South Carolina Department of Transportation

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SCDOT CADD MANUAL
CIVIL 3D 2026

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Getting Started

Introduction

This manual has been written to highlight the processes which may be useful to design, model and prepare a set of roadway plans for an SCDOT project. While every effort was made to include all relevant information, the Autodesk Civil3D software has a multitude of tools available which cannot all be explained within this manual. As you develop your knowledge of the software it may be useful to seek additional instruction outside of this manual. The AutoCAD and Civil3D software's both have extensive documentation provided by Autodesk (see the links below). Civil3D is an extension built on top of the AutoCAD software, meaning it contains all the core functionalities of AutoCAD but adds specialized tools and features specifically for civil engineering and infrastructure projects, such as terrain modeling, road design, and drainage analysis. Therefore, some of the more basic CAD functionalities such as lines, arcs, layers, move, copy etc. would be covered in the AutoCAD documentation rather than the Civil3D documentation.

AutoCAD: **https://help.autodesk.com/view/ACD/2026/ENU/**

Civil3D: **https://help.autodesk.com/view/CIV3D/2026/ENU/**

** Another opportunity to acquaint yourself with the software is through the training and tutorials provided by Autodesk. These include written documentation and provide workflows paired with example files that are downloaded when the program is installed.*

Autodesk Learning – Video tutorials providing high level overview of program capabilities.

Autodesk Civil 3D Online Tutorials – Written tutorials paired with sample drawings.

Tutorial Folder Locations

Tutorial dwg files: C:\Program Files\Autodesk\AutoCAD 2026\C3D\Help\Civil Tutorials\Drawings

Manual Formatting

Throughout this manual some text formatting has been adjusted to help highlight specific items.

`Any Command line prompts will be formatted like this to help direct your attention to the command line for the next step in a workflow.`

** Any information considered to be guidance or suggestion rather than a strict workflow or description will be formatted like this.*

Open Civil 3D

Start the Civil 3D 2026 application by double-clicking the Civil 3D 2026 Imperial or the Civil 3D 2026 SCDOT icon if available on your desktop or select the program through the Start Menu.

Civil 3D 2026 Desktop Shortcuts

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After the application loads you should see the screen below. This is known as the Start tab.

1. If you select the “+” sign next to the **Start** tab, you will create a new drawing. This will be discussed in more detail later in this manual.
2. **Open**: This selection allows you to open an existing drawing (both locally or web and mobile-based), access Sheet Set Manager, or open sample files.
3. **New**: This selection allows you to create new drawings and sheet sets.
4. **Recent**: Shows most recently opened files for ease of access. You have a choice between “List View” and “Grid View” by clicking the 3 lines or the 4 squares, respectively. These are located under “Recent” and to the left of “Sort by”.

** Files may be temporarily removed from this list by right-clicking on them and selecting “Remove from list”. If there are multiple files with the same name at different locations, the file path can be checked via the computer icon below the date associated with the file.* 

5. **Sort by**: You may organize the list by “Last Opened” or by “Name”.
6. **Search**: You may search for the file(s) you are looking for by name.

Make a new drawing by clicking the “+” next to the Start tab as shown below:

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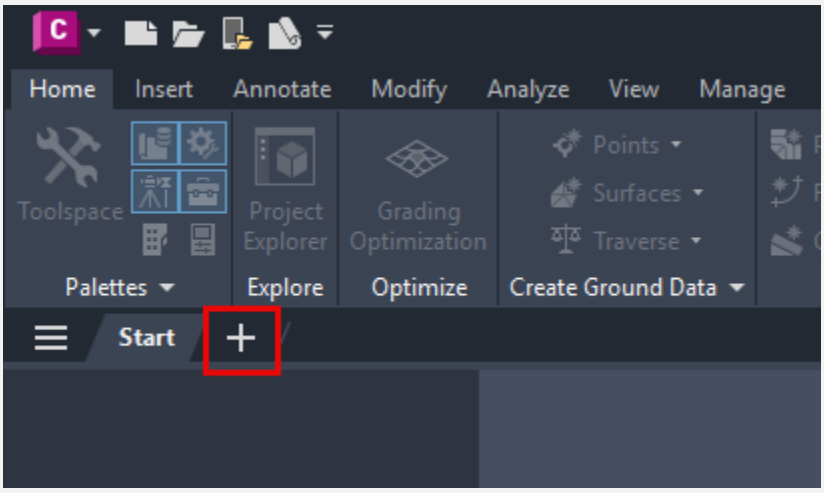
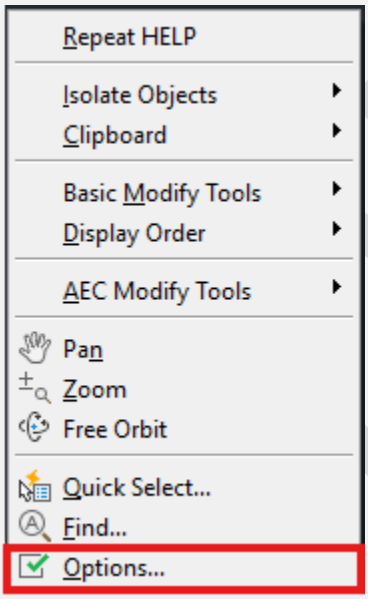


This will create a new drawing titled “Drawing 1”.

AutoCAD User Profiles

** The information presented in this section should be used to form a general understanding of AutoCAD User Profiles. Specifics of how this is setup may vary for internal SCDOT staff vs. external consultants.*

AutoCAD User Profiles save personalized settings, like colors, fonts, cursor size, and standard filepath locations, allowing the ability to quickly switch environments for different projects or share settings across computers and organizations. Profiles can be managed either by right clicking in the middle of the screen and selecting Options or by typing “OP” in the command line then pressing enter.



1. Switch to the Profiles tab within the Options dialog.
2. Select the appropriate profile. C3D_Imperial, C3D_Metric, and AutoCAD are all generic profiles setup and provided by Autodesk. Any additional profiles listed would be custom profiles setup by your organization.
3. After choosing the appropriate profile select “Set Current”
4. Select “OK”

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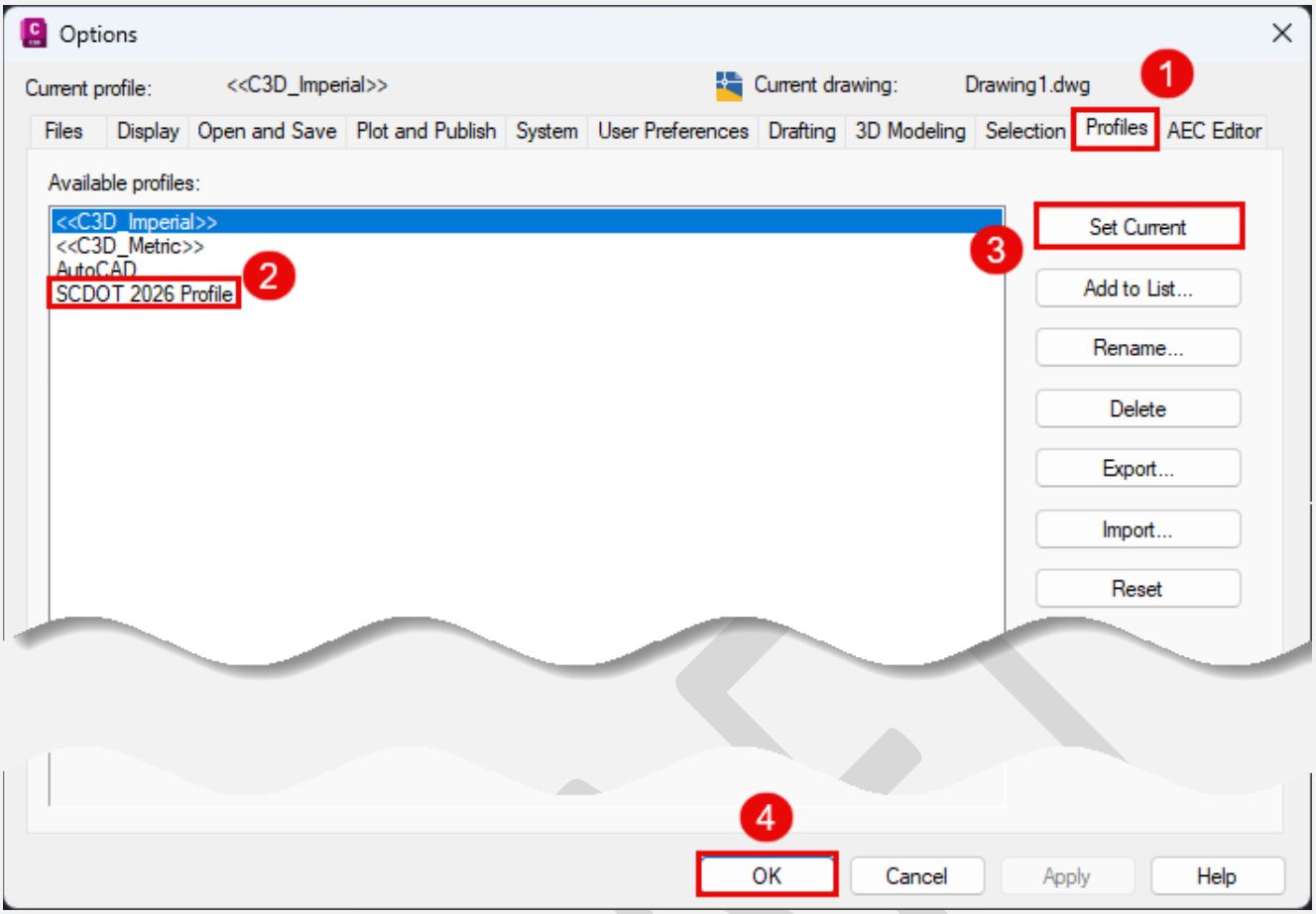
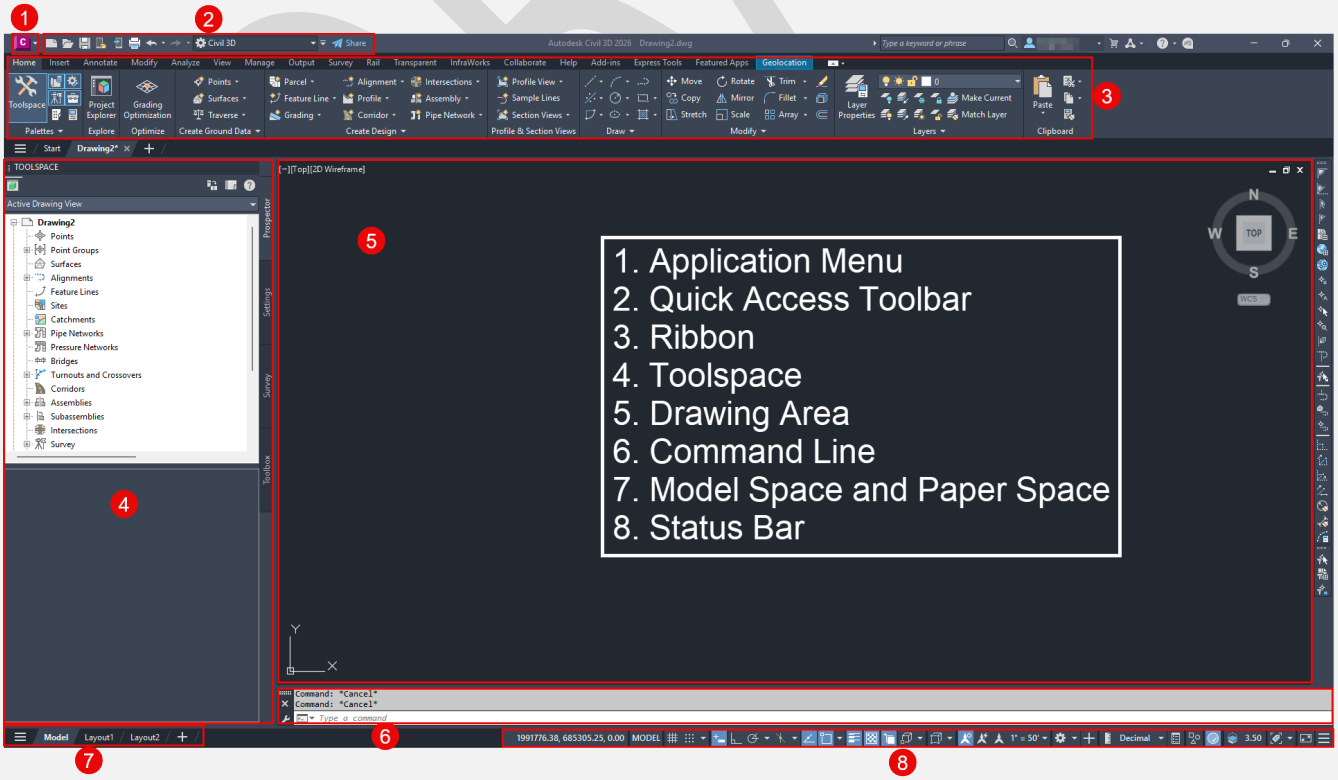


** Depending on your organizations setup the user profile may automatically be set when Civil 3D starts up.*

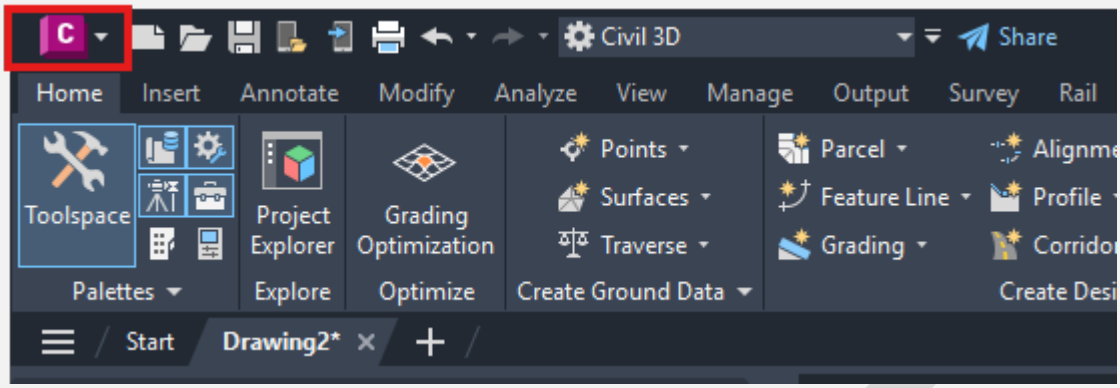
Interface

The items below will be described in more detail to provide a brief overview of how to navigate the interface.

