > **Pipe Network Creation Tools**.
3. In the **Create Pipe Network** dialog box, do the following:
 - a. For **Network Name**, enter **Storm1**.
 - b. For **Network Parts List**, select **Storm Sewer**.
 - c. For **Surface Name**, select **Road FG**.
 - d. For **Alignment Name**, select **Jordan Court**.
 - e. Click **OK**.



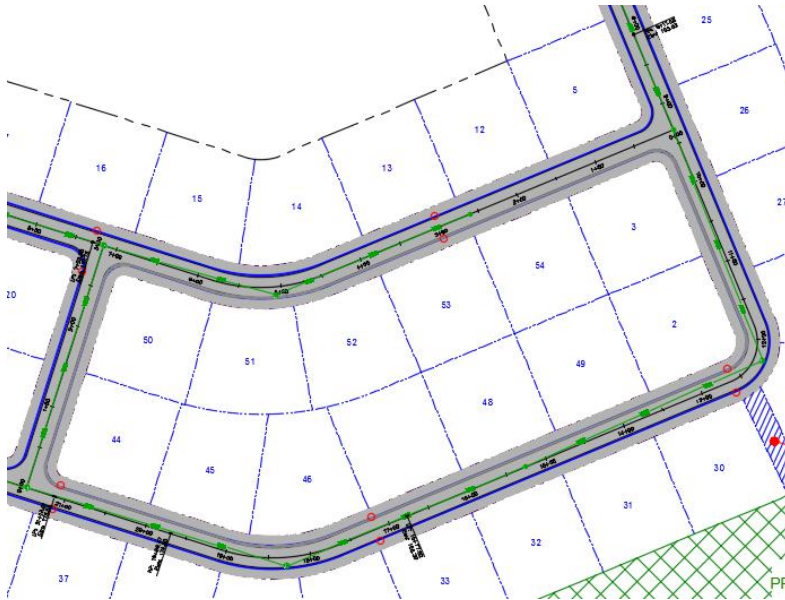


FIGURE 14.7 Inlet placement

4. You're prompted to specify a structure insertion point. In the left viewport, zoom in to the red circles at Jordan Court station 5+50 (0+170). On the Network Layout Tools toolbar, do the following:
 - ▶ To choose a structure, select Rectangular Junction Structure NF (SI) > Curb Inlet from the first drop-down list.
 - ▶ To choose a pipe, select Concrete Pipe (SI) > 15 Inch (400mm) Concrete Pipe from the second drop-down list.

The Network Layout Tools toolbar should appear as shown in

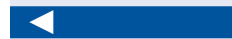
Figure 14.8.



FIGURE 14.8 The Network Layout Tools toolbar after selecting the structure and pipe

5. Right-click the Osnap icon at the bottom of the screen, and then click Object Snap Settings.

If the Osnap icon isn't visible, turn it on using the status bar customization menu, accessed by clicking the icon in the bottom-right corner of your screen.



These settings will cause the Center object snap to be used each time you click a point in the drawing. This will help you do the next few steps a bit more quickly.

As you create each pipe and structure, you can click over to the bottom-right viewport at any time to see the system being constructed in 3D. Then you can click back to plan view to continue with the actual steps.

6. On the Object Snap tab of the Drafting Settings dialog box, do the following:
 - a. Check the box next to Object Snap On (F3).
 - b. Click Clear All.
 - c. Check the box next to Center.
 - d. Click OK.
7. Click the center of the red circle to the east of station 5+50 (0+170).
8. Click the center of the red circle to the west of station 5+50 (0+170).
9. Pan northward until you can see the two red circles at the low point of station 2+40.42 (0+073.28). Click the circle to the south of the road.
10. On the Network Layout Tools toolbar, choose the pipe Concrete Pipe (SI) > 18 Inch (450mm) Concrete Pipe.
11. Click the center of the red circle located north of station 2+40.42 (0+073.28).
12. On the Network Layout Tools toolbar, do the following:
 - a. Choose the structure Cylindrical Junction Structure NF (SI) > Storm Manhole.
 - b. Choose the pipe Concrete Pipe (SI) > 24 Inch (600mm) Concrete Pipe.
13. Click the red circle located at the western corner of the common area.
14. On the Network Layout Tools toolbar, choose a structure of Concrete Rectangular Winged Headwall (SI) > Winged Headwall for 24" (600mm) Pipe.
15. Click the red circle on the opposite side of Emerson Road.
16. Press Esc to end the command.

