CAD SCHROER US INC

AEP Medusa4 Pipe Design User Guide

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Overview of Custom Tools

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V4

Contents

1. Installation

Installation consists of two main folders: **C:\Medusa4_v5_2_1** containing core Medusa software and **C:\MED_Custom** containing AEP customizations.

Licensing

Medusa is a licensed application. Licensing consists of a Windows Service *FLEXlm license for CSG*, and a license file *C:\Medusa4_v5_2_1\medsys\med\license\csglmd.lic*.

The service must run a the server specified in the license file, and is installed by system administrator using *C:\Medusa4_v5_2_1\medsys\med\license\Startup_License_Serv er.bat*

Installing software from existing server

1. Create zip files of **C:\Medusa4_v5_2_1** and **C:\MED_Custom**
2. Copy zip files to new computer and extract in same locations
3. Execute vcredist_x86.exe (located on Medusa4 CD or it can be downloaded from Microsoft)
4. Copy the shortcuts ***AEP Medusa4 Drafting*** and ***AEP Medusa4 Pipe Design User Guide*** from **C:\MED_Custom\med4_AEP_proj521** to the desktop.

Installing software from ISO download (initial install)

1. Install Medusa from downloaded Medusa4_5_2_1_windows.iso (see document *Installing_Medusa_from_ISO_disk_image_file*).
2. Create **C:\Medusa4_v5_2_1\Temp** directory
3. Copy (extract) **C:\MED_Custom** folder to new system
4. Copy ***model.mac*** and ***modelview.mac*** from **C:\MED_Custom\med4_AEP_Custom\m3d\macro** to **C:\MEDUSA4_V5_2_1\med3d\m3d\macro** (overwrite existing files).
5. Copy the shortcuts ***AEP Medusa4 Drafting*** and ***AEP Medusa4 Pipe Design User Guide*** from **C:\MED_Custom\med4_AEP_proj521** to the desktop.

2. Set up

Working folder

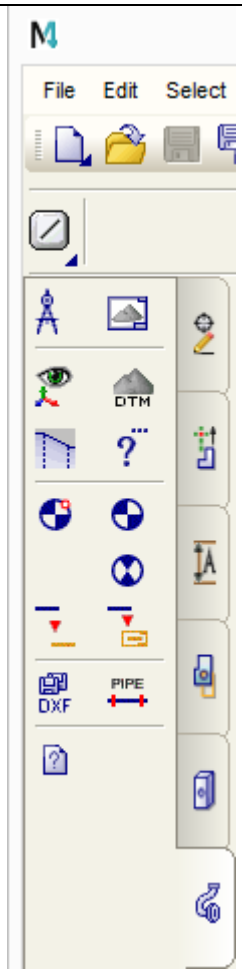
The default working folder is called **Pipe Projects** located in Windows home directory. This can be changed by editing **C:\MED_Custom\med4_AEP_proj521\uservars.bat**

The directory will be created when Medusa is started the first time.

Project folder

Create a sub-folder in **Pipe Projects** and copy a centerline file into it. A sample centerline csv file can be found in **MED_Custom\med4_AEP_Custom\doc**

3. AEP Custom tool tray



Custom tool tray

All custom tools are located on a separate ***AEP Piping Design*** tool-tray (by row):

- Create corridor file from centerline file
- Layout new sheet from corridor file

- Interactive 3D viewer (from 3D tab)
- Regenerate terrain model

- Update design
- Query current sheet design properties

- Select PI (for moving, deleting & modifying PI properties)

- Create PI via plan view
- Create PI via profile view

- Connect and align pipe to existing pipe
- Connect and align pipe to specified pipe design

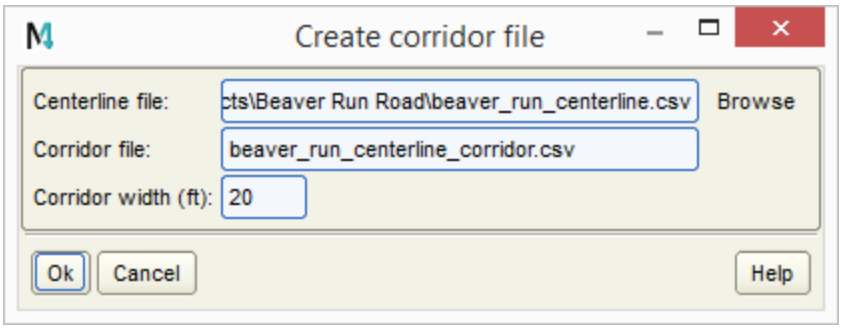
- Export ditch bottom to DXF
- Layout pipe sections & generate bending instructions

- View AEP MEDUSA4 Pipe Design Guide (this document)

4. Step by step example

Create corridor file from centerline

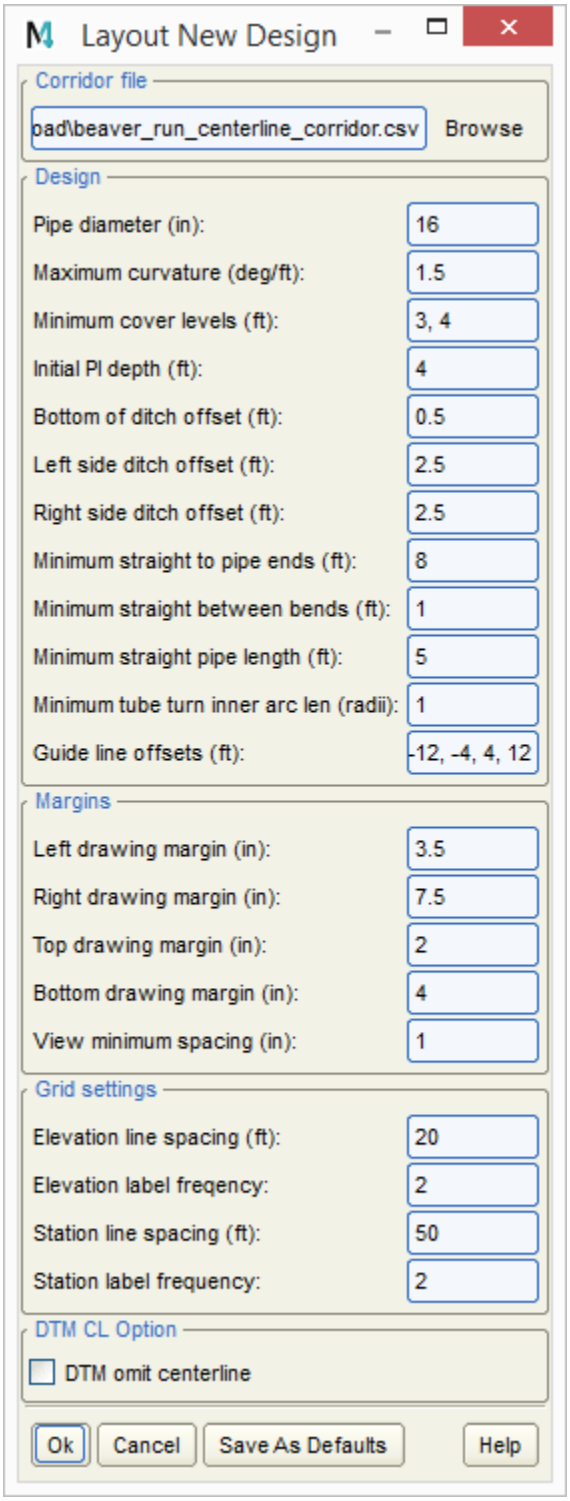
Select *Create corridor* tool, browse to and select centerline file from your project folder. Use name given or type in a new corridor name.



