

That CAD Girl

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Pipes with Land Desktop and Civil Design

Initial Setup

- You must be attached to the correct Land Desktop project database.
- You must have a good existing ground and/or proposed surfaces built.
- Go to the Scales tab in Projects> Drawing Setup and set the correct horizontal and vertical scales.
- Load the Civil Design Menu Palette or Workspace
- Go to Profiles> Profile Settings> Labels and Prefix and put an asterisk " * " in the box next to Layer Prefix

General Steps to Defining and Drawing Pipe Runs

1. Define Alignments and Draw Profiles for Pipe Runs
2. Establish Default Pipe Data Settings
3. Establish Default Node/Structure Settings
4. Set Node and Pipe Label Settings
5. Draw and Define Pipe Runs
6. Adjust and Revise Node and Pipe Data
7. Set Layers and Layer Prefix for Drawing Pipe Runs
8. Draw Pipe Runs in Profile View (During Design Process)
9. Draw Pipe Runs in Profile View (After Design Process)
10. Draw Pipe Runs in Plan View

Additional Information

- A. Changing a Rim Elevation to Reference a Different Surface
- B. Importing and Exporting Pipe Settings to a DFM File
- C. Exporting Pipe Runs to Excel Using XML Export
- D. Pipe Run editing cheat sheet

1 Define Alignments and Draw Profiles for Pipe Runs

Even if the Pipe Run follows or mostly follows a roadway alignment and will only be shown as part of the roadway profiles, it is recommended that you use a single profile for the entire Pipe Run during design. Once all rim elevations, invert elevations, label settings, etc. have been finalized, the Pipe Run can be imported into the roadway profiles to show the applicable areas.

1. Define the longest and main Pipe Runs as horizontal alignments and then define the secondary runs.
 - a. For horizontal alignments, you do not need a PI at each node location - only at actual bends.
 - b. You can draw and define the alignments with polylines or lines.
 - c. When defining the horizontal alignment for pipes, define from the bottom to the top (reverse of flow direction). If the profile for the entire run is to be plotted, this will ensure that station 0+00 will be at the low point and will show low to high from left to right on the profile.
 - d. Name the alignment the same as the Pipe Run. Generic names are typically best - SS-01, SD-01, etc.
2. Create profiles for the alignment.
 - a. If the rim elevations for the pipe structures will be based on a single surface, set that surface current and then go to Profiles> Existing Ground> Sample from Surface.
 - b. If the rim elevations for the Pipe Run will come from more than one surface:
 - i. Go to Profiles> Existing Ground> Toggle Multiple surfaces. This allows you to sample multiple surfaces at one time.
 - ii. Go to Profiles> Existing Ground> Select Multiple Surfaces. Hold the CTRL key and, in the left side of the box, click on the surfaces to be sampled.
 - iii. Sample surfaces by going to Profiles> Existing Ground> Sample from Surface.
 - c. Insert the profile into the drawing by going to Profiles> Create Profile> Full Profile.
 - d. If you have selected multiple surfaces, you'll be prompted to select the profile surface to be imported. Always import the original/existing surface before any proposed ground surfaces.
 - e. To import additional profiled surfaces, go to Profiles> Create Profile> Surface Profile and select the additional profile surface.
3. Repeat for all Pipe Runs.

2 Establish Default Pipe Settings

Before defining Pipe Runs, go to Pipes> Settings> Edit, select the “Pipe” button in the “Node and Pipe Data Values” section of the dialog box and make the following adjustments (if desired).

The default settings shown below are based on the “Default (Feet)” prototype project.

The image shows a screenshot of the "Pipe Data Settings" dialog box. The dialog box has a title bar with a close button (X). Below the title bar, it shows the file path: "File: c:\tcg_landprojects\test\dwg\test.dfm". The settings are as follows:

- Pipe Diameter: 8.00 (with a "Select" button)
- Pipe Name: PIPE
- Formula: Manning (dropdown menu)
- Pipe Material: CMP
- Pipe Coefficient: 0.0130
- Invert In depth below Rim: 4.00 (ft)
- Invert Out depth below Rim: 4.10 (ft)

At the bottom, there are three buttons: "OK", "Cancel", and "Help".

Three callout boxes with arrows pointing to specific fields provide instructions:

- Callout 1: Points to the "PIPE" text in the "Pipe Name" field. Text: "Backspace over this 'PIPE' value to keep each pipe from being named 'PIPE'."
- Callout 2: Points to the "CMP" text in the "Pipe Material" field. Text: "Change the pipe material here."
- Callout 3: Points to the "4.00" and "4.10" values in the "Invert In depth below Rim" and "Invert Out depth below Rim" fields. Text: "Change the initial invert in and out settings here. For sanitary sewer, these values are typically 6.0 and 6.2."

HINT: Making changes through the Pipe Data Settings will only be reflected in Pipe Runs defined AFTER the changes are made and will not revise pipe settings for runs previously defined. For instance, if the Pipe Material defaults in the Pipe Data Settings dialog box is set to CMP, defining a run will result in all pipes being CMP. To change the pipe material AFTER the run has been defined, you must do so to each pipe through the Pipe Run Editor by going to Pipes> Conceptual Profile> Edit Data.