You have created a storm sewer network, which discharges at a location across Emerson Road (see Figure 14.9).

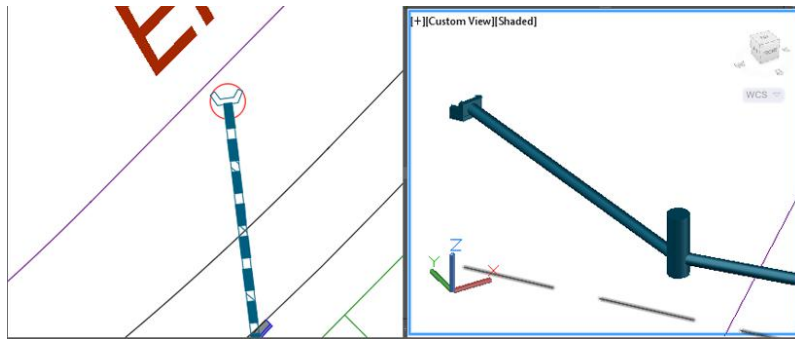


FIGURE 14.9 A portion of the newly created storm pipe network

17. Save and close the drawing.

You can view the results of successfully completing this exercise by opening *Creating Pipe Networks By Layout - Complete.dwg*.

Drawing a Pipe Network in a Profile View

Viewing a pipe network in a profile view is critical to performing an accurate design. The depths, slopes, and elevations of an underground pipe system are every bit as important as the horizontal location of each component on the plan. Civil 3D enables you to represent a pipe network in profile view, which is the ideal way to visualize and modify the vertical aspect of a pipe network design.

You can use the *Draw Parts In Profile* command to draw an entire network in profile view or to draw select parts. When this is done, the pipes and structures shown in plan view are the same pipes and structures shown in profile view. Any change or addition to the pipe network will be visible in both views.

Exercise 14.3: Draw a Pipe Network in Profile View

In this exercise, you'll use the *Draw Parts In Profile* command to show the storm network in a profile view.

1. Open the drawing named *Drawing Pipe Networks in Profile View.dwg* located in the Chapter 14 class data folder.
2. In the left viewport, select the new storm manhole near the western corner of the Common Area, and then click *Draw Parts In Profile* on the ribbon.

◀ If you haven't already done so, download and install the files for Chapter 14 according to the instructions in this book's Introduction.





3. In the top-right viewport, click one of the grid lines of the Jordan Court profile view. The manhole is drawn in the profile view. Press Esc to clear the selection.
4. Click the pipe that connects to the manhole from the southeast.
5. Click Draw Parts In Profile on the ribbon, and again click the grid of the Jordan Court profile view.
6. Repeat steps 2 and 3 for the inlet located north of station 2+40.42 (0+073.28).
7. Repeat steps 2 and 3 for the pipe that begins at station 2+40.42 (0+073.28) and ends at station 5+50 (0+170).
8. Repeat steps 2 and 3 for the inlet located to the west of station 5+50 (0+170).

Now there are two pipes and three structures drawn in the profile view (see Figure 14.10).

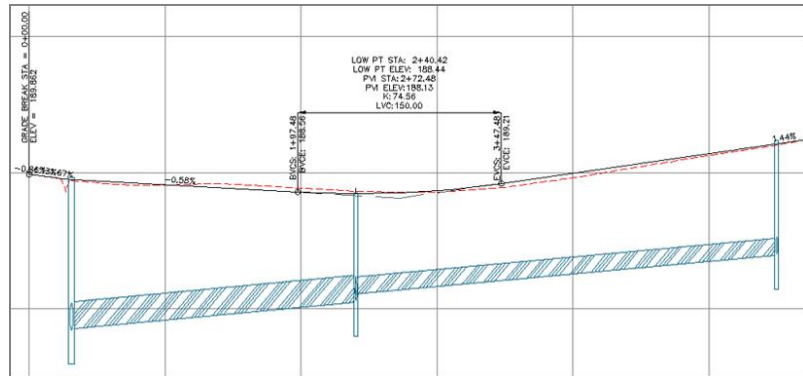


FIGURE 14.10 Two pipes and three structures drawn in a profile view

9. Save and close the drawing.

You can view the results of successfully completing this exercise by opening Drawing Pipe Networks in Profile View - Complete.dwg.