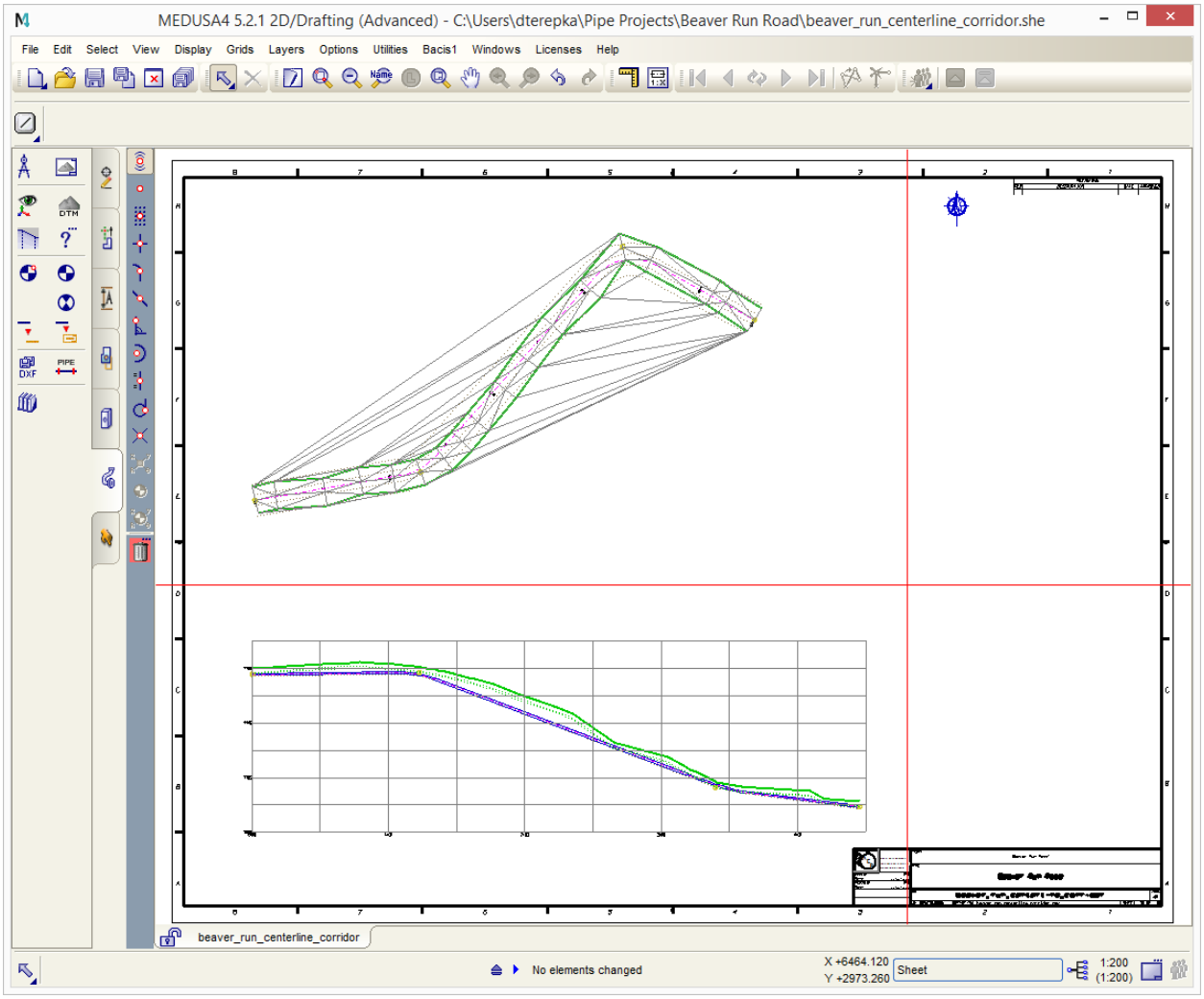
Click Ok and the corridor file will be created in the project folder.

Layout New Design

Select *Layout New Design* tool to bring up the Layout New Design dialog. Note: you may enter multiple minimum cover levels, and/or guide line offsets, separated by commas.



Click OK to lay out the new design (the design will be laid out on a new 2D sheet).



Initial layout

Selecting PIs

Select *PI* tool. When using this tool, left clicking on a PI (PI means Point of Intersection) selects that PI. You can sweep select multiple PIs at once, and shift-left-click to add and remove further PIs from the selection (this is standard select-style tool behavior).

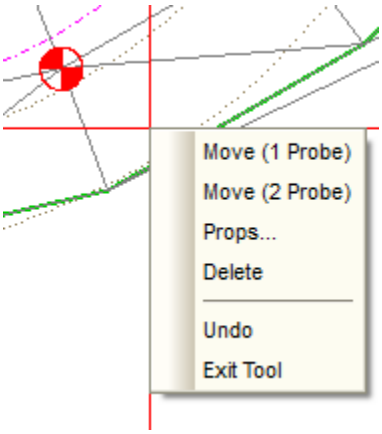
Note that each PI is represented in both the plan and profile views. When a PI is selected, both of its representations will simultaneously appear highlighted. Any changes you make to the position or properties of a PI will be reflected in both the plan and profile views accordingly.

While using the Select PI tool, you can also zoom in and out using middle mouse button, pan by holding down Ctrl key and right mouse button and moving mouse up/down/left/right.

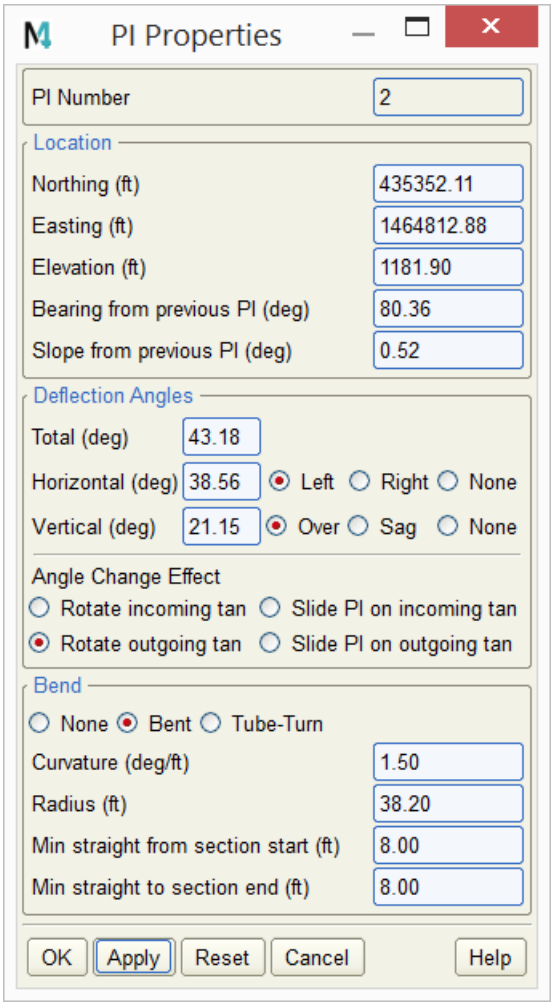
Viewing and changing PI properties

Properties dialog

To view or change a PI's properties, first start the Select PI tool and select the PI whose properties you wish to view or change. Then present the Select PI tool pop-up menu by clicking the right mouse button (see select tool pop-up menu image below), then click the *Props…* button, the PI Properties dialog will then be presented as shown below.



Select Tool Popup-Menu



PI Properties Dialog

The selected PIs properties are shown in the PI Properties Dialog. You can select a different PI while the dialog is open and the dialog will update accordingly.

The dialog updates dynamically as you make changes to the properties displayed. For example, changing the Horizontal deflection angle will cause other fields to change (such as the total deflection angle).

Setting certain properties to certain values will cause other fields to become non-editable to prevent inappropriate values being entered.

For example:

- If 90.0 degrees is entered for slope, then this means that the PI's incoming tangent points straight up, and at this time the bearing property cannot be mathematically deduced or set (because for that shape of pipe there is no bearing from the previous PI), so the bearing field clears and becomes disabled, while ever slope is set to 90.0 degrees.

- If both horizontal and vertical deflection angles are set to zero, then this will cause the total deflection angle to become zero. This is because in that particular case there is no discernable "plane of deflection" because the PI's outgoing tangent is directly in line with the PI's incoming tangent. If you were to then enter a non-zero value for the total deflection angle at this time it's not clear what the result of the should be, so the total deflection angle property is disabled at that time to prevent inappropriate input.