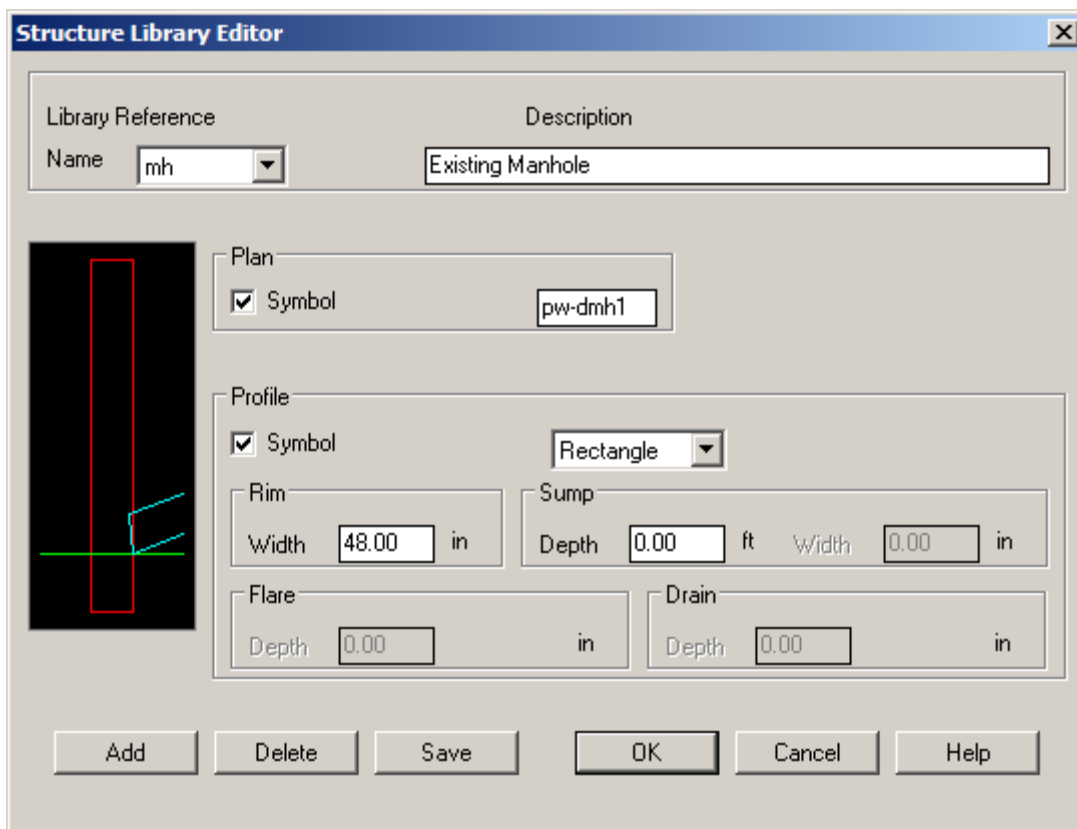
3 Establish Default Node/Structure Settings

Land Desktop provides several pre-made structures for use in profiling of pipes. The structures are: MH (existing manhole), PMH (proposed manhole), CB (existing catch basin), PCB (proposed catch basin), END (outlet end of a pipe), NULL (generic structure not drawn in either plan or profile view) and NULL2 (generic structure drawn in profile, but not in plan view).

You can set a default structure type for all nodes in the run through Pipes> Settings> Edit> and then selecting the "Node" button in the "Node and Pipe Data Values" section of the dialog box.

You can manually change the structure type for each node through the Pipe Run Editor by going to Pipes> Conceptual Profile> Edit Data.

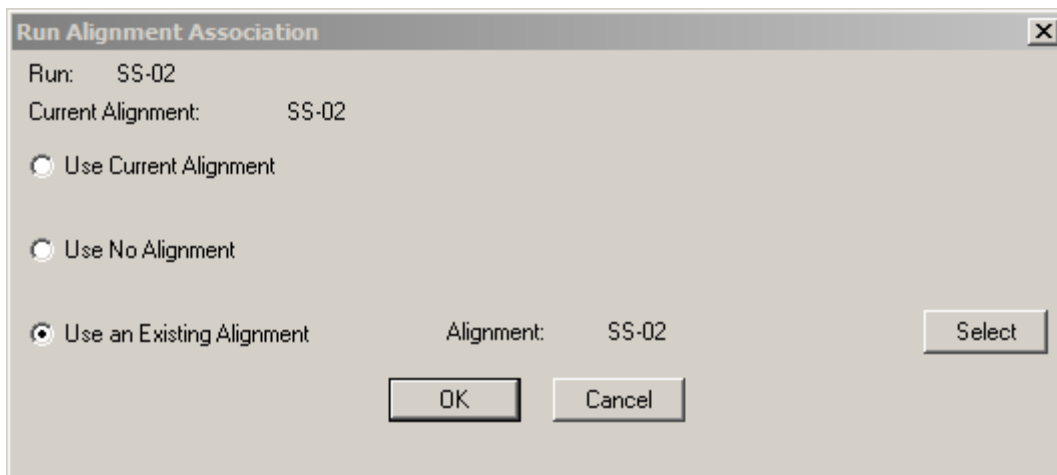
You can make specific changes to each structure type or create new structures through Pipes> Settings> Edit and then selecting the "Structure Library Editor" button as shown below.



HINT: Making changes to the structures in the Structure Library Editor will be reflected in all Pipe Runs defined before OR after the changes are made. For instance, changing the Sump Depth of a structure will update all previously defined Pipe Runs as well as those yet to be defined.