Editing Gravity Pipe Networks

As you might guess, the tools for editing pipe networks are even more extensive than the tools used to create them. This is one reason the recommended way to approach pipe design is to perform a rough layout and then use the editing tools to perfect the design. As you're about to learn, Civil 3D provides many ways to edit pipe networks. In the following sections, the ways to edit pipe networks are presented in four groups: grips, editing tools, properties, and the Pipe Network Vistas.

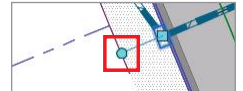
Editing Pipe Networks Using Grips

Grips are a great tool for making quick and simple graphical edits. Civil 3D provides the following specialized grips for pipes and structures:

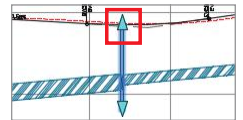
Structure – Square Grip – Plan View This grip changes the location of the structure without changing its rotation. As a structure is moved, the ends of any pipes that connect to it move with it.



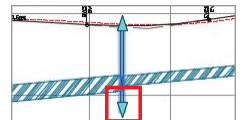
Structure – Circular Grip – Plan View This grip changes the rotation of the structure without changing its location.



Structure – Top Triangular Grip – Profile View This grip changes the elevation of the top of the structure. Use caution when editing the top of a structure because, depending on its properties, the software may automatically reset it to match a surface.

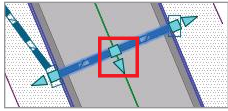


Structure – Bottom Triangular Grip – Profile View This grip changes the elevation of the sump (inside floor) of the structure. This elevation can't be placed above the invert (bottom of the inside wall) of the lowest incoming pipe.

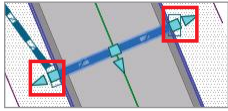


Pipe Midpoint – Triangle Grip – Plan View This grip is used to change the diameter of a pipe. Dragging it away from the pipe increases the diameter, and dragging it toward the pipe decreases the diameter. This grip can be used in conjunction with the AutoCAD Dynamic Input feature to view the diameter or even type it in.

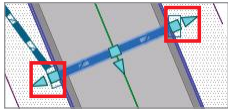




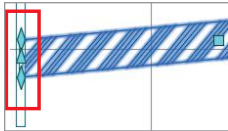
Pipe Midpoint – Square Grip – Plan View This grip moves the pipe to a new location without changing its angle or its slope.



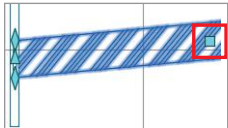
Pipe Endpoint – Square Grip – Plan View This grip moves the location of one end of the pipe while keeping the other end fixed. In profile view, it maintains the current elevation of that end of the pipe.



Pipe Endpoint – Triangular Grip – Plan View This grip changes the length of the pipe while maintaining the angle of the pipe and the location of the opposite end.



Pipe Endpoint Grips – Profile View These grips change the elevation of a pipe at its endpoint. The diamond-shaped grip at the top sets the crown (top of the inside wall) elevation. The diamond-shaped grip at the bottom sets the invert (bottom of the inside wall) elevation. The triangular grip sets the centerline elevation. These grips can be used in conjunction with the AutoCAD Dynamic Input feature to view the elevation or even type it in. They don't change the horizontal location of the pipe's endpoint.



Pipe Midpoint – Square Grip – Profile View This grip changes the elevation of the pipe without changing its slope. It doesn't affect the location of the pipe in plan view.


You should note that when you change the location of the endpoint of a pipe in plan view, the structure connected to it doesn't move with it. To place the structure at the end of the pipe, you must move the structure as a separate action. If you don't update the location of the structure, the pipe may reset to match the structure at some point in the future.

Exercise 14.4: Edit a Pipe Network Using Grips

In this exercise, you'll use grips to make some adjustments to the storm network.

1. Open the drawing named *Editing Pipe Networks Using Grips.dwg* located in the Chapter 14 class data folder.
2. In the plan view on the left, zoom in to the inlets located at station 5+50 (0+170).

If you haven't already done so, download and install the files for Chapter 14 according to the instructions in this book's Introduction.