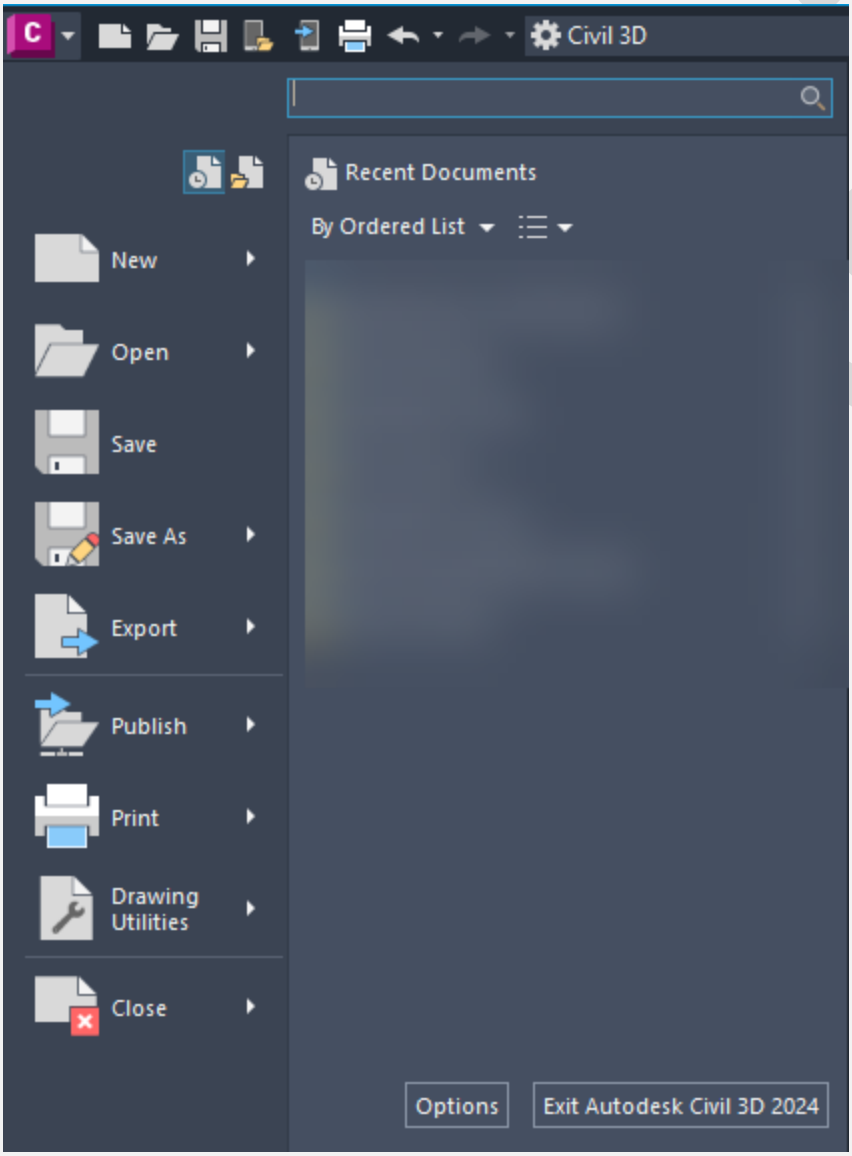


Application Menu

Select the **Civil 3D icon** in the top-left corner of the screen.

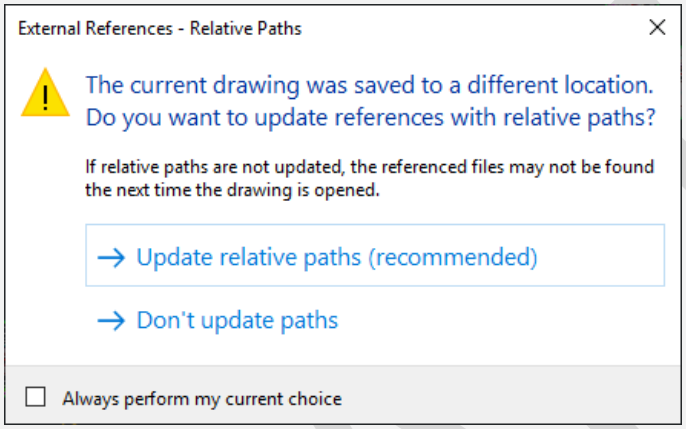


After clicking on the icon, you will see a list of options.



1. **New**: This selection allows you to create new drawings and sheet sets.
2. **Open**: This selection allows you to open an existing drawing (both locally or web and mobile-based), access Sheet Set Manager, import DGN files (Microstation format), import Industry-Foundation Class (IFC) files and open sample files.
3. **Save**: This allows you to perform a quick save of their current drawing. The shortcut for this is CTRL + S.
4. **Save As**: This allows you to save their current drawing as another drawing, drawing template file, drawing standards file, other formatted files (that is, DWG, DWT, DWS, and DXF), save the layout as a drawing file, and DWG Convert which will allow us to save to a DWG format that is compatible with earlier releases of Civil 3D.

   Update relative paths is (recommended) when performing save as



5. **Export**: This allows you to export their current drawing to a DWF, DWFx, 3D DWF, another DWG version, DGN, DXF, PDF, IFC, and other file formats (that is, WMF, SAT, STL, EPS, DXX, BMP, IGES and IGS).
6. **Publish**: This allows you to access the Send to Print service, Archive, eTransmit, Email, and Share View.
7. **Print**: This allows you to access Plot, Batch Plot, Plot Preview, View Plot and Publish Details, Page Setup, 3D Print, Manage Plotter, Manage Plot Styles, and Edit Plot Style Tables.
8. **Drawing Utilities**: This allows you to access Drawing Properties, DWG Compare, Drawing Settings, Units, Audit, Status, Purge, Recover, Open the Drawing Recovery Manager, and Update Block Icons.
9. **Close**: This closes the current drawing or all drawings (user's choice).

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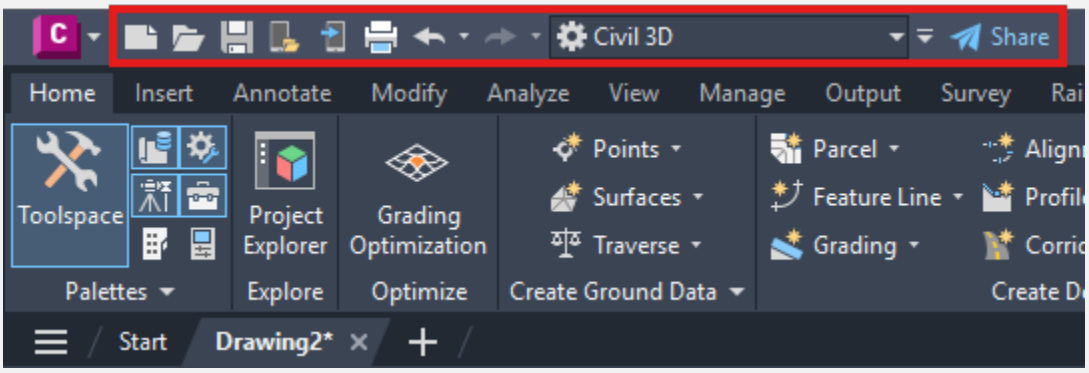
Quick Access Toolbar



To the right of the Civil 3D icon, there are a set of options that will make editing and saving files easy and intuitive to use. This section of icons is known as the Quick Access Toolbar. Here, many of the same options available in the application menu are available as quick-select icons for tools and functions that are common to everyday workflows.

From left to right, they are as follows:

New, Open, and Save are the first 3 which have already been discussed previously.

Open from Web & Mobile: Open an existing drawing from AutoCAD Web & Mobile

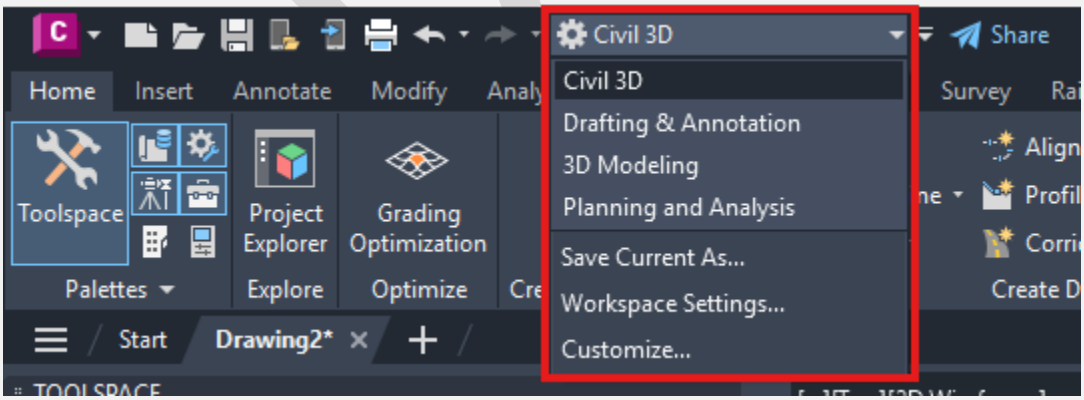
Save to Web & Mobile: Saves the current drawing to AutoCAD & Mobile.

Plot: Prints a drawing to a plotter, printer or file.

Undo: Allows the user to reverse any action that was previously done. The shortcut for this action is CTRL + Z.

Redo: Allows the user to redo any undo that has occurred. The shortcut for this action is CTRL + Y.

Workspace: Here you can change the tools available in the ribbons on the third and fourth levels depending on the type of design and analysis you are looking to perform within the current drawing. It is located to the right of the Undo and Redo icons at the top left of the screen.



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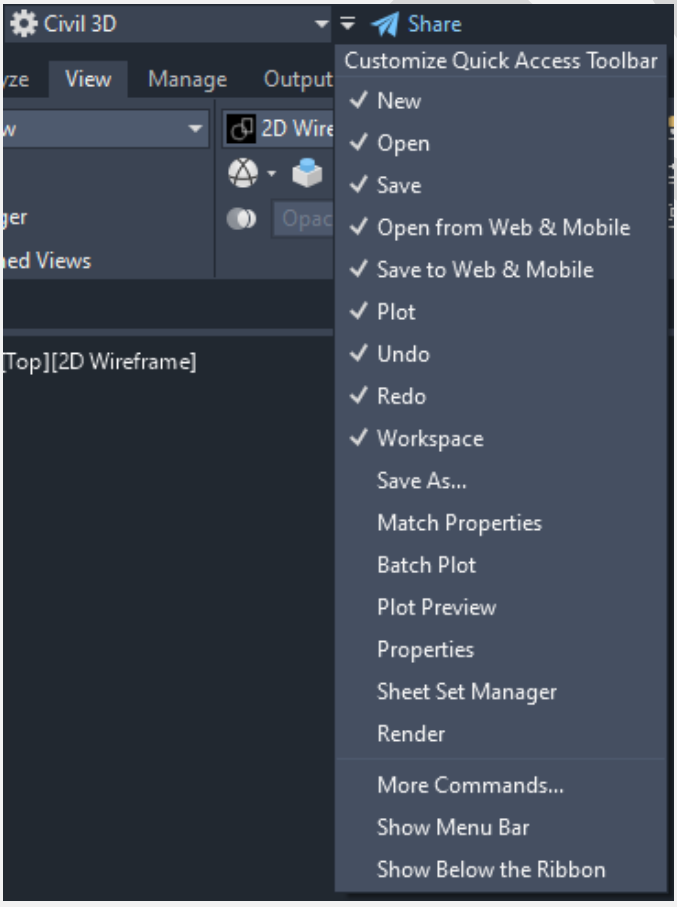
Workspaces displayed and available include the following:

- **Civil 3D**: Tools displayed in the ribbon will provide you with the bulk of the tools necessary to perform civil engineering design and analysis.
- **Drafting & Annotation**: Tools displayed in the ribbon will provide you with the basic 2D drafting tools and functionality native to the AutoCAD environment.
- **3D Modeling**: Tools displayed in the ribbon will provide you with the basic 3D modeling tools and functionality. It's important to note that 3D modeling capabilities within this display are not Civil 3D-related but are more intended for basic AutoCAD functionality.
- **Planning and Analysis**: Tools displayed in the ribbon will provide you with additional mapping and analysis tools. These tools come in handy when connecting to ArcGIS data or when adding a basemap to the drawing.
- **Save Current As…**: Provides the ability to save any customizations you have made to a customized workspace that can be made current later on.
- **Workspace Settings**: Selecting this option will pull up another dialog box that will allow you to define which workspaces are available, as well as the display order of the workspaces listed.
- **Customize**: Selecting this option will pull up another dialog box that will allow you to customize any of your workspaces if necessary. This will come in handy if you intend to create custom tools, layouts, and so on specific to your workflow.