Disabled properties will be automatically re-enabled when the circumstances that were causing them to be disabled no longer exist.

Some properties have a limited range of values that can be specified. These properties, and their corresponding range of permitted values, are summarized in the table below:

Property	Units	Minimum Value	Maximum Value
Bearing from previous PI	Degrees	0	< 360
Slope from previous PI	Degrees	-90	90
Total deflection angle	Degrees	0	< 180
Horizontal deflection angle	Degrees	0	< 180
Vertical deflection angle	Degrees	0	< 180
Curvature	Degrees Per Foot	> 0	None
Radius	Feet	> 0	None
Min straight from section start	Feet	0	None
Min straight from section end (ft)	Feet	0	None

Please note:

- If you specify a non-zero value for the Horizontal deflection angle then you must also choose Left or Right for the deflection direction (because 30 degrees "None" would not make sense).

- If you specify a non-zero value for the Vertical deflection angle then you must also choose Over or Sag for the deflection direction (because 30 degrees "None" would not make sense).

In general, when a property is specified outside the above ranges then where this impacts on the calculation of other properties, those properties will be cleared to dynamically indicate the value is unacceptable. Correcting the value will resolve this issue, and the other fields will then be displayed with the relevant values.

When setting the total, horizontal or vertical deflection angles, there are 4 settings that control the effect of changing the deflection angle:

- Rotate incoming tan: this causes the selected PI's incoming pipe tangent (and thus the previous PI) to be rotated about the selected PI, to achieve the specified deflection angle. The selected PI, its outgoing pipe tangent, and the next PI, are not moved.

- Rotate outgoing tan: this causes the selected PI's outgoing pipe tangent (and thus the next PI) to be rotated about the selected PI, to achieve the specified deflection angle. The selected PI, its incoming pipe tangent, and the previous PI, are not moved.

- Slide PI on incoming tan: this causes the selected PI to slide along its incoming pipe tangent to achieve the specified deflection angle. The previous PI and next PI are not moved, and the incoming pipe tangent will not be rotated. However, the incoming and outgoing pipe tangents will increase or decrease in length, and the outgoing pipe tangent will be rotated about the next PI, to achieve the specified deflection angle. Sliding the selected PI onto, or beyond the previous PI is automatically prevented.

- Slide PI on outgoing tan: this causes the selected PI to slide along its outgoing pipe tangent to achieve the specified deflection angle. The previous PI and next PI are not moved, and the outgoing pipe tangent will not be rotated. However, the incoming and outgoing pipe tangents will increase or decrease in length, and the incoming pipe tangent will be rotated about the previous PI, to achieve the desired deflection angle. Sliding the selected PI onto, or beyond the next PI is automatically prevented.

Please note that the effect of these settings is not dynamic. The required setting must be chosen before specifying the new deflection angle (the setting is only used when the angle is specified).

The initial default setting (when MEDUSA4 is started) is the rotate outgoing tan setting (because this is the most likely to be used). Once a setting has been chosen, it will persist for the MEDUSA4 session unless changed.

The rotate incoming tan and rotate outgoing tan settings are available for use with the total, horizontal and vertical deflection angles. The slide PI on incoming tan and the slide PI on outgoing tan settings are only available for use with the total deflection angle (the horizontal and vertical deflection angle properties are disabled whenever either of the slide PI settings is chosen).

You can also choose from 3 types of bend: *None, Bent* or *Tube-Turn.* These types are summarized below:

- None – this means there is no bend at the selected PI, effectively this means there is a sharp turn at the PI. This type of bend is primarily for use with the first and last PIs on a design (which never have bends because the start and end of the pipe is not bent) and is automatically applied by the system to those PIs.

  However, temporarily specifying no bend at other PIs can be helpful when working with PIs in close proximity to each other because it prevents various rule checks coming into effect, which would otherwise hinder the placement process.

  Please note though that if any PI (other than the first and last PIs) is set to no bend, this will prevent the Pipe Section Layout tool from being used, because a pipe containing None type bends (sharp turns) cannot be manufactured in practice. All PIs (other than the first and last PIs) must be set to either Bent or Tube-Turn in order to proceed to pipe section layout.

- Bent – this means there is a manufactured (bent in the field) bend at the selected PI. The curvature/radius properties are checked when you click OK or Apply, to ensure they comply with the maximum curvature rule specified for the project.

- Tube-Turn – this means there is a pre-fabricated (bought-in) bend at the selected PI. The inner arc length of the tube-turn (calculated from the curvature/radius properties, the total deflection angle, and the pipe diameter) is checked when you click OK or Apply, to ensure that it complies with the minimum tube-turn inner arc length rule specified for the project.

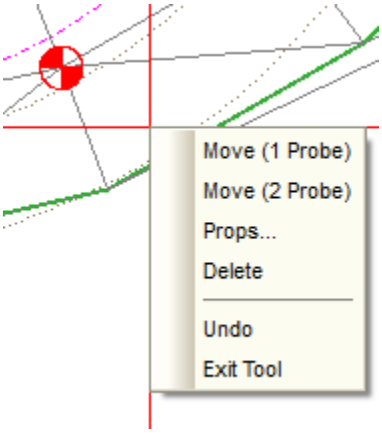
Any changes you make in the PI properties dialog only come into effect on the design drawing when you click the OK or Apply buttons. Various project and PI based rule checks are also performed at this time, and error messages are issued if the rules are breached.

The Reset button initializes the PI properties dialog to show the properties of the currently selected PI, effectively discarding any changes you have made since the last click on OK or Apply.

The Cancel button closed the PI properties dialog, effectively discarding any changes you have made since the last click on OK or Apply.

Moving and Deleting PIs

To move or delete a PI, first present the Select PI tool pop-up menu by clicking the right mouse button (see select tool pop-up menu image below), then click on the Move (1 Probe), Move(2 Probe) or Delete tools as required.



Select Tool Popup-Menu

Move (1 Probe)

Clicking the Move (1 Probe) tool places an image of the selected PI on the cursor, allowing you to specify a new location for the PI by clicking (probing) the new location on the drawing. The standard MEDUSA4 probe modifiers (displayed down the left edge of the MEDUSA drawing window) may be used while this tool is running to control the eventual probed location (e.g. you can specify free probe, near probe, intersect probe etc. etc.).

The Move (1 Probe) tool is only available when a single PI is selected.

Move (2 Probe)

Clicking the Move (2 Probe) tool also enables you to move the selected PI to a new location. However, whereas the Move (1 Probe) tool places the selected PI on the cursor for positioning (with its datum centered on the cursor) ready for placement, the Move (2 Probe) tool requires you probe a pick-up point and a placement point. This tool is useful when you want to move the PI with respect to something else already on the drawing. The probe modifiers (displayed down the left edge of the MEDUSA drawing window) may be used while this tool is running to control the eventual probed locations (e.g. you can specify free probe, near probe, intersect probe etc. etc.).

The Move (2 Probe) tool is only available when one or more PIs are selected.

Delete

Clicking the Delete tool deletes the selected PIs from the design and adjusts the pipeline accordingly.

The Delete tool is only available when one or more PIs are selected.

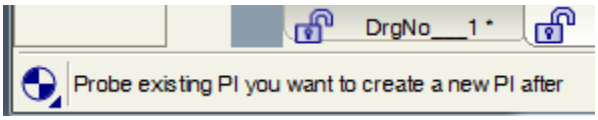
Undo

Clicking Undo causes the last operation in MEDUSA4 to be undone (including properties changes, moves, deletes, basically whatever happened last. An Undo button can also be found on the main MEDUSA4 toolbar under the Edit pull-down menu.