4 Draw and Define Pipe Runs

1. Set the current surface to the one that will establish the majority of your rim elevations.
2. Go to Pipes> Define Pipe Run> Draw Pipe Run.
 - a. Give the Pipe Run a name when prompted. Name each Pipe Run the same as the corresponding horizontal alignment.
 - b. When prompted to turn the current surface ON or OFF, select ON if this is the surface used to determine the majority of your rim elevations. Turning this surface OFF when prompted will require you to enter the Rim elevation at each node location. If the wrong surface is shown, cancel the command, set the correct surface and start the Draw Pipe Run command again.
 - c. In the plan view, use OSNAPs to select each node (manhole) location from top to bottom - in the direction of flow. After picking each node location, hit the Enter key to "Add" a new node to the Pipe Run. After picking the second node location, you will see a yellow arrow pointing in the downstream direction.
 - d. After picking all node locations, use the "X" key to exit the draw Pipe Run command.
 - e. Select "Yes" when prompted to Save Edits.
 - f. The final prompt when defining a Pipe Run forces you to associate the new Pipe Run with an alignment (see dialog box below). When prompted for the alignment to attach the Pipe Run to, select the bottom option, "Use an Existing Alignment". Then pick the "Select" button and select the horizontal alignment created for the Pipe Run.

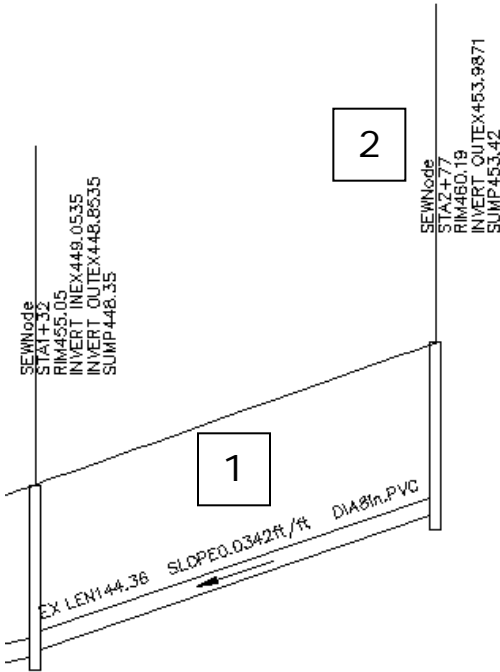


This association between the Pipe Run and horizontal alignment determines the profile that the Pipe Runs will be drawn into. By forcing the association to this specific alignment during the design process, it ensures that the Pipe Run will be associated to this alignment regardless of the alignment that is set current.

3. Repeat for all Pipe Runs

5 Set Node and Pipe Label Settings

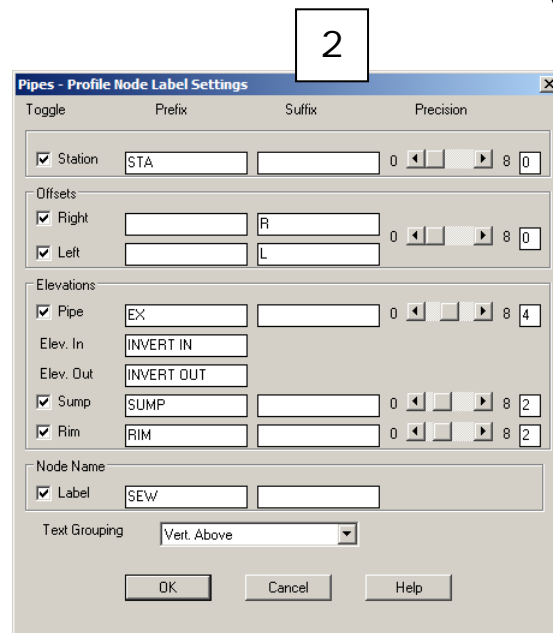
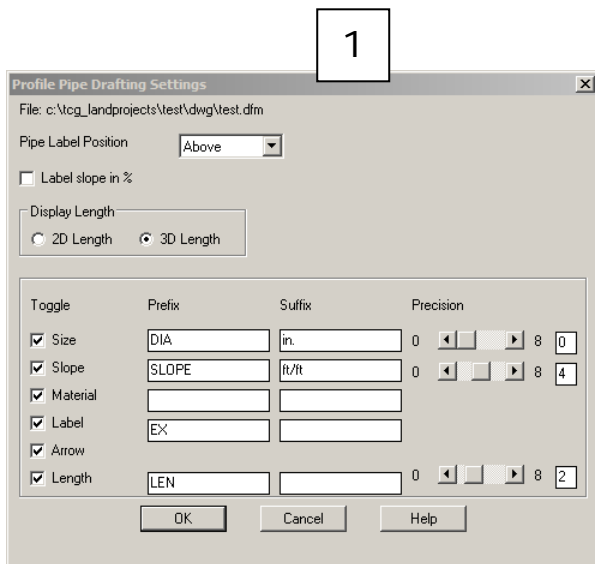
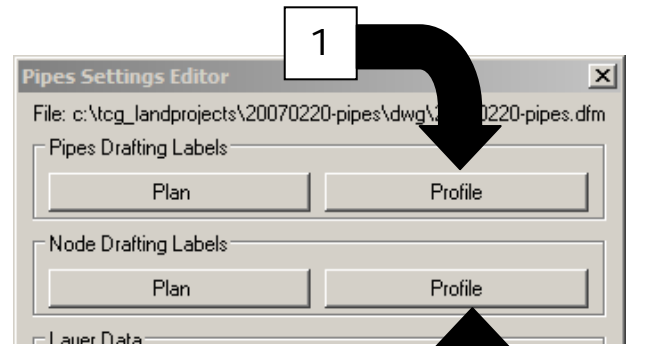
Creating a project using the “Default (Feet)” prototype project produces Node and Pipe profile labels similar to those shown below.