Customize Quick Access Toolbar: Directly next to the workspace selections is another down arrow with a horizontal line above it. If you select this, you will be presented with a drop-down menu that will provide the ability to select the tools available within the Quick Access Toolbar interface:



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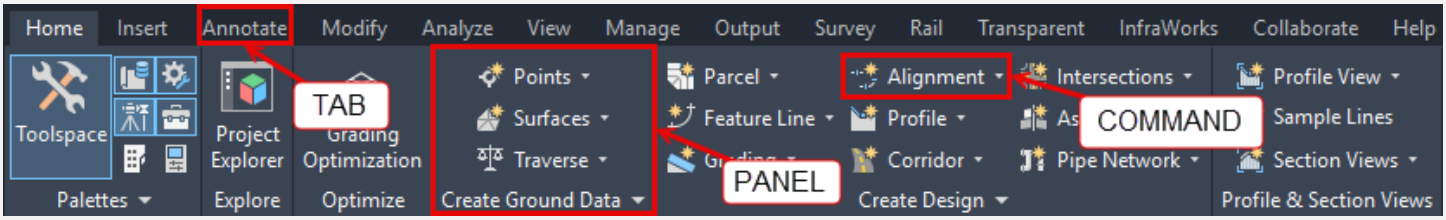
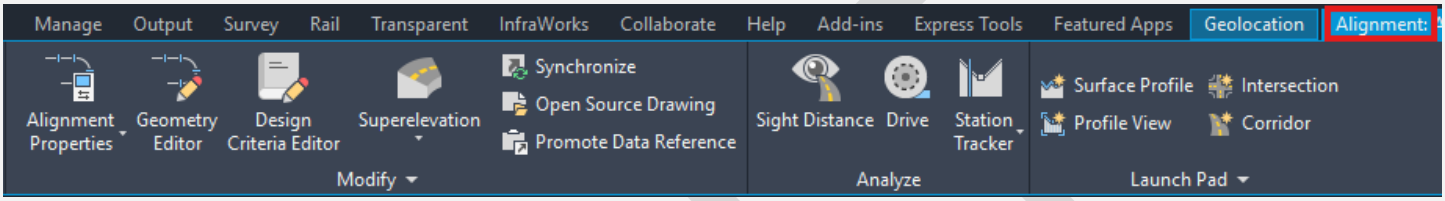
Those items that are checked will be displayed in the Quick Access Toolbar in your current view.

Ribbon

The ribbon is where icons for tools and commands are housed. It is separated into three different areas: tabs, panels, commands.



** When an object is selected an additional "Contextual" tab will be added to the tab list with relevant panels and tools.*



Toolspace

The next part of the user interface is the **Toolspace**. This can be accessed by going to the **Home** tab and selecting the Toolspace icon in the **Palettes** panel. Once activated, you'll notice **TOOLSPACE** being displayed along the left-hand side of your session.

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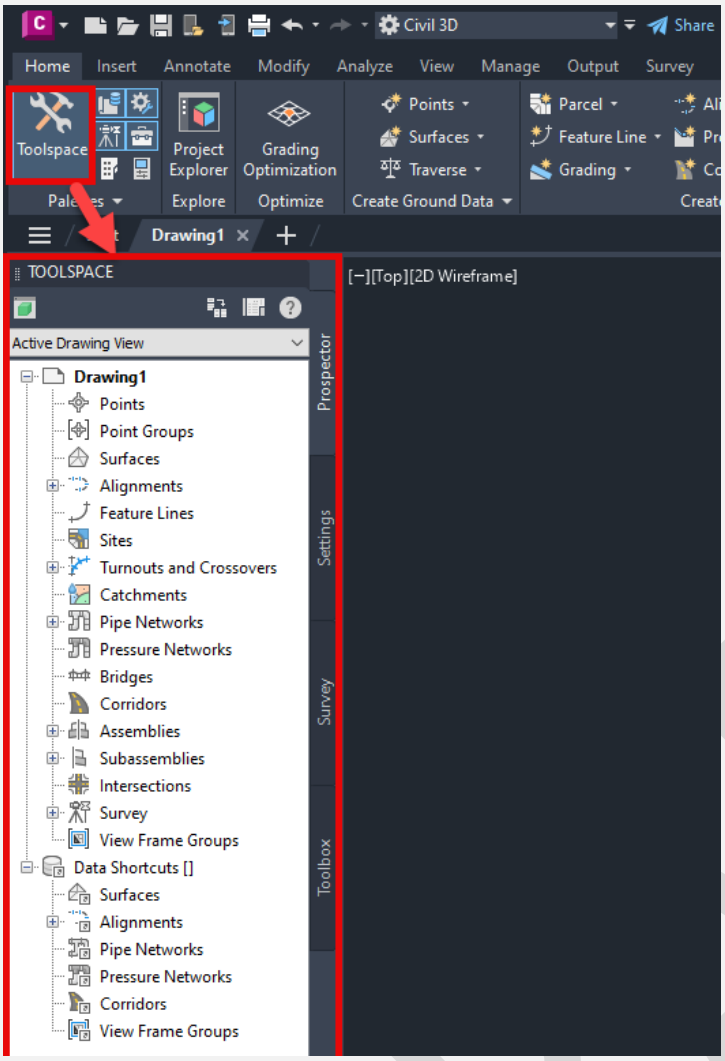

Within the **TOOLSPACE** there are many file and design management tools allowing granular control over design geometry and display. Along the right-hand side of the TOOLSPACE area, there are four individual tabs that will give access to different functionalities: **Prospector**, **Settings**, **Survey** and **Toolbox**. These can be toggled on and off in the Home tab Palettes panel of the ribbon.

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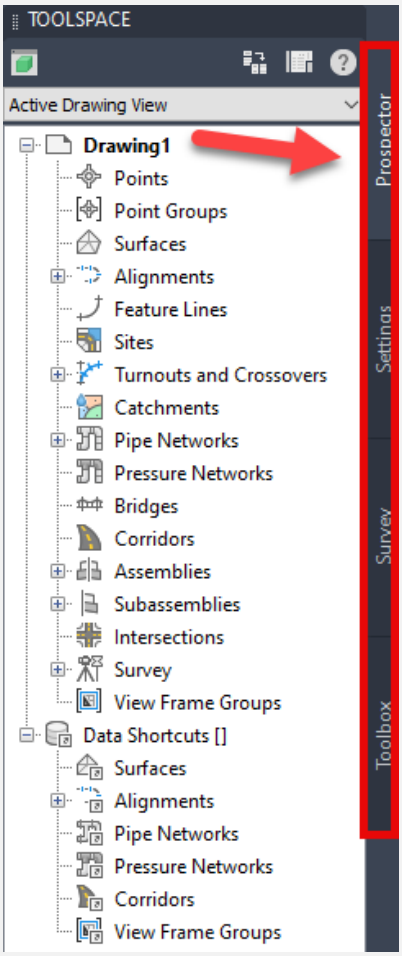

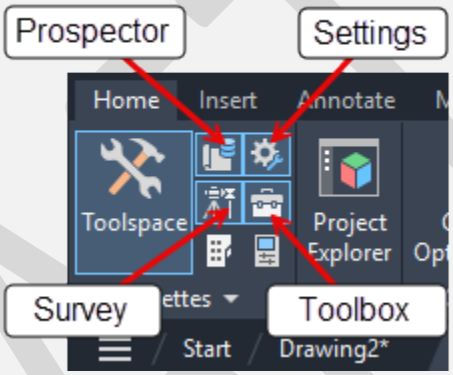

Prospector: Provides you with the ability to create, modify, analyze and manage modeled geometry and components within your drawing(s) open in the current session as well as link modeled geometry and components from other files via **Data Shortcuts Manager**.

Settings: Provides you with the ability to create, modify, and manage settings specific to the drawing(s) open in the current session.

Survey: Provides you with the ability to connect to survey databases and manage configurations to streamline the integration of data within Autodesk's Civil 3D platform.

Toolbox: Provides you with additional reporting and analysis tools that work well for gathering information within the current drawing and exporting data to various reporting formats.

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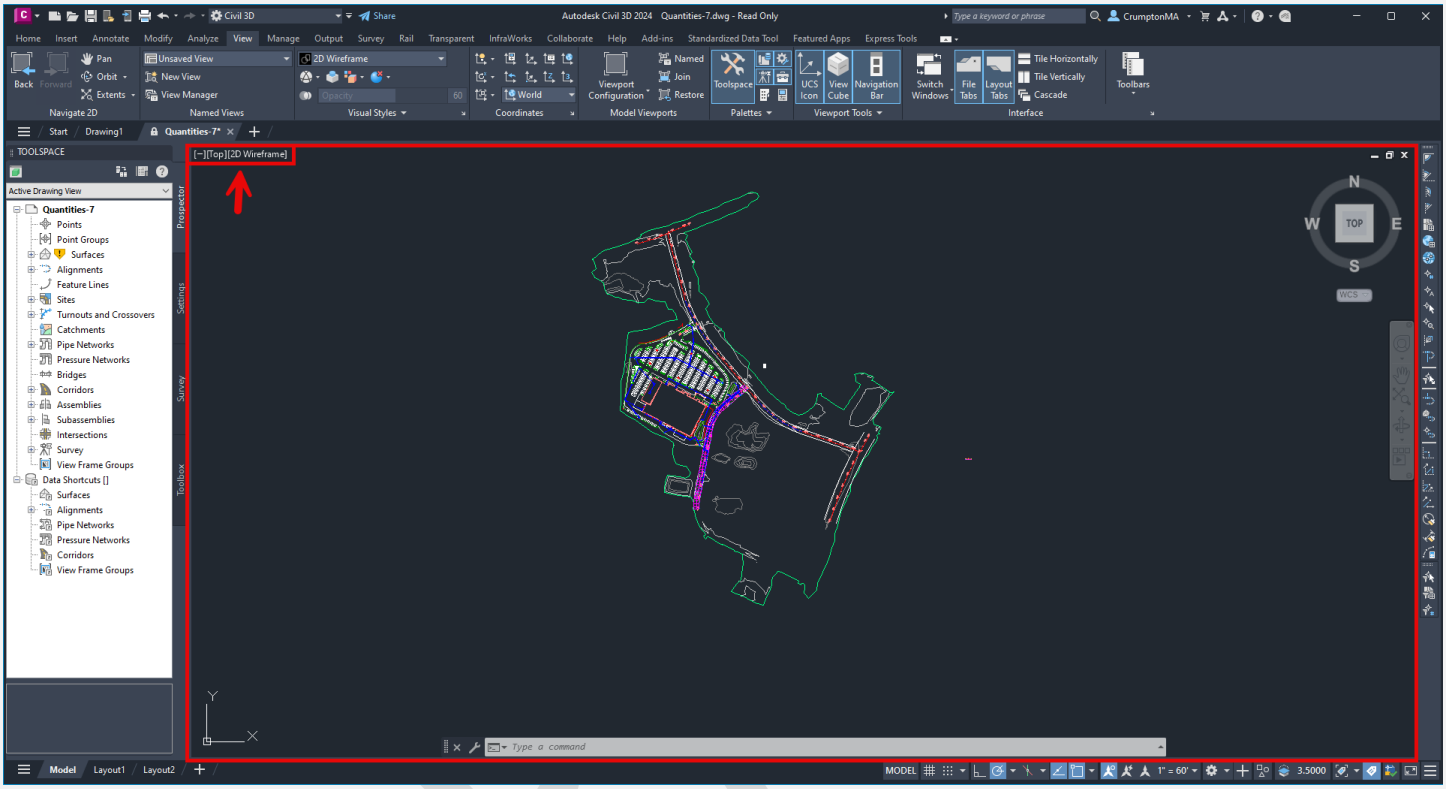
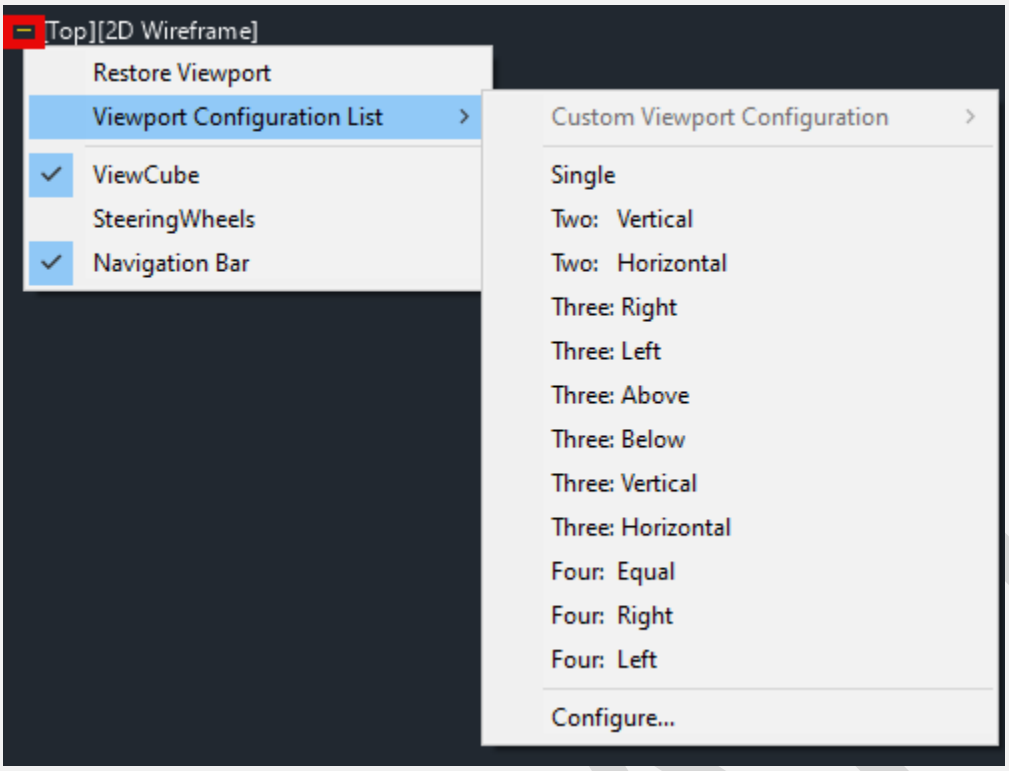
Drawing Area