3. Click both inlets to select them, and then click the circular grip on the inlet to the east.
4. Click the square grip of the west inlet.
This rotates the east inlet to align it with the west inlet, which also aligns the east inlet with the curb.
5. If it isn't already turned on, click the Dynamic Input icon at the bottom of your screen to turn it on. 
6. Zoom in to the pipe at station 5+50 (0+170), and select it. Click the triangular grip at the midpoint of the pipe.
7. Drag the grip away from the pipe, and click when the dynamic input text box reads 1.5 (0.450). Or you can just type 1.5 (0.450) in the box, as shown in Figure 14.11.

This changes the diameter of the pipe to 18 inches (450mm).

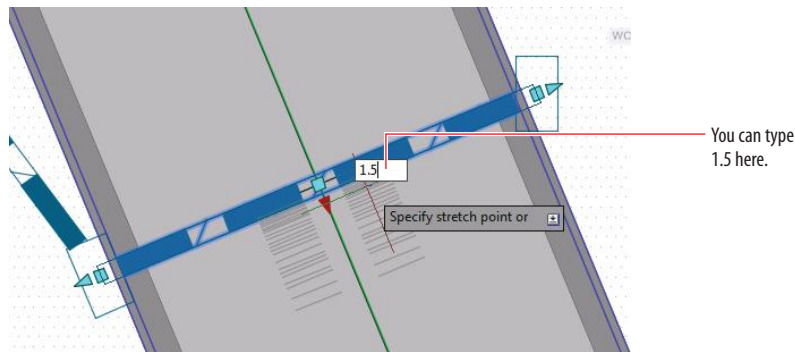



FIGURE 14.11 Using Dynamic Input to enter a pipe diameter value

8. In the bottom-right viewport, zoom in to the manhole located near the west corner of the Common Area. Click the manhole, and then click the square grip at its center.
9. If your Osnap icon is turned off, click it to turn it on. 
10. Click the center of the red circle west of the manhole.
11. Click in the top-right viewport, and then click the pipe in the Jordan Court profile view that is farthest to the left.
12. Click the bottom diamond-shaped grip on the left end of the pipe, and then zoom out until you can see the dynamic input dimension and text box. Type 180 (54.864) in the text box, and press Enter.

Step 4 will be easier if you press F3 to turn off running object snaps.

If the Dynamic Input icon isn't visible, turn it on using the status bar customization menu, accessed by clicking the icon in the bottom-right corner of your screen.

If you watch carefully, you'll see the position of the manhole change slightly in the profile view.

The next steps will be easier if you turn off your running Osnaps. You can use the F3 key to do so.



13. Press Esc to clear any selections. Click the Dynamic Input icon to turn off that feature, and then click the structure farthest to the left in the Jordan Court profile view.
14. Click the triangle grip at the bottom of the structure, and drag it upward until a red dashed line appears (see Figure 14.12). Click while this symbol is visible.

The sump elevation of the structure is raised slightly, but Civil 3D won't allow the sump to be placed above the lowest connecting pipe.

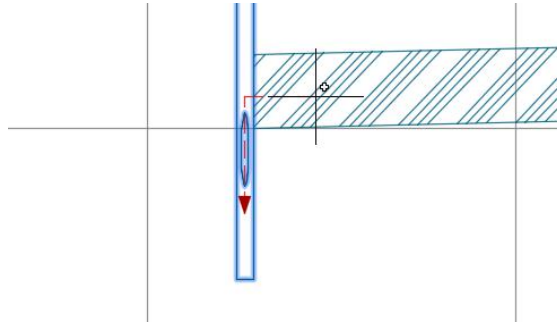


FIGURE 14.12 Editing the sump elevation of a structure using grips

15. Save and close the drawing.

You can view the results of successfully completing this exercise by opening *Editing Pipe Networks Using Grips - Complete.dwg*.

Editing Pipe Networks Using Editing Tools

Another way to edit a pipe network is to use the Network Layout Tools toolbar, which is the same toolbar you used initially to create the pipe network. To launch the toolbar in editing mode instead of creation mode, you use the Edit Pipe Network command.

In addition to the Network Layout Tools toolbar, there are several commands located on the ribbon and in a context menu that give you even more functionality:



Swap Part This command calls up the current parts list, and it enables you to select a part and replace it with any part in the parts list.