The Plan and Profile buttons for Pipes and Node Drafting Labels in the Pipe Settings Editor establishes all generic labeling settings such as prefixes, suffixes, precision, etc. These settings apply to all labels added to the drawing after changes are made in the Editor.

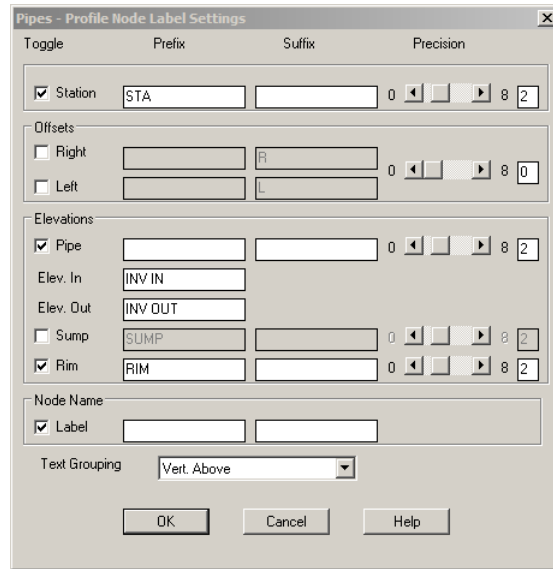
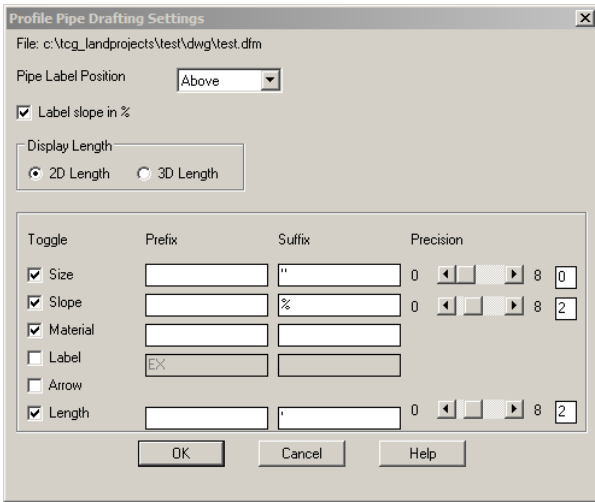
Individual pipe or node labels (such as node name) are changed through the Conceptual Profile> Edit Data dialog box.

To make changes to either the Node or Pipe label settings, go to Pipes> Settings> Edit and pick the desired button:

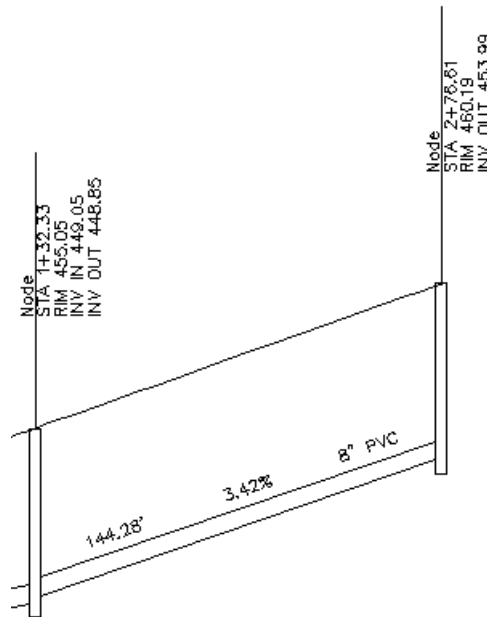


5 Set Node and Pipe Label Settings (Continued)

Making the following changes to the Node and Pipe label settings...



produces profile labels as shown below:



HINT: Add a space after a label prefix or before a suffix to get the appropriate spacing in labels.

6 Adjust and Revise Node and Pipe Data

Changes to specific pipes or nodes (structures) are made through the Pipes Run Editor. Some of these changes are Node Labels (MH 01, MH 02, etc.), structure type, sump drop and invert elevations.

A sample of the Pipes Run Editor (shown in Node View) is shown below:

The screenshot shows the 'Pipes Run Editor - ss01' window. At the top, there are fields for 'View' (set to 'Node'), 'Align' (SS01), and 'Surf' (eg). Below these is a table with the following columns: Node Label, Station [ft], Offset [ft], Rim Elev. [ft], Struct Type, Struct Dim. [in], Node Drop [ft], and Sump Drop [ft]. The table contains four rows of data:

Node Label	Station [ft]	Offset [ft]	Rim Elev. [ft]	Struct Type	Struct Dim. [in]	Node Drop [ft]	Sump Drop [ft]
MH 3	5+43.45	0.00	452.94	PMH	48.00	0.20	0.00
MH 2	3+96.48	0.00	452.06	PMH	48.00	0.20	0.00
MH 1	1+58.88	0.00	447.72	PMH	48.00	0.20	0.00
EX MH	0+00.00	0.00	439.85	MH	48.00	0.10	0.00

Below the table are navigation buttons: <, >, ^, v, >>, <<, PgUp, PgDn, <Home, End>, Home, and End. At the bottom are buttons for Save, Settings, Edit, Tools, Runoff, Messages, Calculate, OK, Cancel, Print View, and Help.