Moving on, the next area is the drawing area, which is fairly straightforward. This area is reserved for your design modeling, annotating, and so on. This is the visual space where you see your model and other elements like layouts (paper space). It's essentially the canvas where you view and interact with the model space and layout tabs. When you switch between different layouts, the drawing area dynamically updates to display the selected layout's content. All your work will be displayed in this area and will appear as shown in this screenshot:

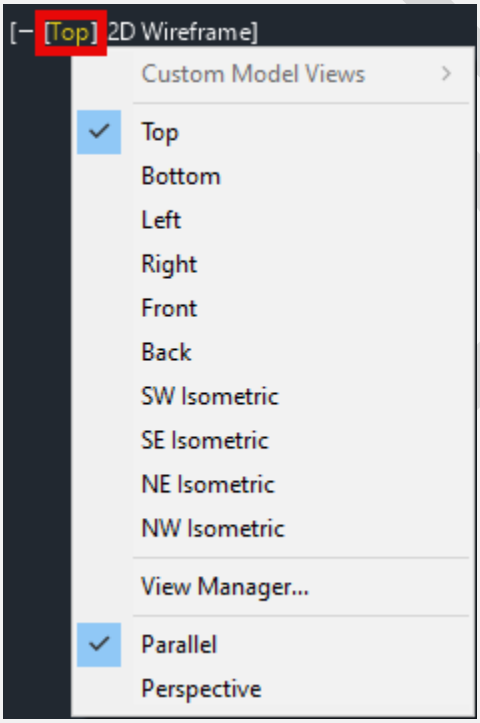


You'll notice, however, a few different icons within your drawing area that are worth pointing out and providing a little more detail on. In the upper left-hand corner, you'll notice a few view descriptions, similar to [-][Top][2D Wireframe]. When you select each of these fields, you are presented with the ability to further manage and/or change the display of all objects displayed in the drawing area.

If you select the first field, **[-]**, you are presented with a few options to customize the drawing area, or model space viewport. The viewport configuration list provides the ability to split the drawing area into multiple views.



If you select the second field, **[Top]**, you are presented with a few options to customize the orientation of the view being displayed within your model space viewport:



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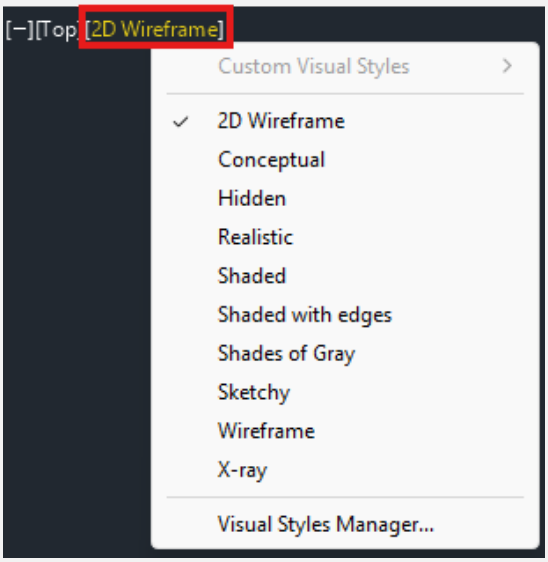
If you select the third field, **[2D Wireframe]**, you are presented with the ability to change the overall display of your model geometry and components within the model space viewport:



Let's move over to the upper right-hand corner of your drawing area. This is where you'll find **ViewCube** which allows you to quickly change the **user coordinate system (UCS)** and view orientation of components displayed in your drawing area. By selecting any of the lettered directions or the rotation options in the top right, or selecting any location on the square/cube located in the center, the view orientation will update as you select each of the options.

Just underneath **ViewCube**, you'll notice a **Quick View Access Bar**. On this bar are additional options for navigating the drawing. We have the ability to quickly pull up the Full Navigation Wheel that will display right next to your mouse, pan across your drawing (represented by the hand icon), zoom in/out of your view, orbit/rotate your view along an axis, and **ShowMotion**, which allows you to create animations.

Command Line

The **command line** serves as a central location for controlling Civil 3D through text input, providing an efficient alternative or supplement to using the ribbon or toolbars. Although most tools/commands can be found in the various ribbons or toolbars, some users may find it more efficient to input certain commands as text in the command line. The command line also acts as a source for prompts and feedback, guiding users through each step of a command once it has been started.

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It's important to keep an eye on the command line while working if there is doubt as to what the next action needs to be. Any time there is an active command, and no dialog box presented, the next steps for the command will be displayed at the command line.

** The command line window can be resized to display more information as needed.*

Model Space and Paper Space

Civil 3D utilizes two distinct environments: Model Space for creating 3D or 2D designs at 1:1 scale, and Paper Space (Layouts) for arranging, scaling, and plotting these designs onto sheets. It is important to understand the difference between these two environments before starting design in order to organize the project files and sheets correctly for a project.

Model Space:

The Civil 3D Model Space is an infinite, 3D environment used for drafting, designing, and modeling objects at a 1:1, real-world scale. It serves as the primary workspace for creating and modifying geometry and is accessed via the "Model" tab.

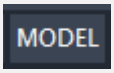
Paper Space:

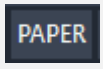
The Civil 3D Paper Space is a sheet environment designed for organizing, scaling, annotating, and plotting drawings. Paper space allows users to arrange viewport windows, insert title blocks, and set print scales without affecting the actual model geometry. Viewport windows are an object acting as a "window" from paper space into model space to display drawings at specific scales. By default the paper space can be accessed via the "Layout" tab(s). However, the layout tabs can be renamed so there may be organization or project specific naming conventions for layout tabs.

** It is important to note that while in a layout tab the model space can still be accessed and edited through the viewport.*

Status Bar

The status bar is located in the lower right-hand corner of the screen. While the name would indicate that the items here are only to provide information, they are actually interactive to aid the design process. Some items are highlighted below but more information for each item can be found online at Status Bar Quick Reference.



or


Model or Paper Space – This is an indicator of whether the drawing is currently in model or paper space but can be used as a toggle to switch to the other as well. While in a layout tab it is important to note which "space" the drawing is in because errors could quickly arise while working in the wrong "space".


2D Object Snap – Object snap allows the ability to snap to certain points such as perpendicular, endpoint, intersection, etc. while drawing. This is a toggle to turn that function on and off and the arrow to the right provides the ability to select which point types to snap to.

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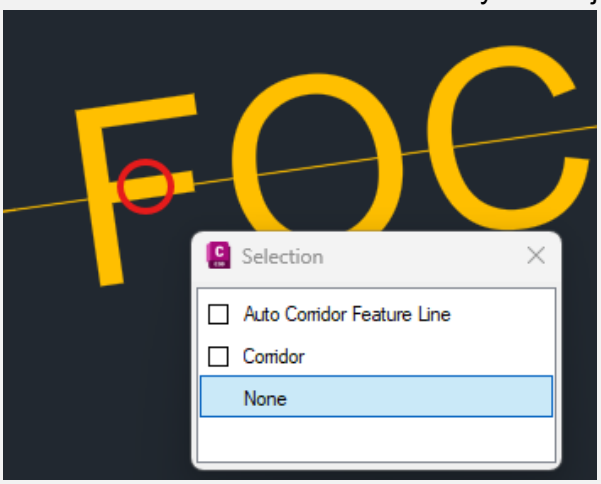
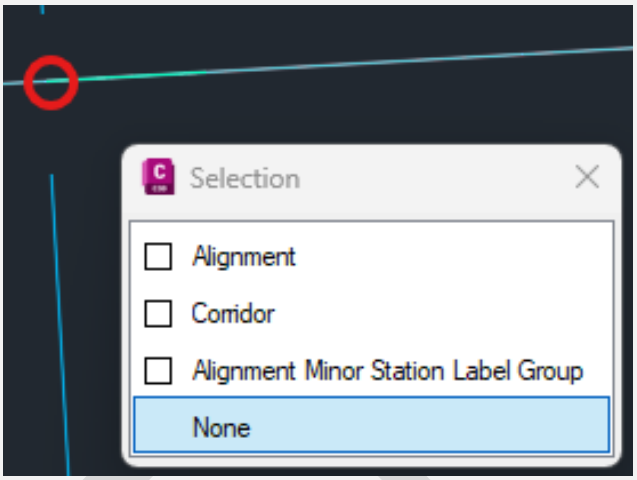
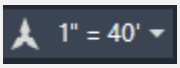
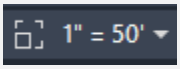
 Selection Cycling – Selection cycling becomes more useful as design progresses and multiple objects are in close proximity or coexist in the same location. With selection cycling turned on, once an object is selected a menu appears with a listing of all the objects available at that location. Only the object chosen from the list will be selected. If there is only one object present at the selection location the list will not populate.







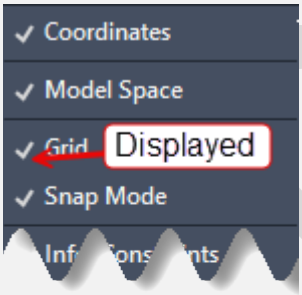
Annotation Scale – Sets the scale for annotations while in the model tab.

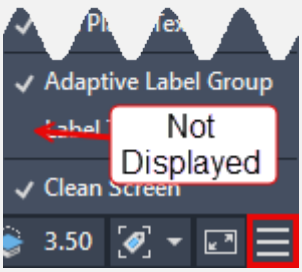


Viewport Scale – Sets the scale for a specific viewport while in a layout tab.

 or  Viewport Lock – Locks the scale and location of a specific viewport while in a layout tab.

 Customization – Opens a list of all the available status bar items and a toggle for their display.





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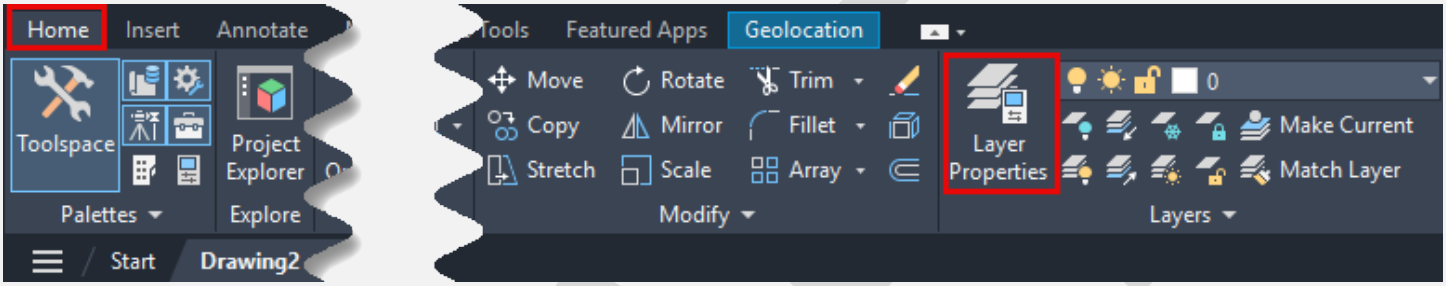
Layers and Styles in Civil 3D

In Civil 3D the settings of layers and styles are commingled, and both influence how objects are displayed in the drawing at any given time. Layers are used to organize drawing data and manage visibility (on/off, freeze/thaw) while styles control how civil objects appear by overriding typical layer behaviors and providing granular control with the use of object component layers. For civil objects such as surfaces and alignments it is also very quick and easy to switch between different named styles, allowing flexibility in how objects are displayed.