Creating New PIs

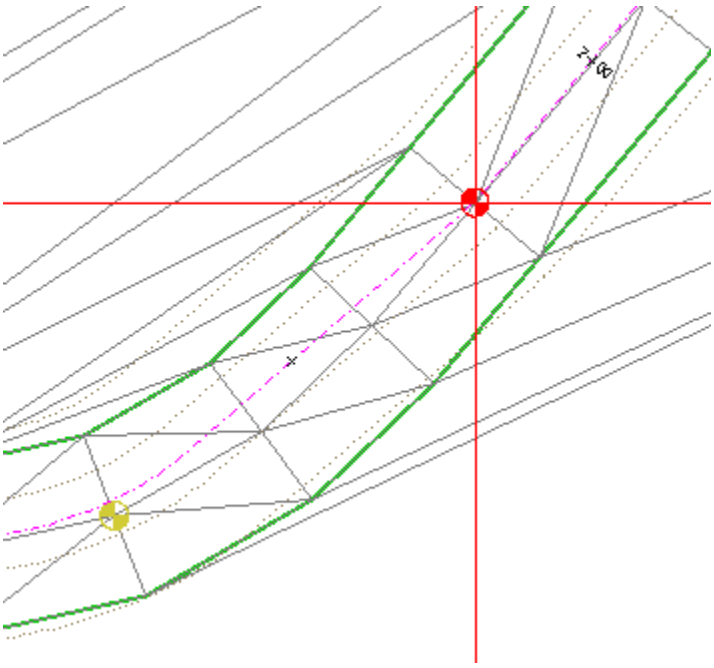
Plan view

Adding a PI in the plan view takes 2 clicks (check prompts at lower left for tips)



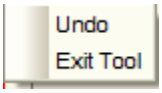
Tool prompts are located at lower left of desktop

First select the PI you want to add an additional PI *after*, then place the new PI with an additional left click.



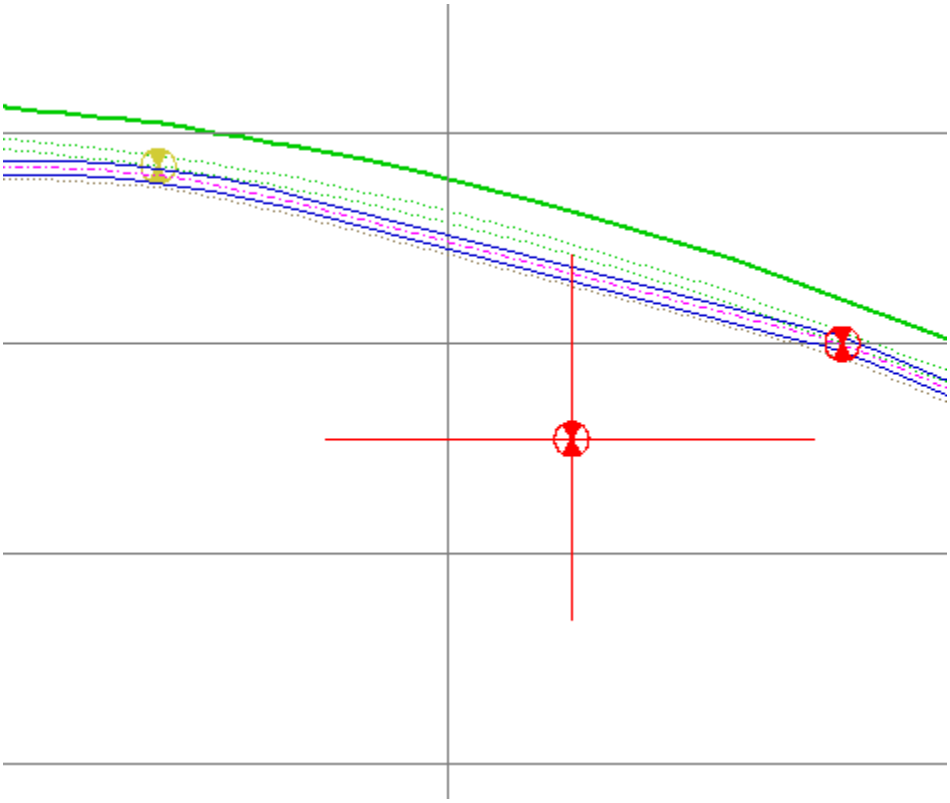
Placing PI in plan view with 2 clicks

Note: *Undo* can be found under right mouse button after placing



Profile view

PI's may be added in profile with one left click. They may also be undone using right mouse button.



Place new PI's in profile with one click

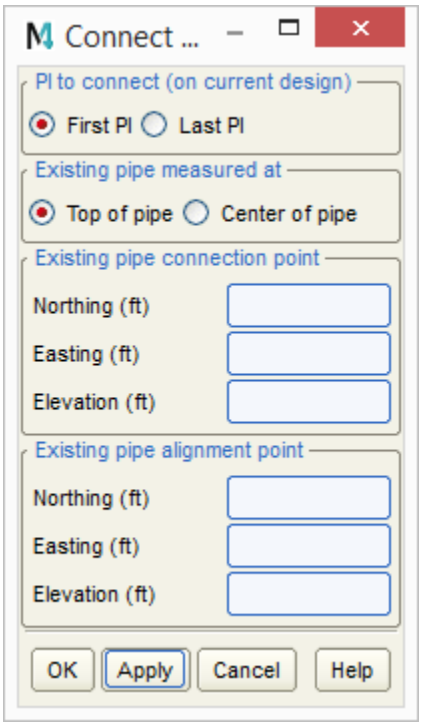
Updating the design

To recalculate the terrain and update the drawing select *Update design*. This may take several seconds to recalculate and reload terrain.

Connection Tools

Connect & align pipe to existing pipe

This tool enables you to connect and align the first or last segment of the current design to the end of an existing pipe. An existing pipe is one which is already in the ground in the field, and does not exist on another PLS design drawing. Clicking this tool presents the following dialog:



To use this tool, first specify whether the first or last PI of the current design is to be connected. Then specify whether the existing pipe (in the field) has been measured at the top of pipe or the center or pipe. Then specify the connection and alignment points of the existing pipe. Clicking the OK or Apply buttons adjusts the current design to make the connection as specified.

Please note:

- When connecting the first PI, the first PI will be moved to the existing pipe connection point. The second PI will then be rotated (about the first PI's new position) so that the first segment of the pipe (i.e. the region of pipe between the first and second PIs) will align with the existing pipe in the field.

- When connecting the last PI, the last PI will be moved to the existing pipe connection point. The penultimate PI will then be rotated (about the last PI's new position) so that the last segment of the pipe (i.e. the region of pipe between the penultimate and last PIs) will align with the existing pipe in the field.

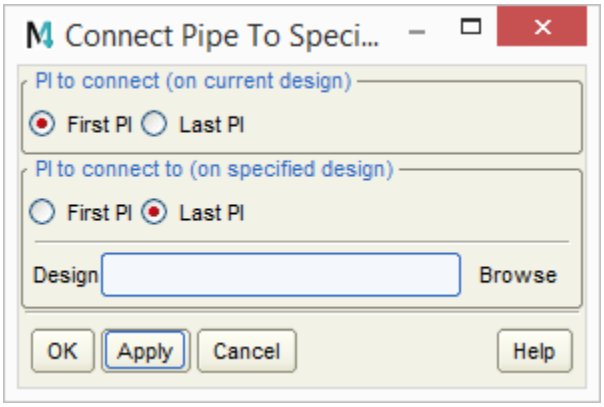
- It is important therefore that the existing pipe alignment point is measured on a region of the existing pipe that runs straight to the end of the existing pipe (in order to define an alignment tangent for the current design).

- The reason that this tool provides for the existing pipe to be measured at the center of pipe is to cater for the rare occasion that the existing pipe end may be pointing straight up or straight down in the ground (in which case it has no discernable top of pipe). In all other cases it is anticipated that top of pipe measurement would be used because this is the normal and easiest way to measure an existing pipe.

- The effect of this tool is not persistent. If after using this tool, the existing pipe in the ground is moved, the current design will not know about this, and the connection process will need to be repeated.

Connect & align pipe to specified pipe design

This tool enables you to connect and align the first or last segments of the current design to the first or last segments of a specified pipe design (i.e. another design on another drawing). Clicking this tool presents the following dialog:



To use this tool, first specify whether the first or last PI of the current design is to be connected. Then specify whether to connect to the first or last PI of the specified design. Then choose the specified design file (you can either type the file name in to the Design field, or use the Browse button to present a file selector to assist you in choosing the file). Clicking the OK or Apply buttons adjusts the current design to make the connection as specified.