The following changes have been made to the table above:

- a. Node Labels -
 - All Nodes were initially named "SEW".
 - Manually named the nodes according to my run layout.
- b. Structure Type -
 - All structure types were initially set to "MH".
 - Manually changed the proposed manholes to type "PMH".
- c. Sump Drop -
 - The sump drop for the EX MH node was initially 0.50.
 - Manually changed the Sump Drop for EX MH to 0.0.

The sump drop is defined according to the structure type. By default, MH structures have a Sump Drop of 0.5. To edit this value, place your cursor in the Structure Type cell and pick the Edit button below. This calls up the Structure Library Editor. Make the appropriate change in the Structure Library Editor.

HINT (for settings shown in Node View):

The Node Drop may be changed manually through the Pipe Run Editor or the default values can be changed by going to Pipes> Settings> Edit, and selecting the "Pipe" button in the "Node and Pipe Data Values" section of the dialog box. The difference between the Invert In Depth Below Rim and Invert Out Depth Below Rim values sets the initial Node Drop.

6 Adjust and Revise Node and Pipe Data (Continued)

The Pipe Run Editor (shown in Pipe View) is shown below:

The screenshot shows the 'Pipes Run Editor - ss01' dialog box. It features a 'View' dropdown set to 'Pipe', 'Align: SS01', and 'Surf: eg'. Below this is a table with columns: Pipe Label, Pipe Size [in], Start Inv. [ft], Finish Inv. [ft], Cen-Cen 2D Length [ft], Pipe Slope [ft/ft], Pipe Drop [ft], and Pipe Descr. The table contains three rows of data. To the right of the table are navigation buttons: '<', '>', '^', 'v', '>>', '<<', 'PgUp', 'PgDn', '<Home', 'End>', 'Home', and 'End'. At the bottom are buttons for 'Save', 'Settings', 'Edit', 'Tools', 'Runoff', 'Messages', 'Calculate', 'OK', 'Cancel', 'Print View', and 'Help'.

Pipe Label	Pipe Size [in]	Start Inv. [ft]	Finish Inv. [ft]	Cen-Cen 2D Length [ft]	Pipe Slope [ft/ft]	Pipe Drop [ft]	Pipe Descr.
	8.00	448.84	446.06	146.97	0.0189	2.78	PVC
	8.00	445.86	441.63	237.60	0.0178	4.23	PVC
	8.00	441.43	430.25	158.88	0.0703	11.17	PVC

There were no manual changes made to the settings shown above.

HINTS (for settings shown in Pipe View):

- One of the more confusing parts of the Pipe Run Editor is the phrasing “Start Invert” and “Finish Invert”. These values refer to the start and end of the PIPE, not the Invert In and Invert Out of the manholes or nodes. For instance, in the top line of the table shown above, the Finish Inv. elevation (for the pipe) of 446.06 represents the Invert In to that manhole. The Start Inv. elevation (for the pipe) of 445.86 shown on the next line represents the Invert Out of that manhole and reflects the 0.2’ Node drop as seen in the Node View.

Because of this, revising the invert of a pipe can be tricky. The Start Inv. of a pipe is calculated by subtracting the Node Drop from the Finish Inv. of the upstream pipe. Because it’s a calculated value, the Pipe Run Editor will not allow you to revise the Start Inv. of a pipe. Instead, revise the Finish Inv. and the Node Drop to set the desired elevations.

- The “Pipe Label” cells are empty because we changed this value by going to Pipes> Settings> Edit, and selecting the “Pipe” button in the “Node and Pipe Data Values” section of the dialog box. If you do not make this change before defining the pipe run, each Pipe Label will be “PIPE”. The Pipe Run Editor will not allow a Null field at this point, so you will have to replace all “PIPE” pipe labels with a single space.
- The “Description” fields can be manually changed in the Pipe Run Editor but the default is set by going to Pipes> Settings> Edit, and selecting the “Pipe” button in the “Node and Pipe Data Values” section of the dialog box.

6 Adjust and Revise Node and Pipe Data (Continued)

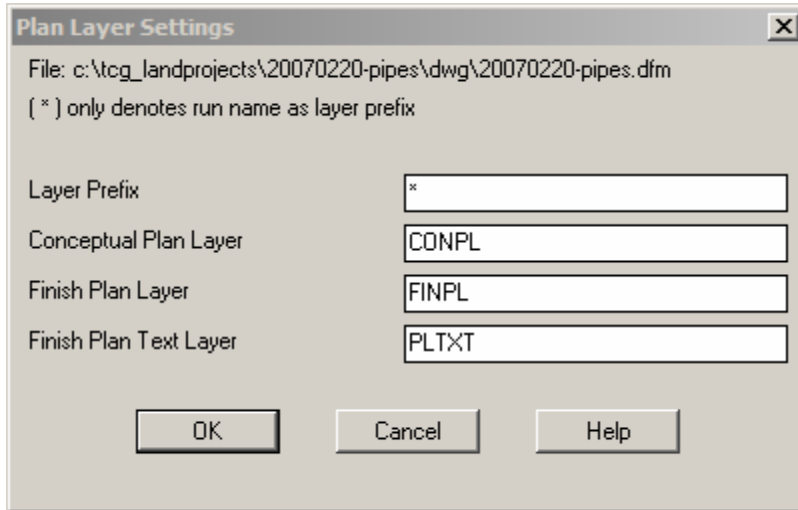
HINTS for all settings shown in the Pipe Run Editor:

- When making changes through Pipes> Conceptual Profile commands, Land Desktop creates an additional layer in the drawing and draws in Pipes and Structures as “stick figures”. Unless changed, this layer name ends in “CONPR” (for conceptual profile). It is usually easier to work with the fully formed pipes and structures created through the Pipes> Finish Draft Profile> Draw Pipes command so you can freeze the “CONPR” layers.
- Some values in the Pipe Run Editor can be changed directly, but most are calculated from other values. If you are unable to make a change to a value, place your cursor in the cell and then pick the Edit button below. A Help box will tell you how the value is determined.