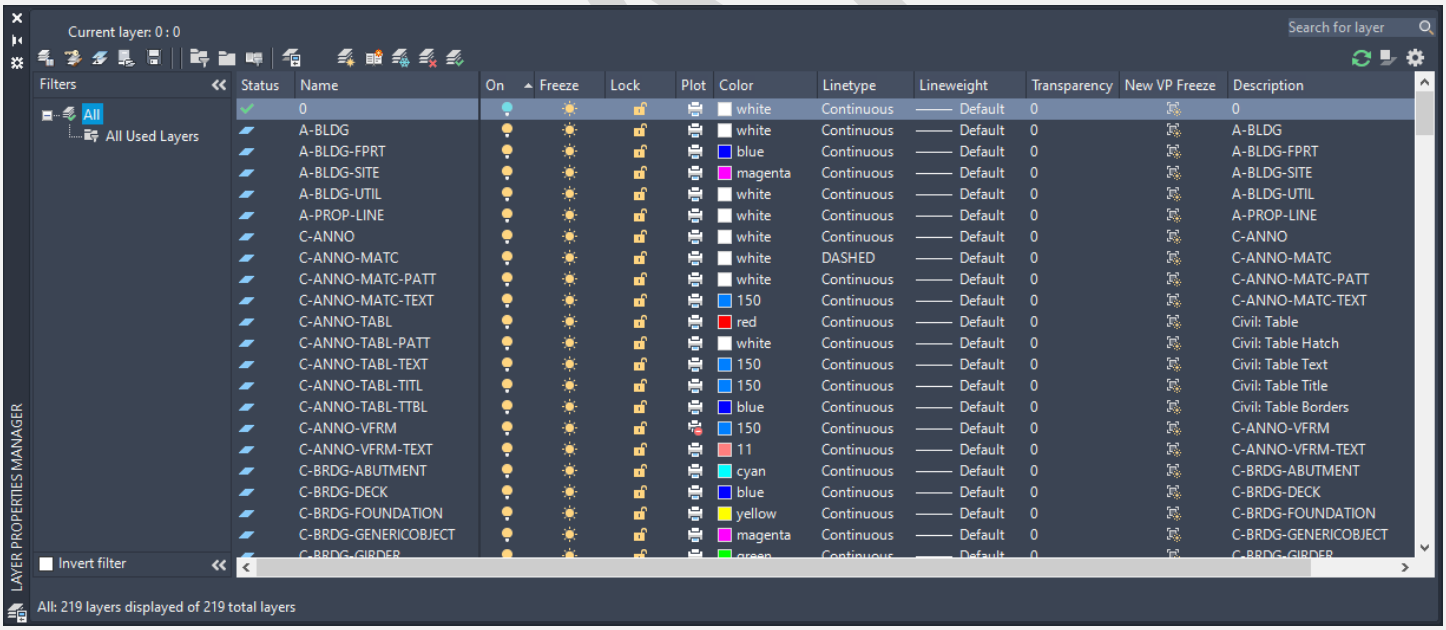
Layer Display

Turning layers on/off and freezing/thawing layers both control object visibility, but freezing layers offers performance benefits in complex drawings.

In the “Home” tab in the “Layers” palette go to “Layer Properties”



When you left-click Layer Properties, the following window will appear:



- <u>On/Off:</u> Turning a layer off makes its objects invisible but still considers them during regeneration (like when zooming or using certain commands). Use turning layers on/off for visual clarity and when you need to occasionally reference objects on those layers.
- <u>Freezing/Thawing:</u> Freezing a layer, on the other hand, makes its objects invisible and excludes them from regeneration, resulting in faster operations. Thawing does the opposite. Use freezing/thawing layers when you need to improve performance in complex drawings or when you don't need to see or interact with objects on certain layers.

Object Layer(s)

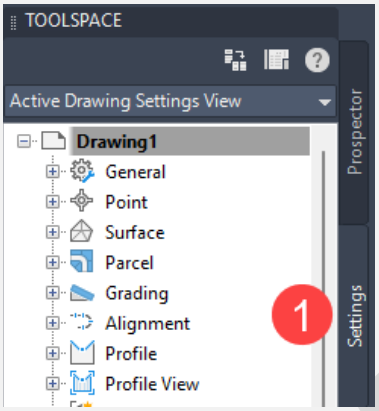
Each object in Autodesk Civil 3D has a layer on which the object physically resides. For simpler objects such as lines, arcs, text, etc the object visibility will only be tied to the assigned layer. Certain civil objects that are more complex have an object base layer on which the object physically resides, and object component layers that control the display of object components. See Appendix A for a list of objects that use the base layer plus component layer setup.

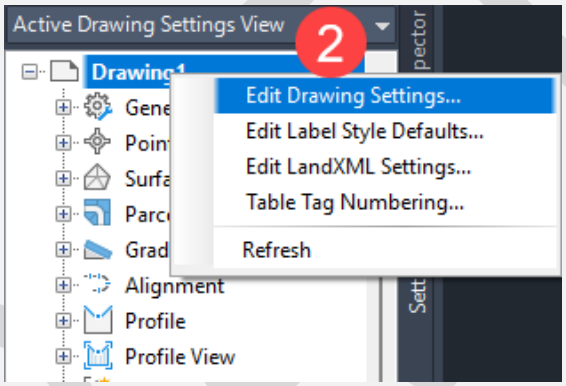
** Object Layers and Object Styles have been presented at the beginning of the manual because they are applicable to the display of objects while interacting within Civil 3D. However, it may be best to revisit this section as you progress through this manual as certain information described here may make more sense with additional experience using the program.*

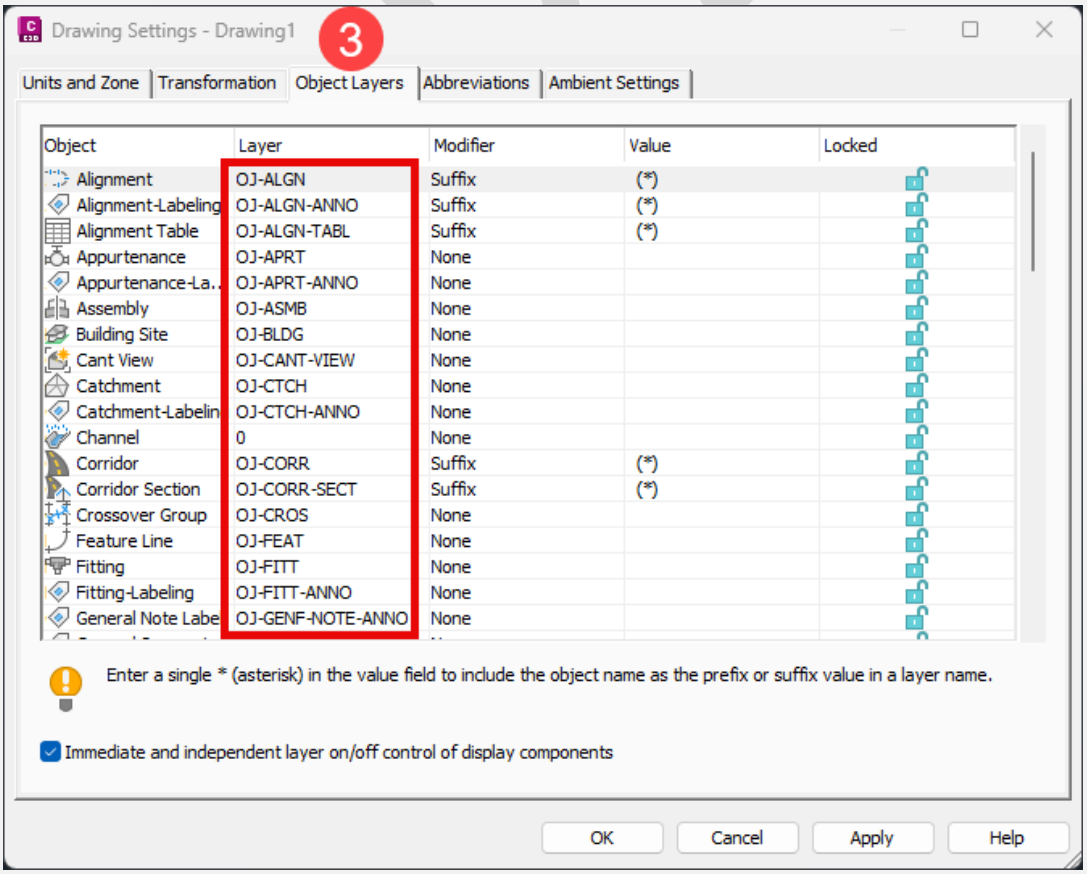
Object Base Layer

Default base layers for objects are specified on the Object Layers tab of the Drawing Settings dialog box. When creating an object, the default layer can be accepted or a new layer can be specified.

** Under most circumstances the default layer should be accepted.*





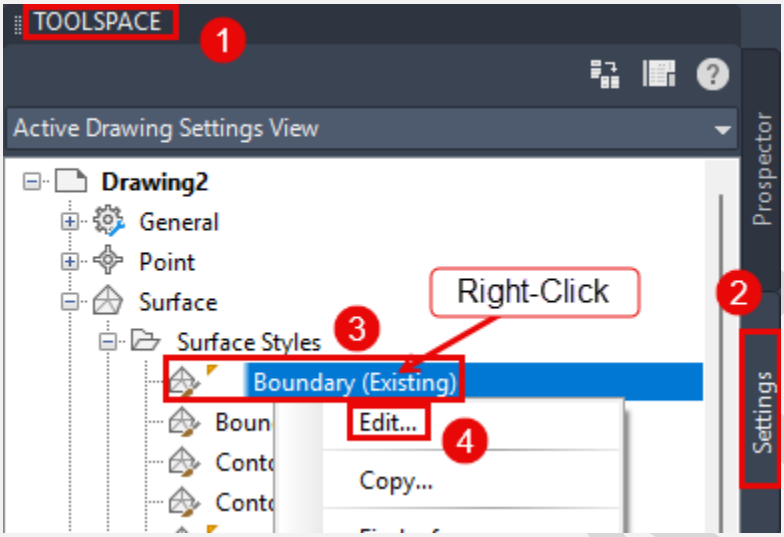


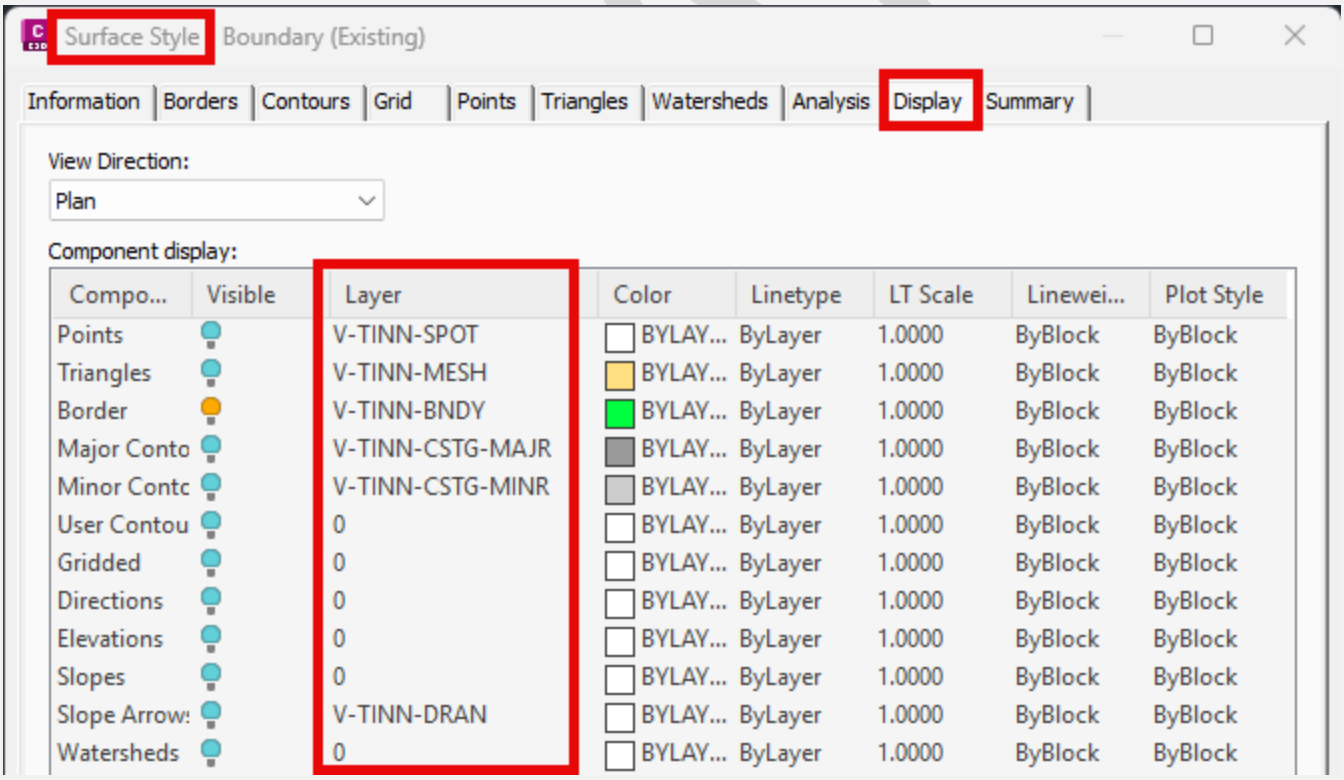
Object Component Layers

The component layers are defined in the Display tab of the Object Styles dialog box. The component layers allow you to work with objects as if parts of them are located on different layers.