Please note:

- When connecting the first PI (on the current design), the first PI will be moved to the location of the specified design's first or last PI (as chosen). The second PI (on the current design) will then be rotated (about the first PI's new position) so that the first segment of the pipe (i.e. the region

of pipe between the first and second PIs) will align with the specified design's first or last segment (as chosen).

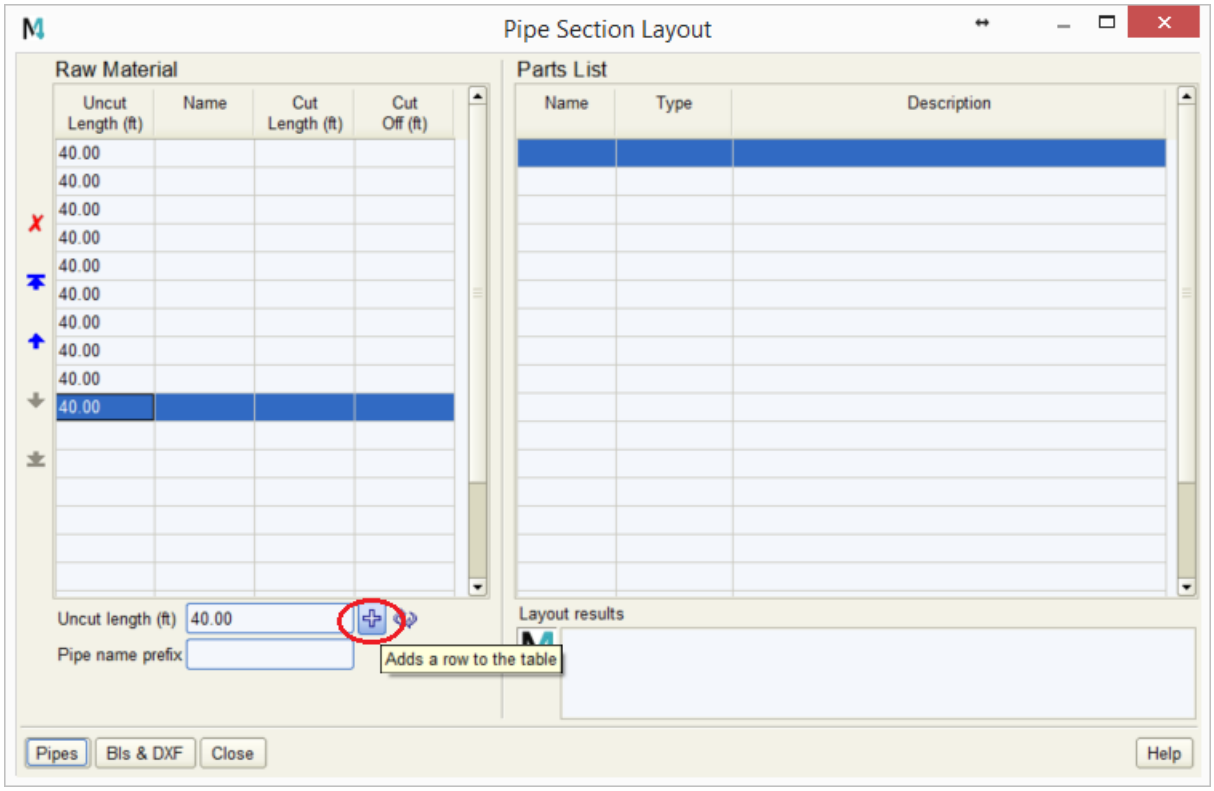
- When connecting the last PI (on the current design), the last PI will be moved to the location of the specified design's first or last PI (as chosen). The penultimate PI (on the current design) will then be rotated (about the last PI's new position) so that the last segment of the pipe (i.e. the region of pipe between the penultimate and last PIs) will align with the specified design's first or last segment (as chosen).

- The effect of this tool is not persistent. If, after using this tool, the specified design is altered so that the PIs no longer connect or align, the current design will not know about this, and the connection process will need to be repeated.

Layout of pipe sections

Entering uncut pipe lengths (raw material for cutting/bending)

PIPE Bring up pipe section layout tool



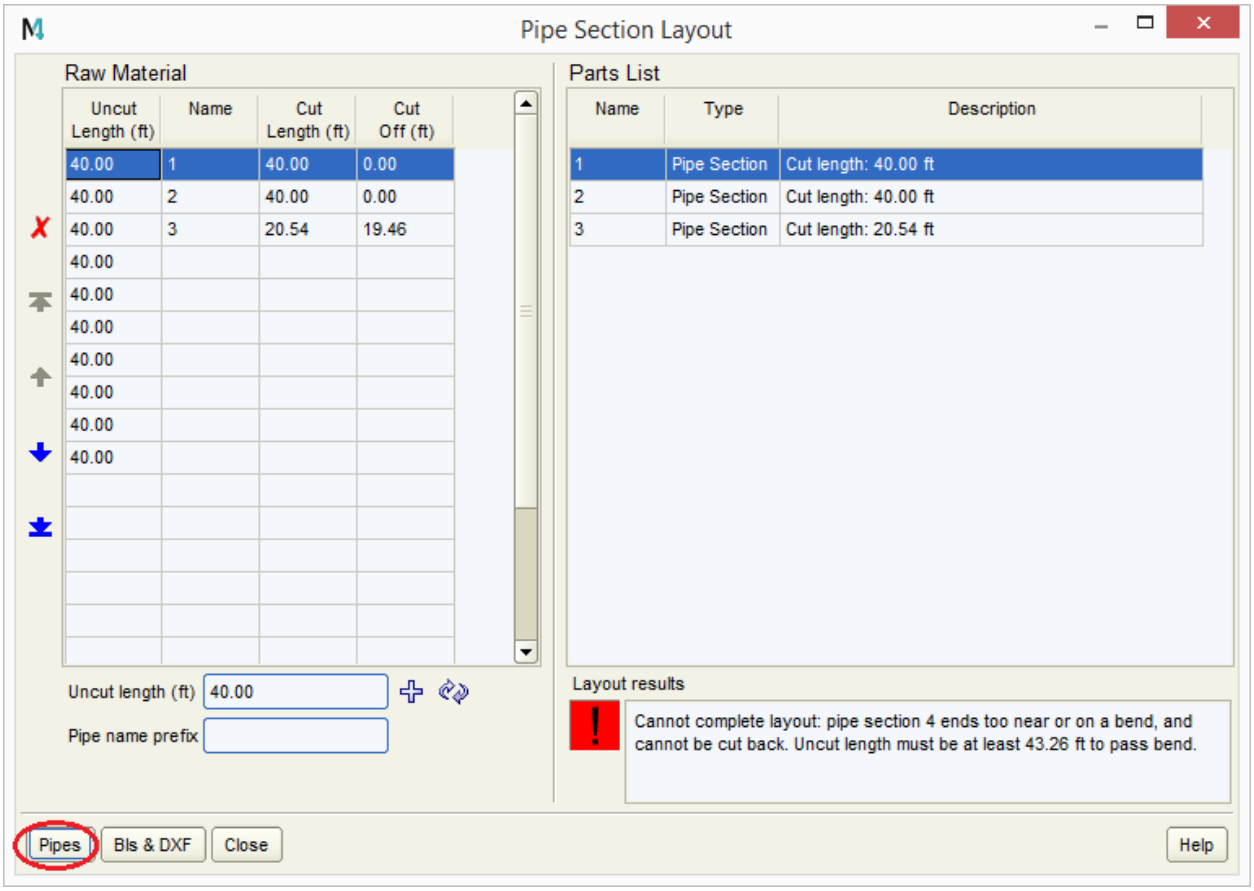
Entering Raw Material

Enter and uncut pipe length and click the **+** button to add as many uncut pipe lengths as desired.

Calculating out pipe sections

After entering a number of uncut pipe lengths, optionally enter a *pipe name prefix* and click the *Pipes* button to lay out the sections along the pipe route.