7 Set Layers and Layer Prefix for Drawing Pipe Runs

Setting the Layer Prefix for Plan, Profile and X-Section views of pipes will prefix all default pipe layers with the Pipe Run name.

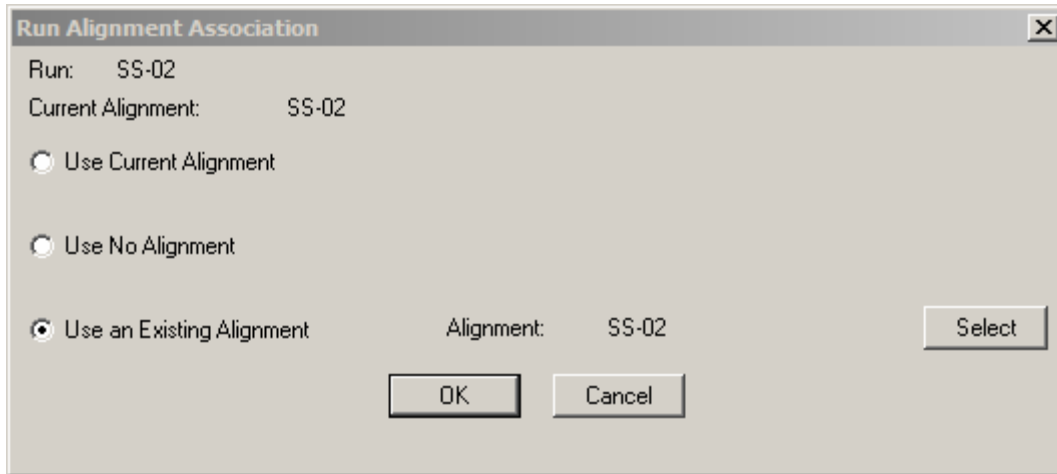
1. Go to Pipes> Settings> Edit and select the "Plan" button in the "Layer Data" section of the dialog box.
2. Put an asterisk (or confirm an asterisk is already there) in the box next to "Layer Prefix".



3. Set the Layer Prefix for the Profile and X-Section views by picking the two respective buttons.

8 Draw Pipes in Profile View (During Design Process)

In one of the previous steps, "Draw and Define Pipe Runs", we forced the Pipe Runs to associate with an alignment that exactly duplicated the Pipe Run by selecting the option shown below.



By forcing this association, we ensure that any pipes drawn will be on the profile of the corresponding alignment. To check the alignment association of a Pipe Run, go to Pipes> Alignment> Change Run Alignment.

Once you've ensured that the alignment association is correct:

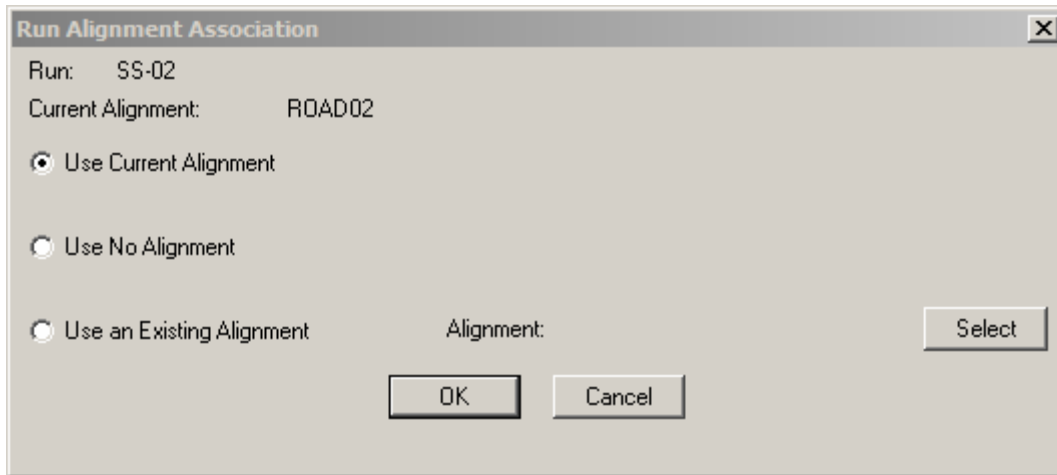
1. Go to Pipes> Finish Draft Profile> Draw Pipes.
2. Right click in the drawing area to display a dialog box and select the Pipe Run.
3. Answer "Yes" when prompted to delete existing Pipe Run layers.

HINT: It is CRITICAL that drawing pipes into the profile and plan views OF EVERY RUN be the very last step in the pipe design process. For example, if you draw pipes for Pipe Run SS-01 and then change an invert of Pipe Run SS-01A that ties into a manhole in run SS-01, the pipes drawn for SS-01 will be out of date.

9 Draw Pipes in Profile View (After Design)

Once the design is complete, we will want to draw the pipes in other profiles such as those for the roadway alignment. Because the pipes will only be drawn in the profile for the associated alignment, we must change the association of the Pipe Runs.