** There is not a single Object Styles dialog box. Each object type has a dialog box where display settings can be accessed. An example is shown below.*

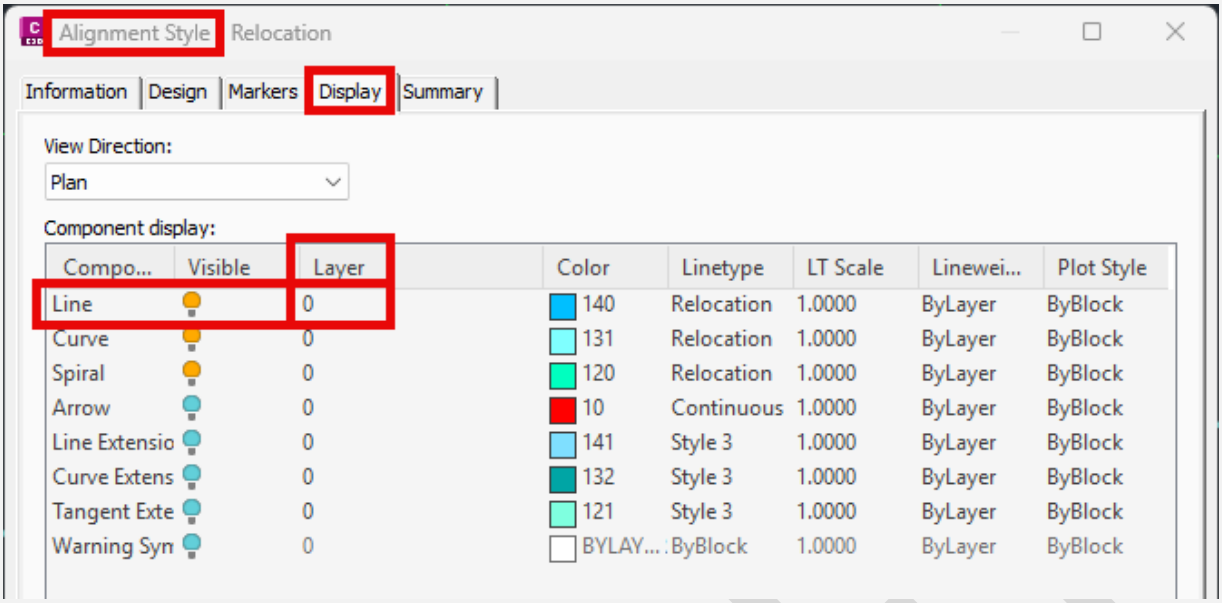
To access the object styles for a specific type of object, in the Toolspace select the Settings tab. Then under the styles folder for the object (e.g. Surface) right-click on the specific style and click edit.



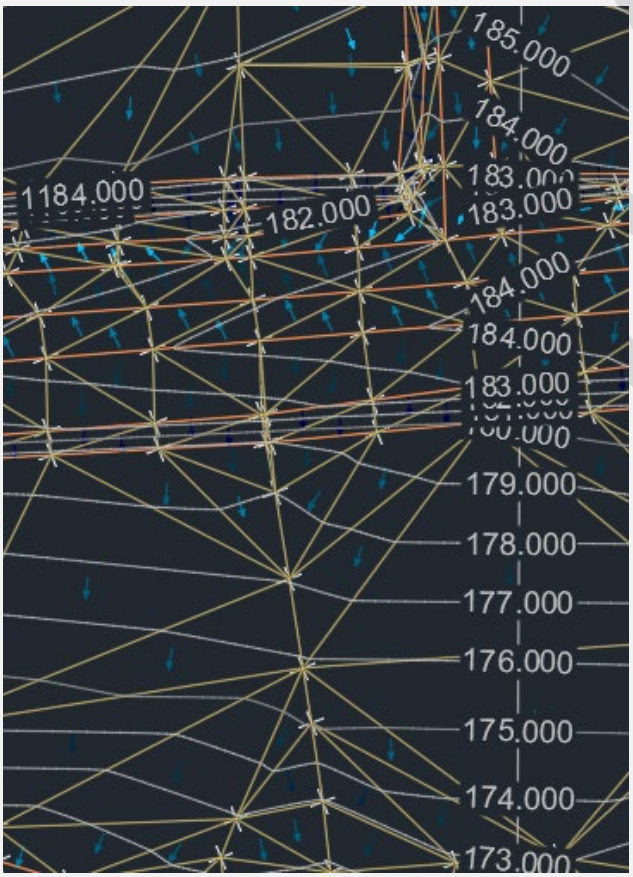


Objects are physically created on the base layer, but the display of components is governed by the associated component layers. Each object component uses the visibility settings for the component layer (such as on/off), as well as the color, linetype, lineweight, and plot style for the layer if the various Component Display settings are set to ByLayer.

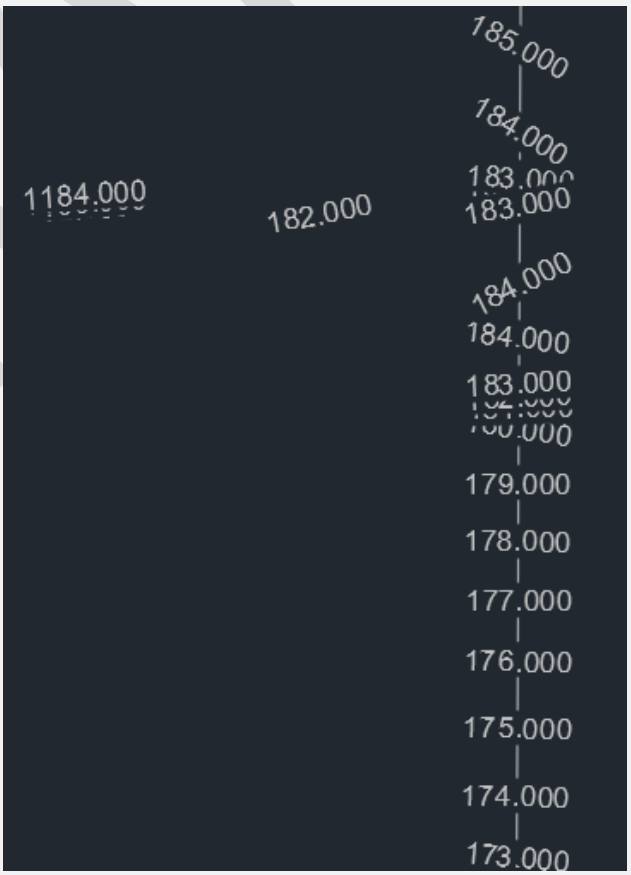
** Layer 0 has a special meaning in the Component Display settings. When the layer is set to 0, the object base layer is used for that component. For example, if the alignment base layer is OJ-ALGN, and the layer for the Line component is set to 0, then the alignment lines behave as if they are located on layer OJ-ALGN.*



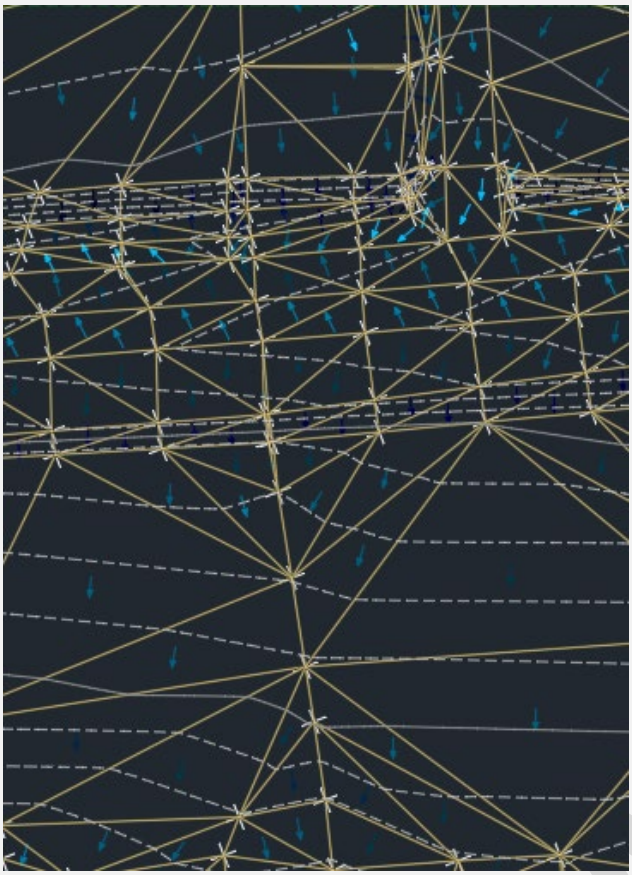
A good example of how these layer types interact is with a surface object. If the surface base layer is frozen, the display of all surface components is not visible. If individual object component layers are frozen only the display for the selected components are not visible. See examples below.



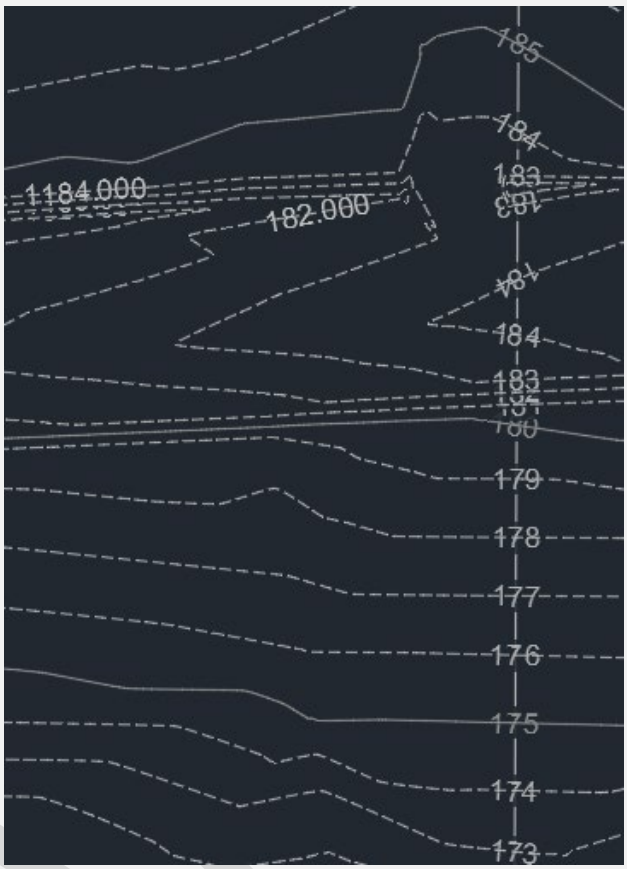
Base and **Component** Layers Thawed



Surface **Base** Layer Frozen



Surface Annotation **Base** Layer Frozen



Surface Mesh, Spots and Flow Direction **Component** Layers Frozen

Object Styles

Objects in Civil 3D are the intelligent and dynamic design components such as points, surfaces, alignments, profiles, and corridors that represent modeled features. Each of these object types can have multiple styles available for use that will change how the object is displayed in various views such as plan, model, profile, and section. Object styles only adjust the display of the object itself, labels have their own styles that are managed elsewhere.

Point Styles

Point styles have been developed that correspond with SCDOT survey point codes. If survey is processed using Civil 3D, survey points should have an associated point style.

Surface Styles

Surface styles have been developed to highlight different surface elements that may be needed by designers. These have been listed below with a brief description.

Boundary (Existing) – Displays only the boundary of a surface. To be used with existing surfaces.

Boundary (Proposed) – Displays only the boundary of a surface. To be used with proposed surfaces.

Contours 1' & 5' (Existing) – Displays contours at 1’ minor and 5’ major intervals and the boundary of a surface. To be used with existing surfaces.

Contours 1' & 5' (Proposed) – Displays contours at 1’ minor and 5’ major intervals and the boundary of a surface. To be used with proposed surfaces.

Elevation Banding (2D) – Displays colored banding in 2D to represent the relative elevation of a surface.

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Slope Arrows (Existing) – Displays slope arrows corresponding with each triangle face as well as 5' major contours of a surface. To be used with existing surfaces.

Slope Arrows (Proposed) – Displays slope arrows corresponding with each triangle face as well as 5' major contours of a surface. To be used with proposed surfaces.

Triangles (Existing) – Displays triangle faces and the boundary of a surface. To be used with existing surfaces.