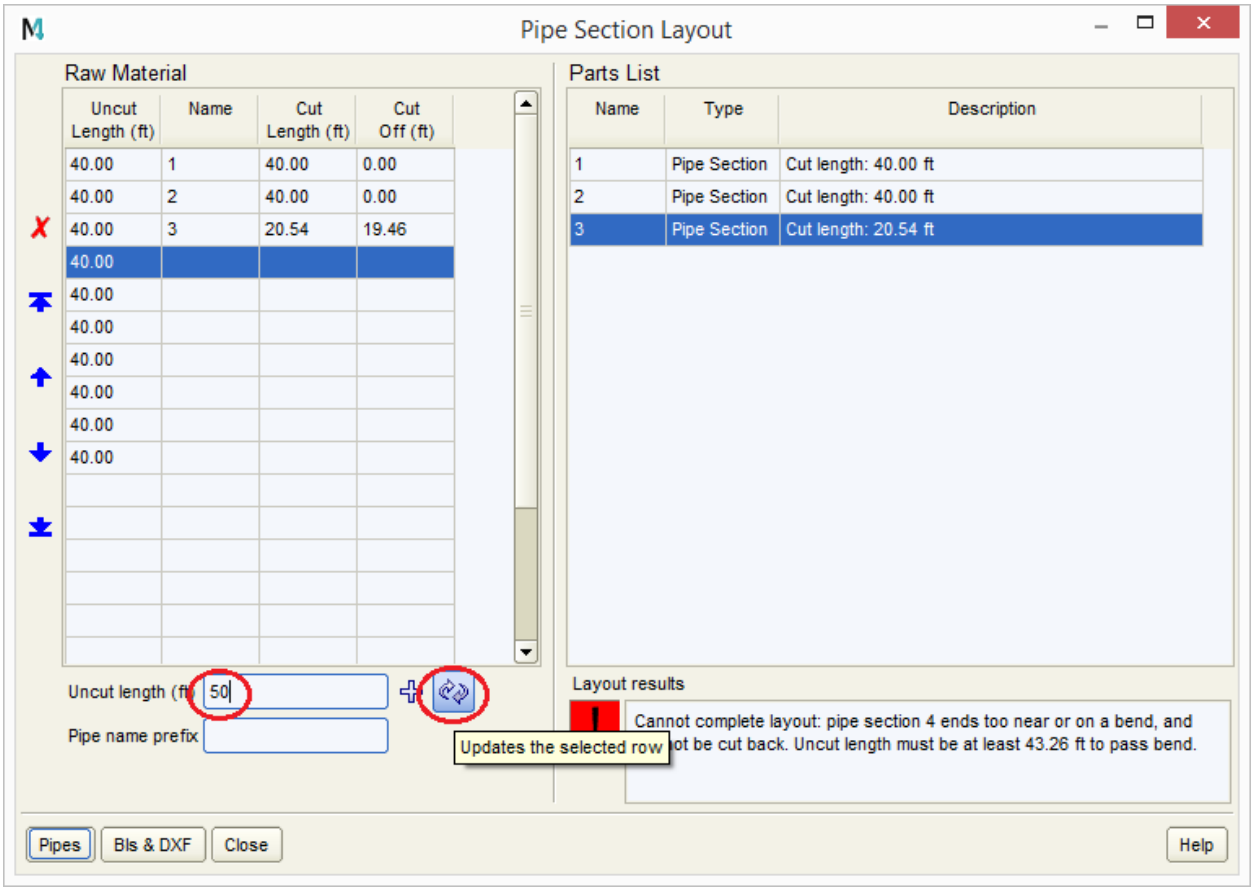
If given pipe lengths are not adequate, an error message will appear at lower right of panel.



Unsolvable pipe section layout

Modifying a pipe length

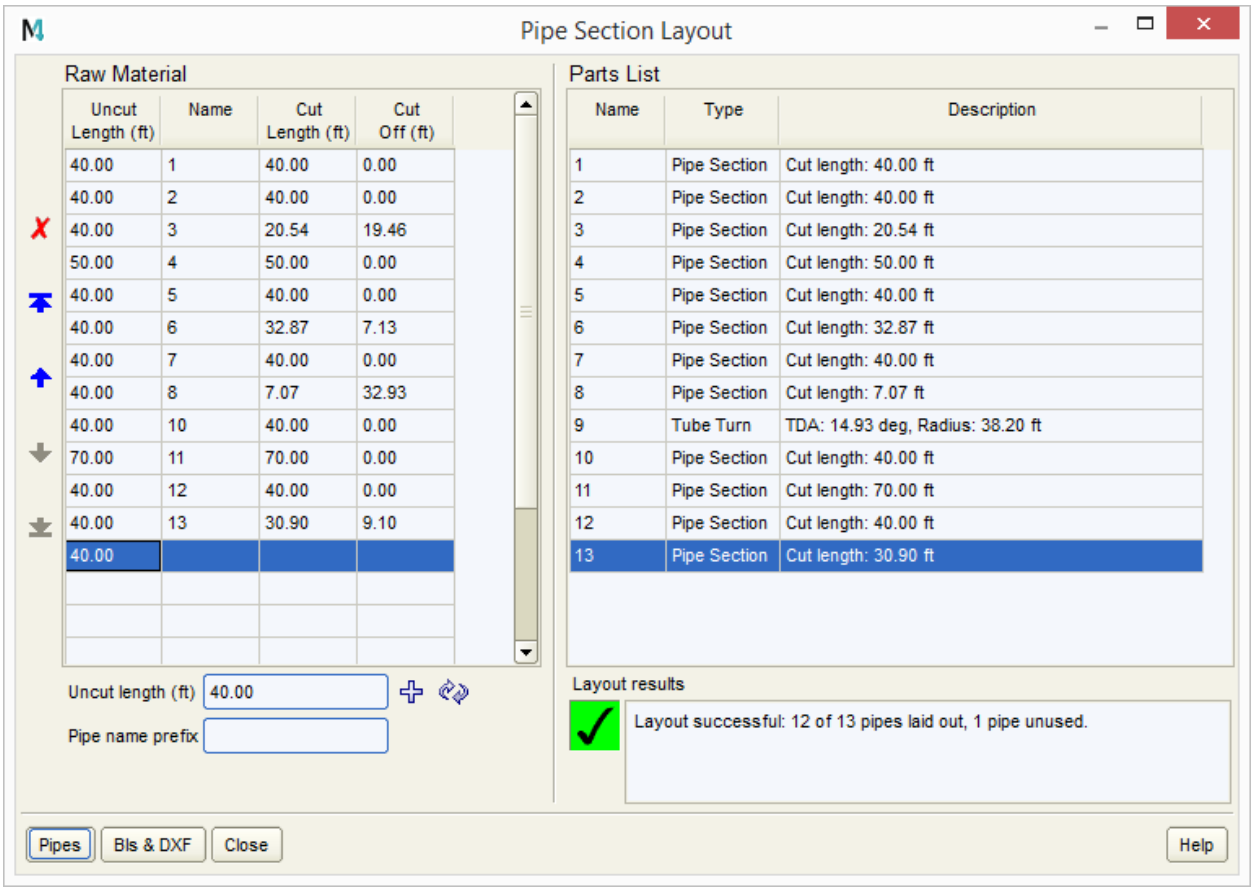
Select the row to modify. Enter a new uncut length and click on update button.