1. Go to Pipes> Alignment> Change Run Alignment and set the option to “Use Current Alignment”. Now, when you change the current alignment and Draw Pipes, the Pipe Run will reassociate any time the current alignment is changed. Therefore the Pipe Run can be drawn in any profile it’s needed.



2. Go to Pipes> Finish Draft Profile> Draw Pipes.
3. Right click in the drawing area to display a dialog box and select the Pipe Run.
4. When prompted whether to delete existing Pipe Run layers, answer as needed to draw pipes into the desired profiles.
5. Repeat this process for all Pipe Runs for the project.

HINT:

- Any time a Pipe Run is drawn into a profile, it is drawn in its entirety. Regardless of whether it is oriented parallel or perpendicular to the alignment. Therefore, significant portions of the Pipe Run may need to be manually erased from the profile.
- It is CRITICAL that drawing pipes into the profile and plan views OF EVERY RUN be the very last step in the pipe design process. For example, if you draw pipes for Pipe Run SS-01 and then change an invert of Pipe Run SS-01A that ties into a manhole in run SS-01, the pipes drawn for SS-01 will be out of date.

10 Draw Pipes in Plan View

1. Go to Pipes> Finish Draft Plan> Draw Pipes.
2. Right click in the drawing area to bring up a dialog box and then select the Pipe Run.
3. Respond to the prompt, "Delete Selected Pipe Run Layers?" as needed.
4. When prompted for "Position for Structure Label" select "P" to pick the label location for each structure and select "O" to define an X and Y offset from each structure.
5. The prompt for "Rotate Structures?" gives you the opportunity to manually orient each structure to fit its location (to align with curb, etc.)

A Changing a Rim Elevation to Reference a Different Surface

Because the Rim elevation of most nodes or structures is typically based on one particular surface, we set that surface current and turn the DTM ON when defining the Pipe Run. However, many times there will be one or two Rims that need to tie to a different surface.

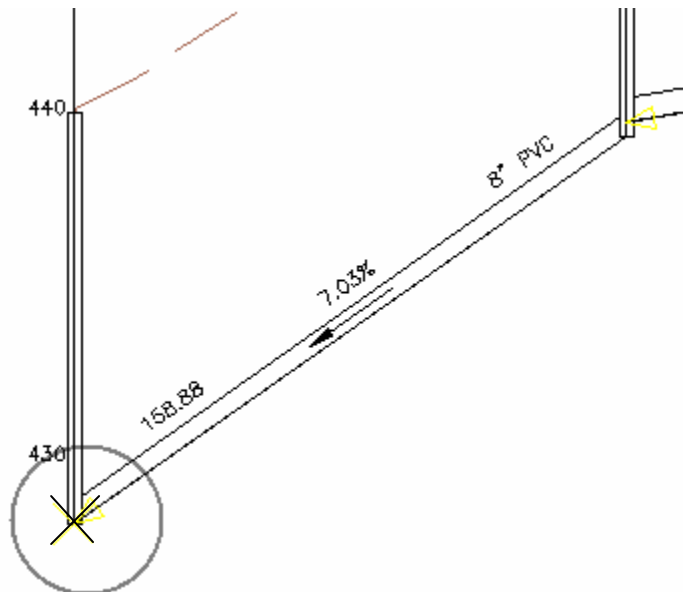
For instance, the bottom structure of a sanitary sewer run will typically be an existing manhole whose Rim elevation is based on the existing surface but the rim elevations of the other manholes will be based on a proposed surface. In this case, we would set the proposed surface current when defining the Pipe Run and then go back and manually change the rim elevation of the bottom manhole to match the existing ground surface.

The easiest way to change a Rim elevation is to:

1. Go to Terrain> Set Current Surface and set the surface from which to pull the NEW rim elevation.
2. Go to Inquiry> Surface Elevation and, using OSNAPs, pick the desired Node location and make a note of the surface elevation.
3. Go to Pipes> Conceptual Profile> Edit Data and type in the new Rim Elevation for the Node/Structure.

Another option is to make the change graphically.

1. Zoom in on the profile showing the structures to be edited.
2. Go to Pipes> Set Current Surface to set the surface to be used to set the Rim elevation.
3. Go to Pipes> Conceptual Draft Profile> Edit Graphical and then right click to select the desired Pipe Run.
4. A yellow "X" will show up at the invert of the first (bottom) structure/node.



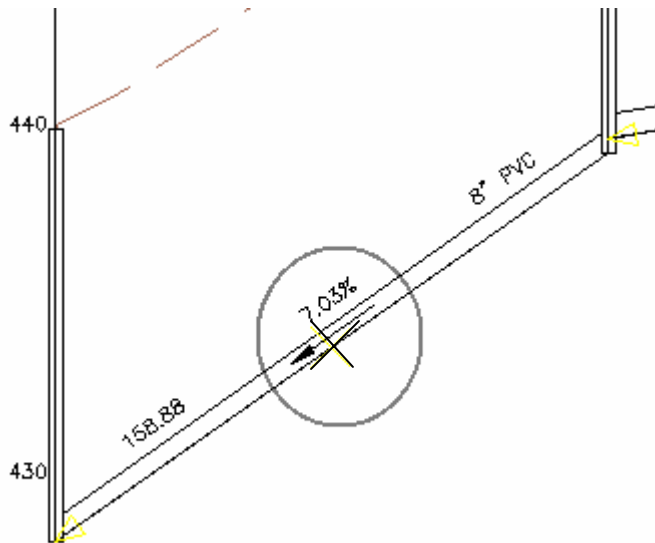
and the command line reads,

```
NODE <EX MH>-> (Prev/In/Rim/DBase/Undo/SAve/eXit) <eXit>:
```

Indicating (shown in **BOLD**) whether it is a Node or Pipe and, if already revised, the name of the structure you are getting ready to edit.