Disconnect Part This command disconnects a pipe from a structure, enabling you to connect it to a different part or move it independently of other parts.

Connect Part This command connects a pipe to a structure to reestablish the dynamic behavior of connected parts.



Split Network This command divides a network into two separate networks.



Merge Networks This command combines two or more networks into a single network.



Exercise 14.5: Edit Pipe Networks Using Editing Tools

In this exercise, you'll use the ribbon commands and Network Layout Tools toolbar to edit the storm and sanitary networks in your drawing.

1. Open the drawing named *Editing Pipe Networks Using Editing Tools.dwg* located in the Chapter 14 class data folder.
2. Click any storm pipe or structure in the drawing, and then click **Edit Pipe Network** on the ribbon.
This opens the Network Layout Tools toolbar.
3. On the Network Layout Tools toolbar, do the following:
 - a. Choose the structure **Cylindrical Junction Structure NF (SI) Storm Manhole**.
 - b. Click the small black triangle to expand the button to the right of the pipe drop-down list. Select **Structures Only**.
4. If your Osnap icon is turned on, click it to turn it off.
5. In either the plan viewport or the 3D viewport, click near the midpoint of the pipe that begins at station 2+40.42 (0+073.280) and ends at station 5+50 (0+170).
A new manhole is inserted along the pipe.
6. Press Esc to clear the current command. Click the newly created structure, and then click the square grip at its center.
7. Snap to the center of the red circle located near Jordan Court station 3+50 (0+110).
8. Press Esc to clear the previous selection. In the left viewport, click the pipe that enters the new manhole from the south. Click **Swap Part** on the ribbon.



If you haven't already done so, download and install the files for Chapter 14 according to the instructions in this book's Introduction.



9. In the Swap Part Size dialog box, click Concrete Pipe (SI) > 18 Inch (450mm) Concrete Pipe and then click OK.
10. Repeat steps 8 and 9 for the pipe that exits the new manhole to the north.
You have now inserted a new manhole and resized the pipes that connect to it (see Figure 14.13).

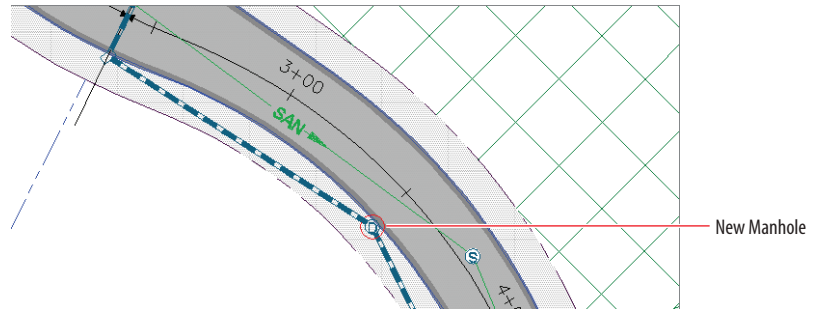


FIGURE 14.13 Newly created manhole and resized connecting pipes



11. Close the Network Layout Tools toolbar, and press Esc to clear the previous selection. Click one of the sanitary sewer pipes in the drawing, and then click Merge Networks on the ribbon.
12. In the first dialog box, click Sanitary-2 and then click OK.
Here, you're selecting a network that will be merged into another. When the process is complete, a network of this name will no longer exist.
13. In the second dialog box, click Sanitary and then click OK.
Here, you're selecting the network that is having Sanitary-2 merged into it.
14. In Prospector, expand Pipe Networks > Networks. Note that the Sanitary-2 network is no longer listed.
15. Repeat steps 11–13, this time selecting Sanitary-3 in the first dialog box.
All sanitary sewer networks have been merged into one; therefore, only one sanitary sewer network is listed in Prospector.
16. Save and close the drawing.

You can view the results of successfully completing this exercise by opening Editing Pipe Networks Using Editing Tools - Complete.dwg.

Editing Pipe Networks Using Properties

Many of the values you need to change when editing pipes and structures can be found in their *properties*. There are two ways to access the properties of a pipe or structure: the Civil 3D method and the AutoCAD method. To use the Civil 3D method, you select a pipe or structure and then click Pipe Properties or Structure Properties on the ribbon. This method provides extensive information about the pipe or structure, much of which can be edited to change the design. The one disadvantage of this method is that you must launch the Pipe Properties or Structure Properties command separately for each pipe or structure you want to edit.