Triangles (Proposed) – Displays triangle faces and the boundary of a surface. To be used with proposed surfaces.

Watersheds – Displays the separate watersheds within a surface with some basic details if a watershed analysis has been run for a surface.

Alignment Styles

Alignment styles have been developed for surveyed alignments and relocated alignments with relocated alignments defaulting to a dashed linetype.

Profile Styles

Profile styles have been developed for multiple different uses a designer may have. These have been listed below with a brief description.

Proposed Profile – To be used for a finalized proposed profile.

Sketch Profile [1] – To be used for drafting alternatives as needed.

Sketch Profile [2] – To be used for drafting alternatives as needed.

Surveyed Ground – To be used for the existing ground profile along the centerline of an alignment.

Surveyed Ground - Left – To be used for the left side of a triple profile.

Surveyed Ground - Right – To be used for the right side of a triple profile.

Corridor Styles

Corridor Styles control the corridor information that is displayed at elevation zero and helps provide clarity on the location and edits made to a corridor. Code set styles control the display of the individual parts of a corridor as it is modeled.

Code Set Styles

Code set styles are a comprehensive style that combine marker, link, and shape styles to define how corridor components are displayed. As point, link, and shape codes are defined in the subassembly and assembly creation process the specific codes provided for these elements will influence how the elements display in the corridor. Code set styles are capable of influencing the display of elements in plan, model, profile, and section views. The Corridor code set style has been setup as the primary code set style for use with subassemblies, assemblies and corridors.

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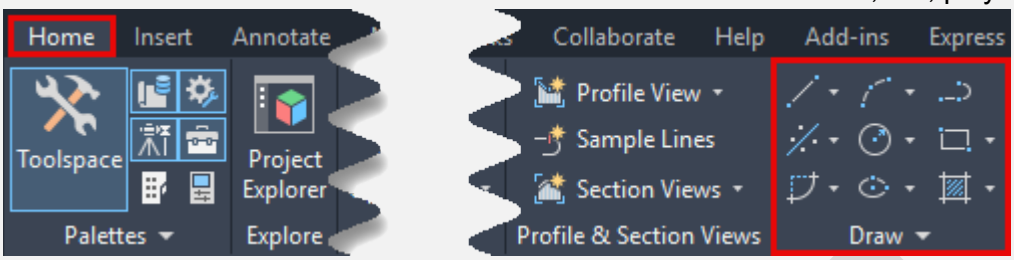
Basic Editing Tools

The tools discussed in this section are the more basic tools that would primarily be available with a base AutoCAD installation without the Civil 3D components. This section is intended to only provide a brief overview of these tools and how to access them.

Draw Panel

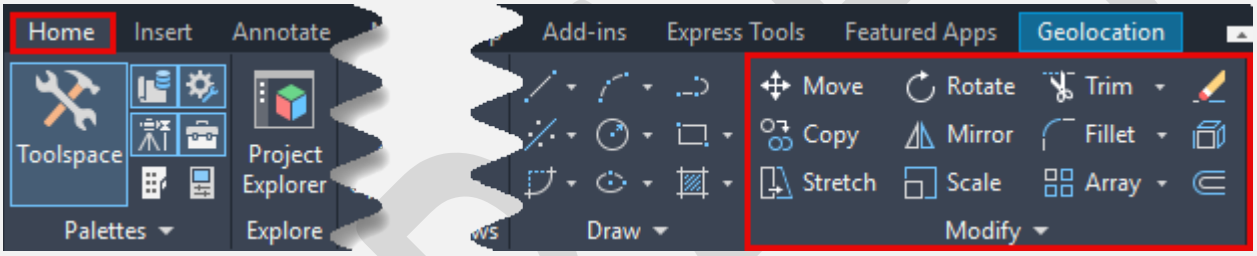
The Draw Panel is on the home tab and contains tools such as line, arc, polyline, circle, rectangle, etc.



** As you become more familiar with the Civil 3D program you will most likely find that polylines are a very useful and flexible object to use. The command for a polyline is PL or (PLINE).*

Modify Panel

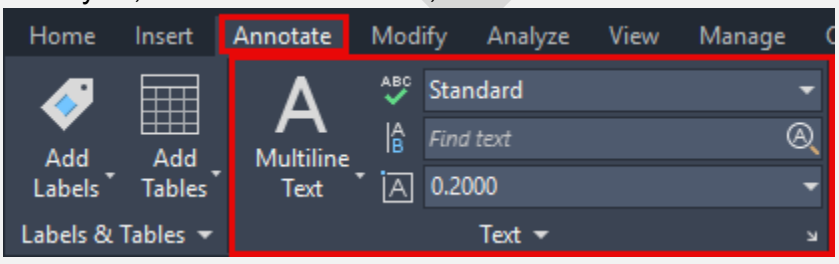
The Modify Panel is on the home tab and contains tools such as move, copy, rotate, mirror, scale, trim, extend, fillet, etc.



** You may find it easier to use the commands for some of the tools which are used more frequently.*
Move – M or (MOVE)
Copy – CO or (COPY)
Rotate – RO or (ROTATE)
Trim – TR or (TRIM)
Extend – EX or (EXTEND)

Text Panel

The Text Panel is on the annotate tab and contains tools such as multiline text, single line text, spell check, text styles, a text search function, etc.



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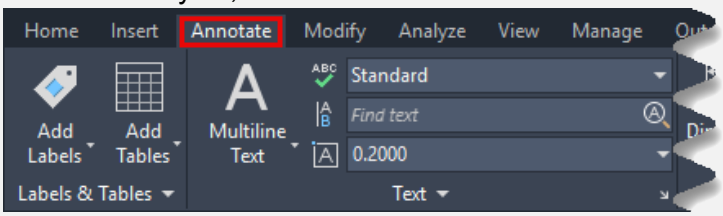
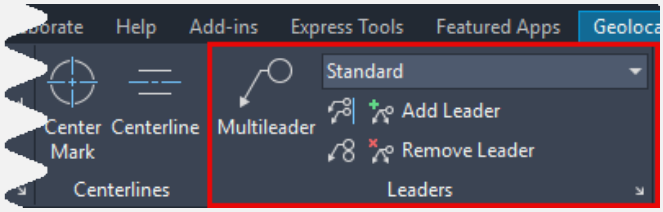
Leaders Panel

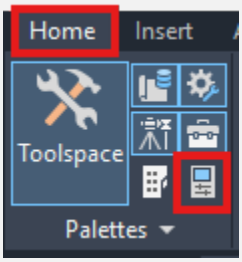
The Leaders Panel is on the annotate tab and contains tools such as multileader, add leader, remove leader, multileader styles, etc.





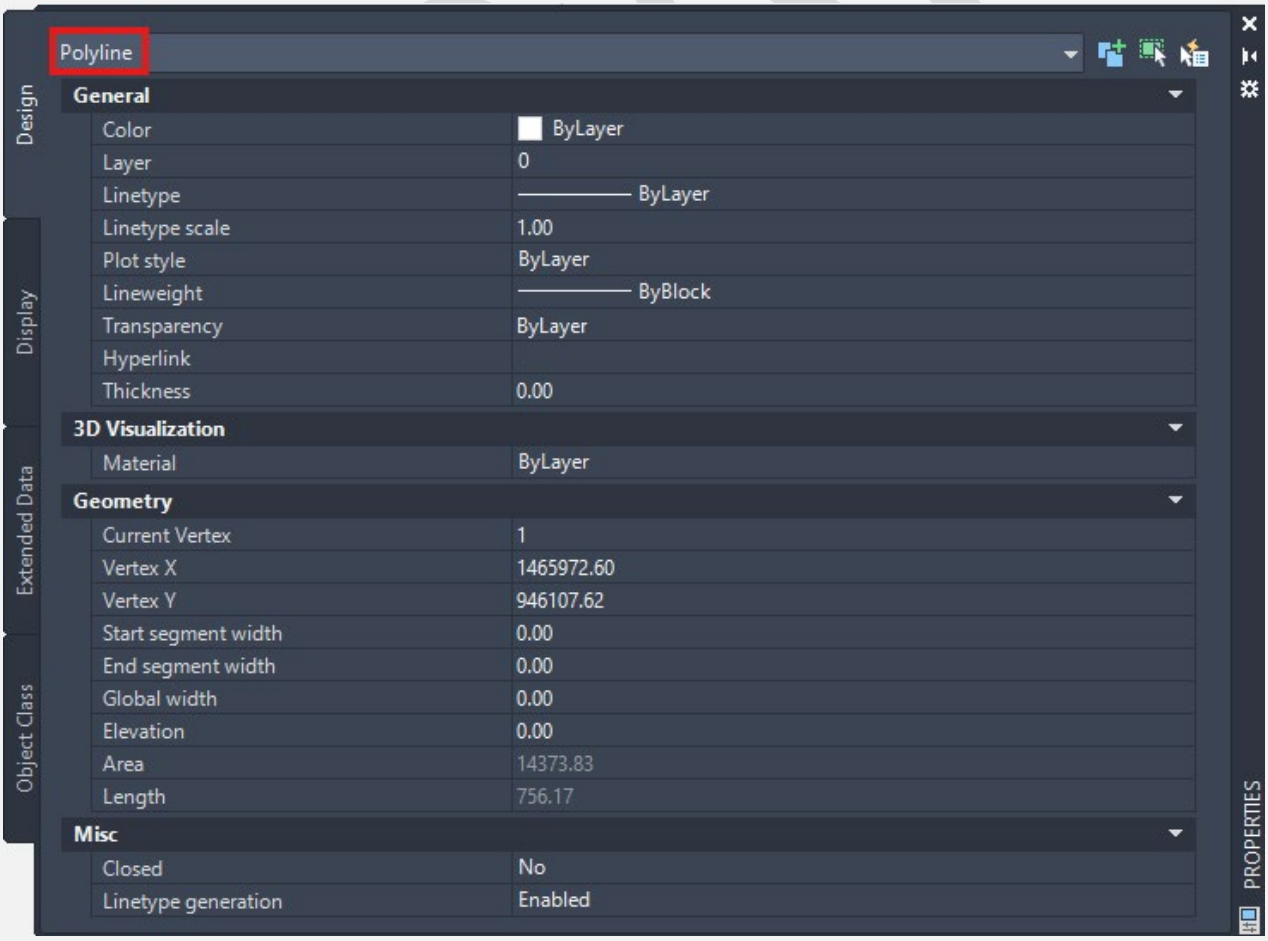
Properties Palette

The properties palette is on the home tab on the palettes panel and can also be accessed with the keyboard shortcut (Ctrl + 1). With the properties palette open if an object is selected, all the objects specific properties can be seen and certain properties can be edited.