A Changing a Rim Elevation to Reference a Different Surface (Continued)

5. Type "P" for Previous to progress the "X" to the next upstream pipe and then hit Enter a second time to progress to the next upstream structure/node.



6. Use the "P" for Previous or "N" for Next options until the "X" is at the NODE to be edited.
7. Type an "R" to edit the Rim elevation for the selected NODE.
8. When prompted to "Turn current DTM surface...", select ON.
9. The rim elevation will update as soon as you select ON but will only be reflected in the entities on the conceptual profile layers, not on the full pipe and structures.
10. Select "X" to exit the menu and select "Yes" when prompted to "Save Edits?".
11. Go to Pipes> Finish Draft Profile> Draw Pipes command to fully see the changes.

HINT:

- When making changes through Pipes> Conceptual Profile commands, Land Desktop creates an additional layer in the drawing and draws in Pipes and Structures as "stick figures". Unless changed, this layer name ends in "CONPR" (for conceptual profile). It is usually easier to work with the fully formed pipes and structures created through the Pipes> Finish Draft Profile> Draw Pipes command so you can freeze the "CONPR" layers.
- When making changes to the Rim elevation the Invert elevations will remain the same - usually leaving a condition where the inverts are several feet ABOVE the Rim elevation. See the section "Adjust and Revise Node and Pipe Data" to correct this problem.

B Importing and Exporting Pipe Settings to a DFM File

All pipe settings and label settings can be exported to a DFM file and saved to a network location so it is available to all team members. It is recommended that one DFM file be created with settings for Sanitary Sewer runs and another DFM created for Storm Sewer runs.

To Export a DFM file:

Go to Pipes> Settings> Export DFM File...

To Import a DFM file:

Go to Pipes> Settings> Import DFM File...

C Exporting Pipe Runs to Excel Using XML Export

Pipe run data can be exported and opened in Microsoft Excel by first exporting the Pipe Runs as an XML file.

1. Go to Projects> Export LandXML.
2. Select the button to export "All Pipe Runs" and then select "Export".
3. Provide the file name and save location.
4. Open the utility program "Autodesk LandXML Reporting" that comes with Land Desktop.
5. Go to File> Open Data File and then browse to and select the XML file.
6. Under the "Forms" tab, expand the "Pipe Report Forms" branch and select either "Pipes in CSV" or "Nodes in CSV" form.
7. You will be prompted to either open the file through the LandXML Reporting program or to save the file. If you save the file, it can be opened with Excel.

D Pipe Run Editing - Cheat Sheet

Node Label (Name)

- a. Default - Pipes> Settings> Edit> and select the "Node" button under "Node and Pipe Data Values"
- b. Per Node Setting - Pipes> Conceptual Profile> Edit Data

Pipe Label (Name)

- a. Default - Pipes> Settings> Edit> and select the "Pipe" button under "Node and Pipe Data Values"
- b. Per Pipe Setting - Pipes> Conceptual Profiles> Edit Data

Pipe Size

- a. Default - Pipes> Settings> Edit> and select the "Pipe" button under "Node and Pipe Data Values"
- b. Per Pipe Setting - Pipes> Conceptual Profiles> Edit Data

Structure Type

- a. Default - Pipes> Settings> Edit> and select the "Node" button under "Node and Pipe Data Values"
- b. Per Node Setting - Pipes> Conceptual Profile> Edit Data

D Pipe Run Editing - Cheat Sheet (Continued)

Structure Sump Drop & Width

Making changes to a structure through the Structure Library Editor will affect all structures of the same type. You can not change specific dimensions of certain structures, only of the structure type.

- a. Pipes> Settings> Edit> Structure Library Editor or
- b. Pipes> Conceptual Profile> Edit Data - Place cursor in any of the "Structure Type" cells and pick the "Edit" button at the bottom to access the Structure Library Editor

Node Drop

- a. Default - Pipes> Settings> Edit> and select the "Pipe" button under "Node and Pipe Data Values"
- b. Per Pipe Setting - Pipes> Conceptual Profiles> Edit Data

Pipe Material

- a. Default - Pipes> Settings> Edit> and select the "Pipe" button under "Node and Pipe Data Values"
- b. Per Pipe Setting - Pipes> Conceptual Profiles> Edit Data

Node Labeling and Precision Settings

Includes Prefix, Suffix and Precision for:

- Station
- Offsets
- Inverts In and Out
- Sump
- Rim
- Node Name

And also setting for:

- Text Grouping and Placement for Profile Labels

Set through Pipes> Settings> Edit> and select the Plan or Profile button in the "Node Drafting Labels" section of the dialog box.

Pipe Labeling and Precision Settings

Includes Prefix, Suffix and Precision for:

- Size
- Slope
- Length

And also settings for:

- Label slope in % vs. ft/ft
- Display length in 2D vs. 3D
- Material
- Pipe Name/Label
- Showing arrow for flow direction

Plan, Profile and Cross Section layers

Set through Pipes> Settings> Edit> and select the "Plan", "Profile" or "X-Section" buttons in the "Layer Data" section of the dialog box.

Layer Prefix

Set through Pipes> Settings> Edit> and select the "Plan", "Profile" or "X-Section" buttons in the "Layer Data" section of the dialog box.