With the AutoCAD method, you select the pipe or structure and then use the Properties command from the ribbon or the context menu. Here you're given access to a limited number of properties, but the advantage is that you can modify multiple pipes or structures simultaneously.

Exercise 14.6: Edit a Pipe Network Using Properties

In this exercise, you'll fix the issue with the sanitary pipe that is located far below the others. You'll use properties to complete this task. The problem with the incorrect pipe elevation was brought to your attention during the first exercise in this chapter, when the sanitary sewer pipe networks were first created.

1. Open the drawing named *Editing Pipe Networks Using Properties.dwg* located in the Chapter 14 class data folder.
In this exercise, you'll focus on the sanitary sewer pipes that lie in Madison Lane. In the profile view on the top right, notice that the pipe beginning at the intersection with Logan Court and ending at the Madison Lane cul-de-sac has been incorrectly placed at a very low elevation.
2. In the upper-right viewport, zoom in to the Madison Lane profile and note the label at the right end that reads *ELEV = 180.972 (55.160)*.
This elevation corresponds with the center point of the cul-de-sac, which is also the location of the manhole.
3. Click in the left viewport, and then zoom in and click the manhole located at the center of the Madison Lane cul-de-sac. Click *Structure Properties* on the ribbon.



If you haven't already done so, download and install the files for Chapter 14 according to the instructions in this book's Introduction.



4. On the Part Properties tab of the Structure Properties dialog box, do the following:
 - a. For Automatic Surface Adjustment, select False.
 - b. For Insertion Rim Elevation, enter 180.972 (55.160).
 - c. Click OK.

In the 3D viewport, you'll see the manhole become very tall, like the one just down the road from it.

This corrects the top elevation of the structure, but the pipe still requires some editing.

5. Press Esc to clear the selection of the manhole. Then, in the left viewport, select the pipe that begins at the Madison Lane cul-de-sac. Right-click, and select Properties.
6. In the Properties window, change Start Invert Elevation to 176.972 (53.941).



7. With the pipe still selected, click Pipe Properties on the ribbon.
8. On the Part Properties tab of the Pipe Properties dialog box, enter -1.5 for Pipe Slope (Hold Start). Click OK.

The effects of these pipe edits are much more obvious in the 3D viewport. The pipe is corrected, but the sump of the manhole at the cul-de-sac is still incorrect.



9. Press Esc to clear the selection of the pipe. Click the manhole at the center of the Madison Lane cul-de-sac, right-click, and select Structure Properties.
10. Although it's already set to 2.000 (0.600), type 2 (0.6) for Sump Depth, and press Enter. Click OK.

The manhole depth is updated because the apparent change to the sump depth triggered a recalculation of the manhole dimensions. If you're zoomed in closely to the profile view in the top-right viewport, it may seem as though it has disappeared.
11. Click the top-right viewport, and zoom out until you can see the Madison Lane profile view.

The profile view has become much shorter because it no longer needs to accommodate the excessively tall manhole (see Figure 14.14).

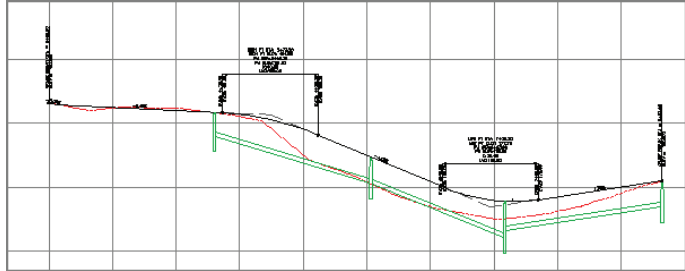


FIGURE 14.14 The sanitary pipe network in profile view after several elevations were corrected

12. Save and close the drawing.

You can view the results of successfully completing this exercise by opening Editing Pipe Networks Using Properties - Complete.dwg.

Editing Pipe Networks Using the Pipe Network Vistas

The pipe network editing methods you've learned about thus far in this chapter are great for working with individual pipes and structures, but what if you want to see the entire network or make edits to multiple parts simultaneously? Luckily, you can do these things with the Pipe Network Vistas command, which opens Panorama and displays two tabs: Structures and Pipes. Each of these tabs displays all the pipes or structures in the entire network in a spreadsheet format, enabling you to view and edit the properties of multiple components at once.