Modifying a raw pipe length

Successful layout

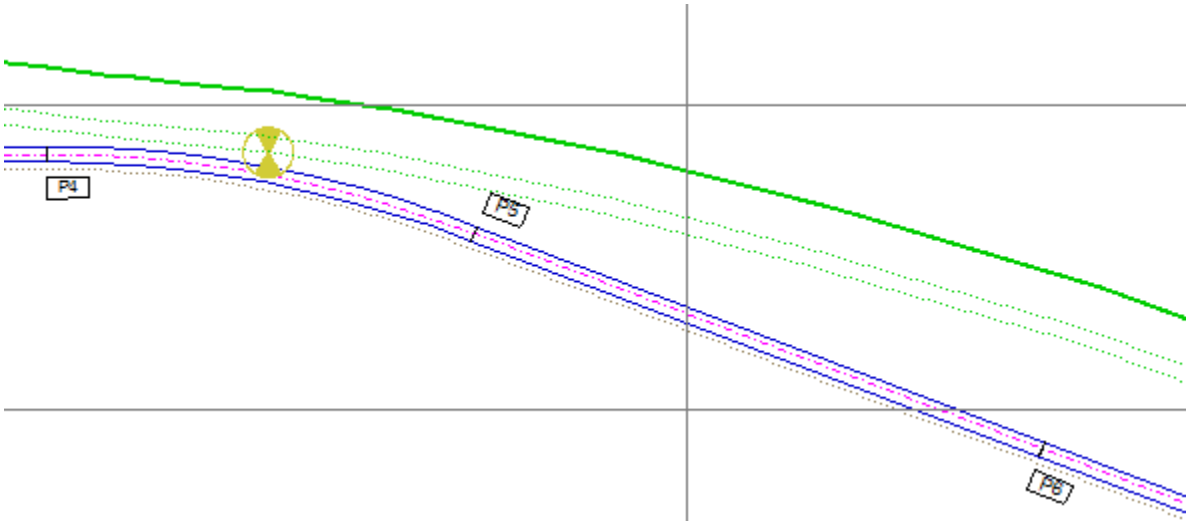
If pipe layout is successful, the entire parts list section will be filled out as shown. Any unused pipes will be left blank on raw material side.



Successful layout of pipe sections

Pipe section marks

Pipe section marks and tags will be automatically laid out on the drawing when Pipe or BIs is clicked.

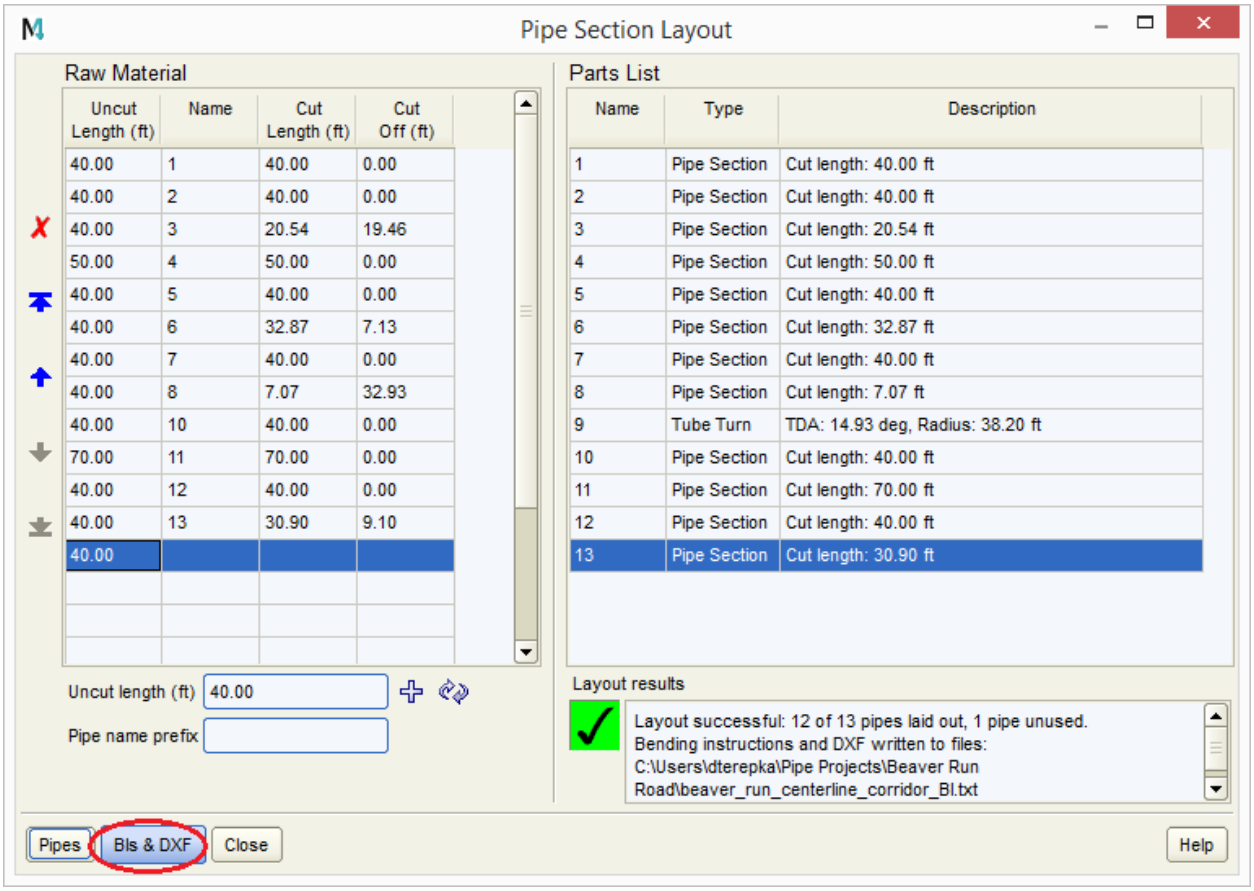


Pipe section marks and tags

Creating the bending instructions file & DXF file (containing the ditch bottom & pipe parts)

If satisfied with the pipe section layout, click the *BIs & DXF* button at lower left corner of the dialog to:

- Generate bending instructions and output them to a text file.
- Export information relating to the ditch bottom and pipe parts to a DXF file. The ditch bottom is represented by a center line and two edge lines (right & left) that run along on the bottom surface of the ditch. The start and end points of each pipe part (i.e. pipe sections and tube-turns) are represented by a text (corresponding to the pipe part's name) and a point symbol.



Creating the BI & DXF file

Raw pipes stored with sheet

Whenever the Pipes or BIs & DXF button pressed, the raw pipe data is written to sheet and will be saved with the sheet. The BI's & DXF will also output the ditch bottom to DXF to your project folder

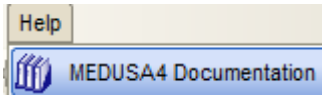
Export ditch bottom button

Use DXF button or BI's and DXF button on "Pipe Section Layout" form to export the calculated ditch bottom to your project folder. The ditch bottom is represented by a center line and two edge lines (right & left) that run along on the bottom surface of the ditch.