The Pipe Network Vistas button is located near the right end of the Network Layout Tools toolbar (see Figure 14.15).



FIGURE 14.15 The Pipe Network Vistas button highlighted on the Network Layout Tools toolbar

If you haven't already done so, download and install the files for Chapter 14 according to the instructions in this book's Introduction.



Exercise 14.7: Edit a Pipe Network Using the Pipe Network Vistas

In this exercise, you'll use the Pipe Network Vistas to change the names of some of the structures and change the style of some of the pipes.

1. Open the drawing named Editing Pipe Networks Using the Pipe Network Vistas.dwg located in the Chapter 14 class data folder.
2. Click any storm pipe or structure in the drawing, and then click Edit Pipe Network on the ribbon.
3. On the Network Layout Tools toolbar, click Pipe Network Vistas. Panorama opens, displaying the Pipes and Structures tabs.
4. Click the Structures tab. While holding down the Ctrl key, click the four rows that currently have Rectangular Junction Structure NF (SI) as the description (see Figure 14.16).

Status	Name	Description	Style	Rule Set	Override ...	Render
✓0	Structure - (126)	Rectangular Junction Structure NF	C-STRM	Basic	No	ByLayer
✓0	Structure - (125)	Rectangular Junction Structure NF	C-STRM	Basic	No	ByLayer
✓0	Structure - (131)	Cylindrical Junction Structure NF	C-STRM - N	Basic	No	ByLayer
✓0	Structure - (129)	Cylindrical Junction Structure NF	C-STRM - N	Basic	No	ByLayer
✓0	Structure - (127)	Rectangular Junction Structure NF	C-STRM	Basic	No	ByLayer
✓0	Structure - (128)	Rectangular Junction Structure NF	C-STRM	Basic	No	ByLayer
✓0	Structure - (130)	Concrete Rectangular Winged Headwall	C-STRM	Basic	No	ByLayer

FIGURE 14.16 Selecting multiple rows in the Structures tab of Panorama

5. Right-click the Description column heading, and select Edit.
6. Type INLET, and press Enter.
All four Description values change to INLET.
7. In the Description column, change any instances of Cylindrical Junction Structure NF (SI) to MANHOLE.
8. Change the description for the last structure to ENDWALL.
9. Click the Pipes tab. While holding down the Shift key, click the first and last rows. All rows should now be selected.

- Right-click the Style column, and select Edit. In the Select Pipe Style dialog box, select C-STRM – Walls In Profile. Click OK.

The appearance of the pipes in profile view changes so that the inside and outside pipe walls are shown (see Figure 14.17).

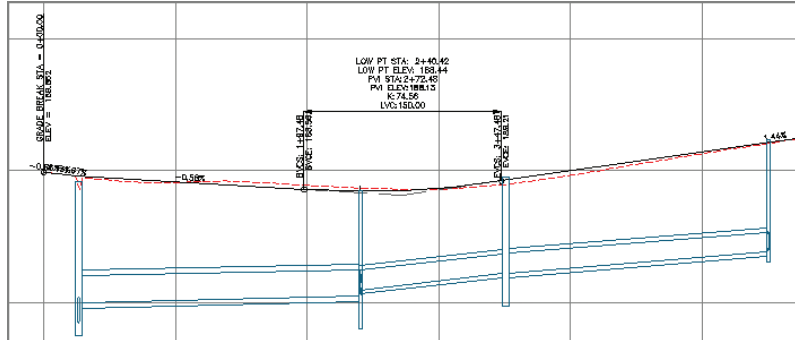


FIGURE 14.17 Pipes in profile view shown with inside and outside walls

- Save and close the drawing.

You can view the results of successfully completing this exercise by opening *Editing Pipe Networks Using the Pipe Network Vistas - Complete.dwg*.

Now You Know

Now that you have completed this chapter, you're ready to begin creating and modifying gravity pipe networks. You can create these networks from objects in the drawing or by drawing them yourself using the Network Layout Tools toolbar. Once you have created a network, you can display it in profile view and edit it using grips, editing tools, properties, and the Pipe Network Vistas.

You're ready to begin working with gravity pipe networks in a production environment.