5. Additional Tools

Documentation

Access AEP custom pipe design documentation from custom tool tray

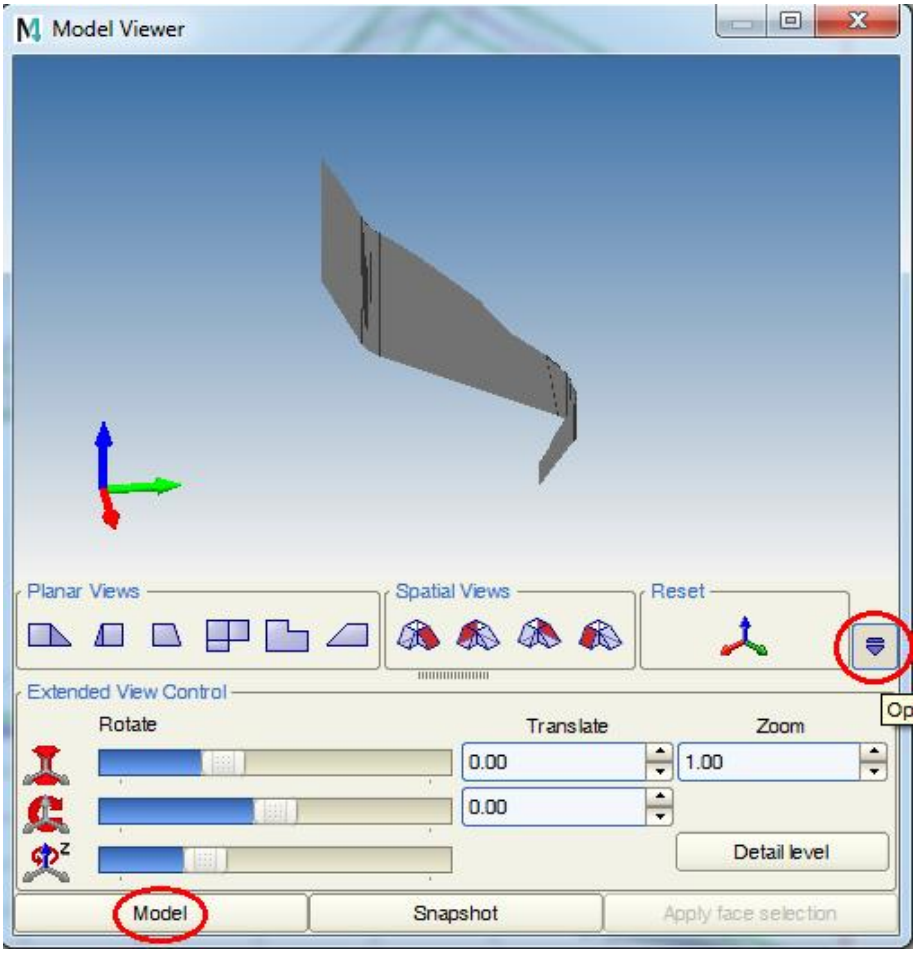


Access general Medusa drafting documentation from the Help pulldown at the top

3D viewer

You can interactively view the 3D ribbon or terrain model. Please note that this is a standard MEDUSA4 tool placed in the tool-tray for convenience.

Use toggle button at right to bring up more options. Use *Model* button to select *_DTM.mod



Selectin a 3D model to view

Regenerate DTM

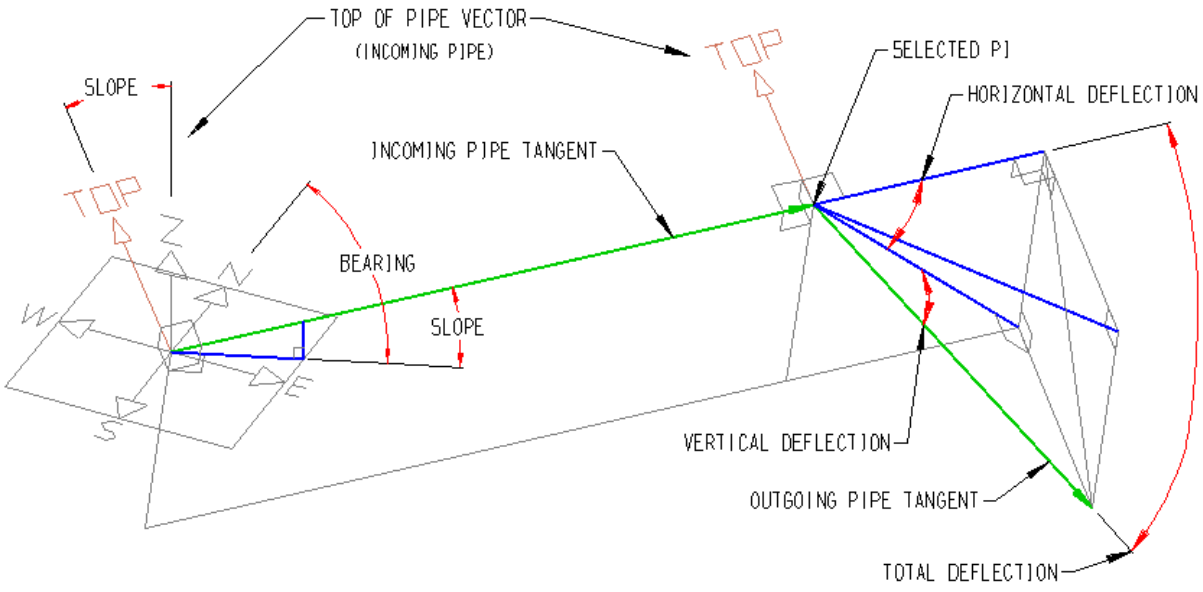
If the corridor file is manually edited, the terrain model can be regenerated from corridor file with regenerate DTM tool.

6. Appendix

PI Properties

Definitions

Northing	Distance north of benchmark (Y)
Easting	Distance east of benchmark (X)
Elevation	Elevation from benchmark (Z)
Bearing from previous PI	Angle from previous to current PI, clockwise from north
Slope from previous PI	Vertical angle from pervious to current PI (90 is up, -90 straight down)
Deflection Total	Angle between incoming and outgoing vectors (180 - included angle)
Deflection Horizontal	(see bearing, slope, defection diagram)
Deflection Vertical	(see bearing, slope, defection diagram)
Bend type	Bend = bent in field, Tube turn = purchased elbow
Curvature (deg/ft)	Max bend allowed per foot of pipe
Radius	Radius at bend



Bearing, Slope, Deflection diagram

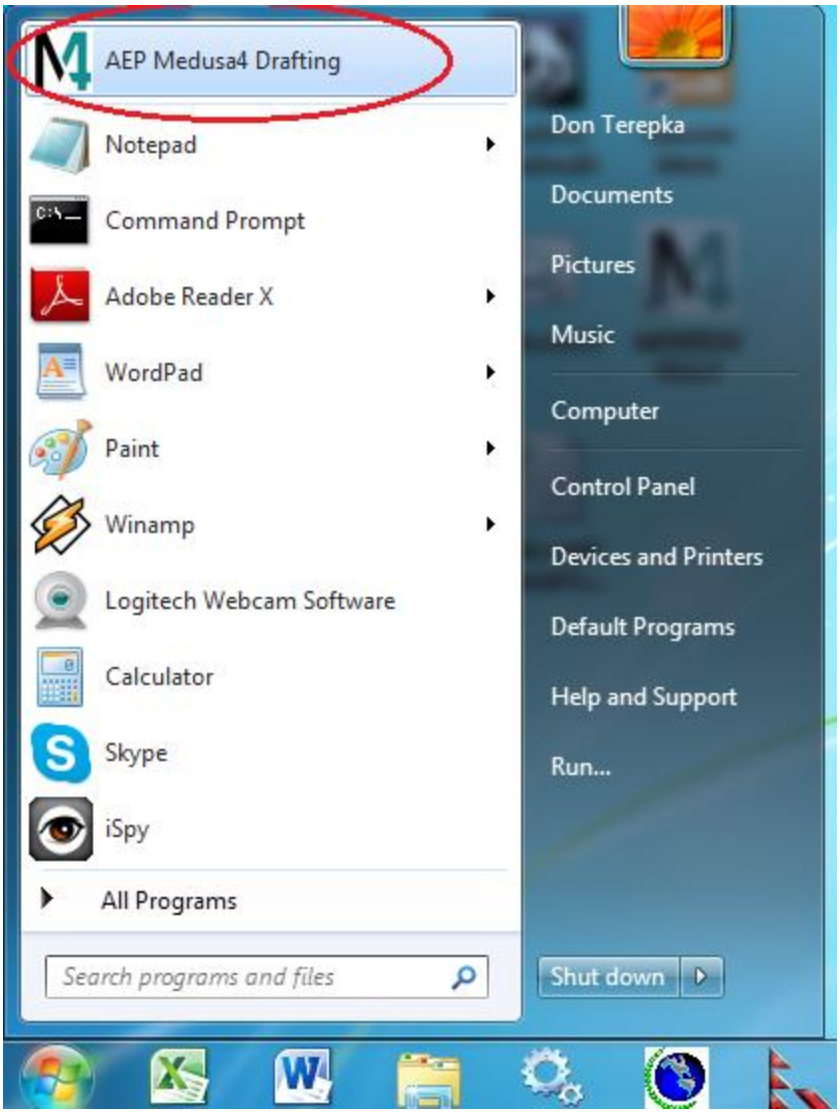
Adding Medusa4 to the Start button

To add Medusa4 to the Windows *Start* button, hold down the right mouse button on the desktop shortcut and drag it over the top of the Windows Start button.

(This short cut can be copied to your desktop from C:\MED_Custom\med4_AEP_proj521)

Right Mouse Button - drag

When the *Start* button menu opens up you can drop it where you want or drag it down into All Programs folder



Adding drafting shortcut to Start button menu