** The escape button is your friend. Just hit the escape button to get out of any object selection or command.*

Examples: Polyline, Alignment, Surface, Text



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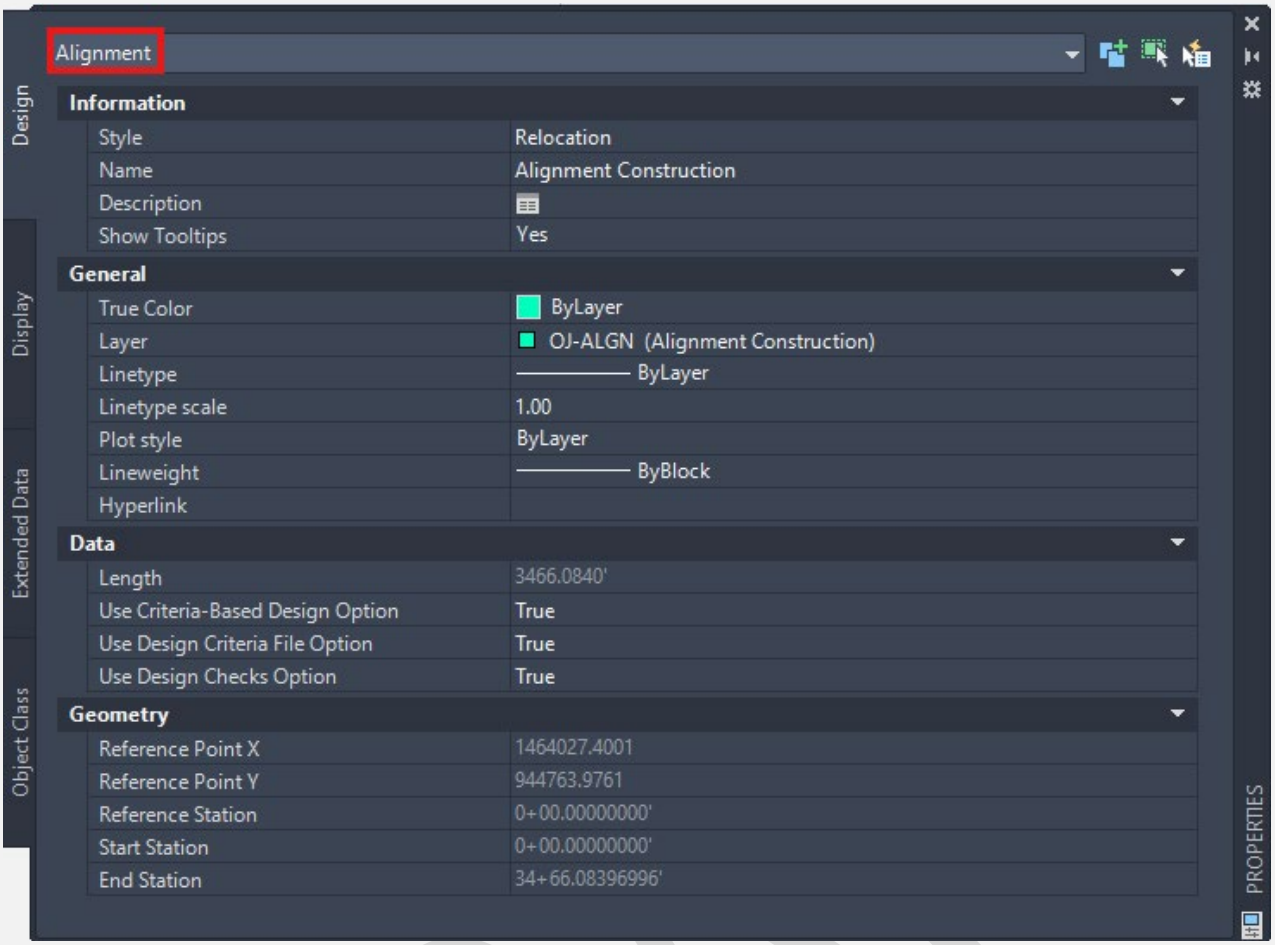
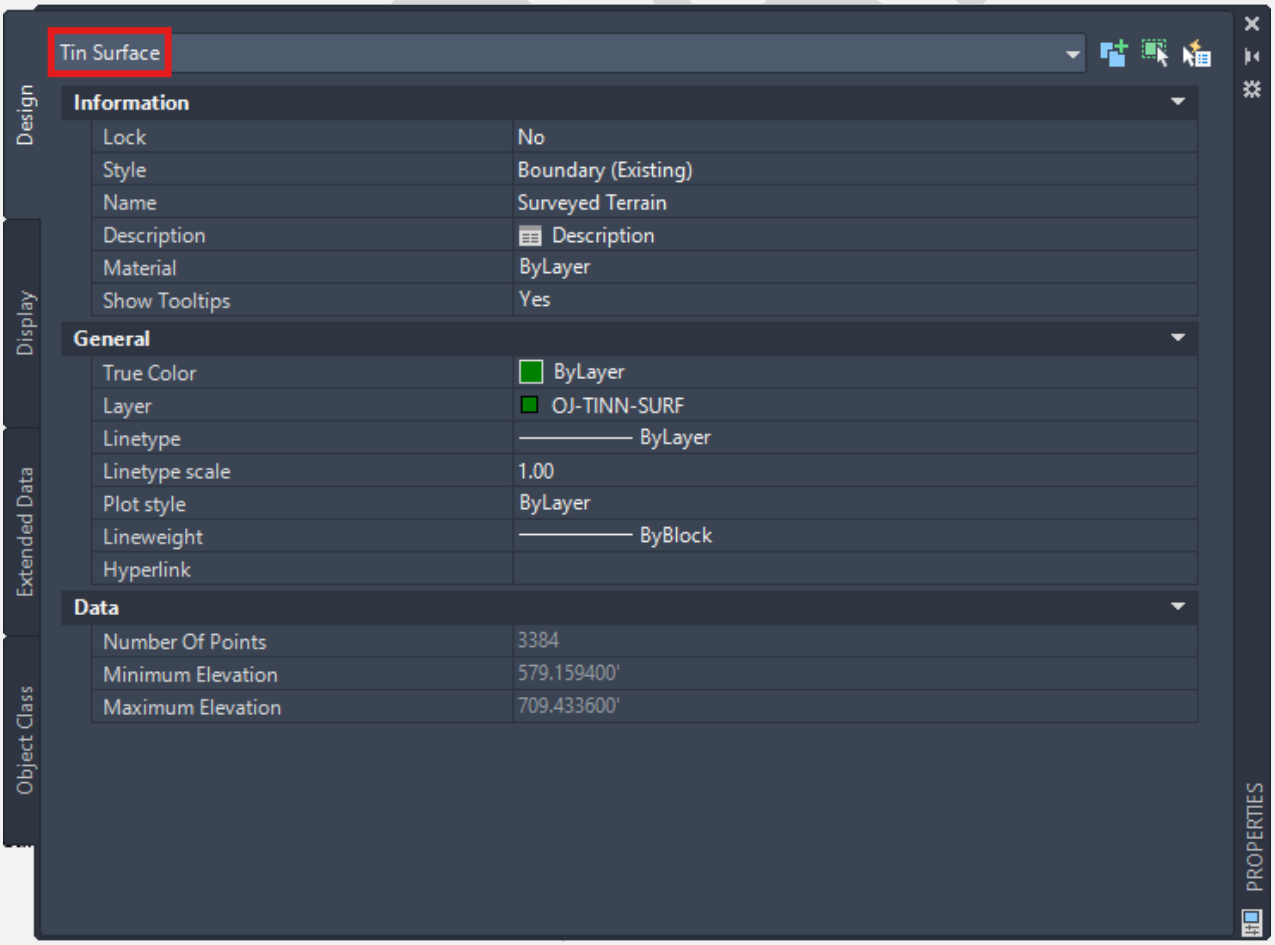
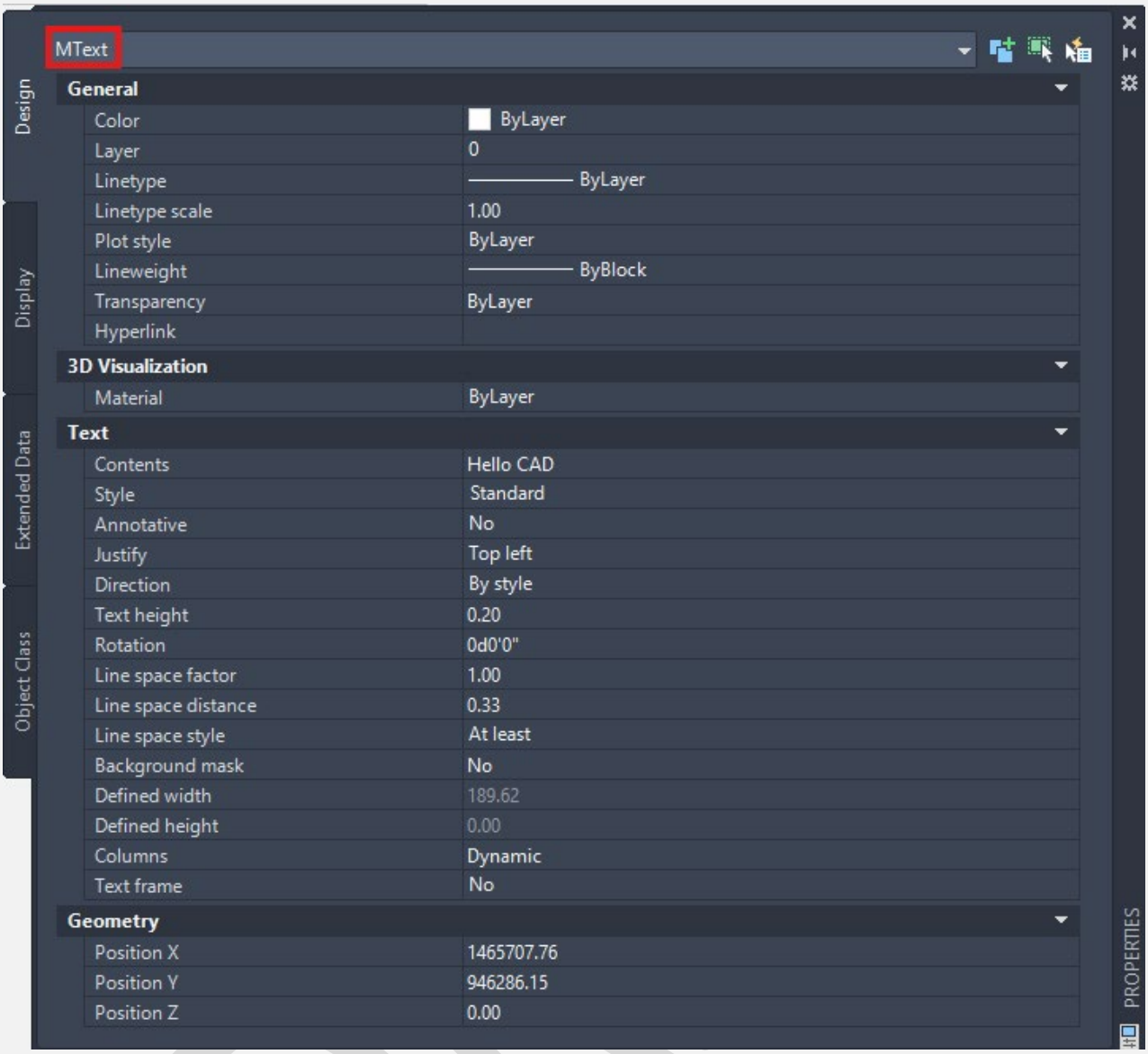

Alignment
Design
Display
Extended Data
Object Class
PROPERTIES
Information
Style
Relocation
Name
Alignment Construction
Description
Show Tooltips
Yes
General
True Color
ByLayer
Layer
OJ-ALGN (Alignment Construction)
Linetype
ByLayer
Linetype scale
1.00
Plot style
ByLayer
Lineweight
ByBlock
Hyperlink
Data
Length
3466.0840'
Use Criteria-Based Design Option
True
Use Design Criteria File Option
True
Use Design Checks Option
True
Geometry
Reference Point X
1464027.4001
Reference Point Y
944763.9761
Reference Station
0+00.00000000'
Start Station
0+00.00000000'
End Station
34+66.08396996'


Tin Surface
Design
Display
Extended Data
Object Class
PROPERTIES
Information
Lock
No
Style
Boundary (Existing)
Name
Surveyed Terrain
Description
Description
Material
ByLayer
Show Tooltips
Yes
General
True Color
ByLayer
Layer
OJ-TINN-SURF
Linetype
ByLayer
Linetype scale
1.00
Plot style
ByLayer
Lineweight
ByBlock
Hyperlink
Data
Number Of Points
3384
Minimum Elevation
579.159400'
Maximum Elevation
709.433600'



** Hovering over any object will provide a small snippet of property information and usually includes Name, Style, Layer, and object specific information.*

Tin Surface

Style	Boundary (Existing)
Name	Surveyed Terrain
Layer	OJ-TINN-SURF

Alignment

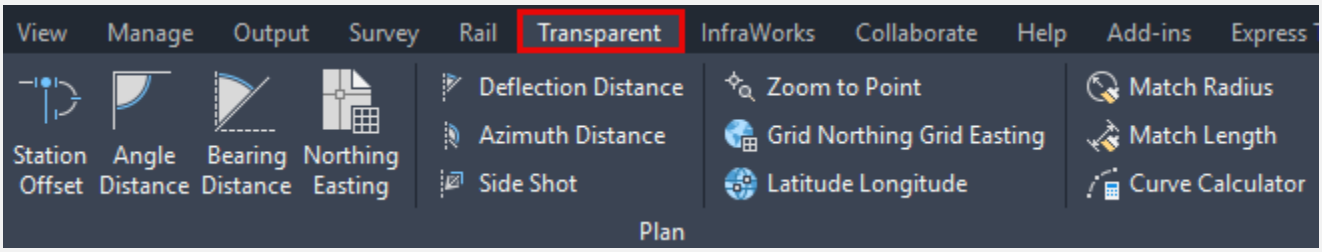
Name	Alignment Construction
Style	Relocation
Layer	OJ-ALGN (Alignment Construction)
Station	26+43.96518935',0.7047'

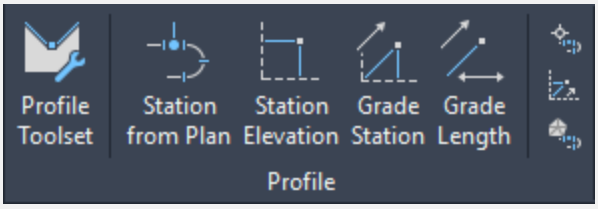
Corridor - Feature Line

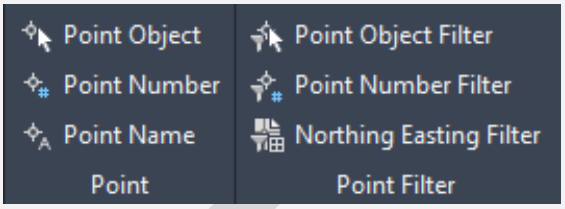
Name	Corridor - Construction
Style	Standard [Copy]
Layer	OJ-CORR (Corridor - Construction)
Code Set Style	Starting Point
Point Codes	Cut

Transparent Commands

Transparent commands in Civil 3D allow for precise object placement (e.g., station/offset, bearing/distance) while another command is active. They can be accessed via the Transparent tab, or by typing the command prefixed with an apostrophe, ('BD for Bearing Distance, 'SO for Station Offset, etc.) in the command line. They enable uninterrupted workflows for creating Civil 3D objects.



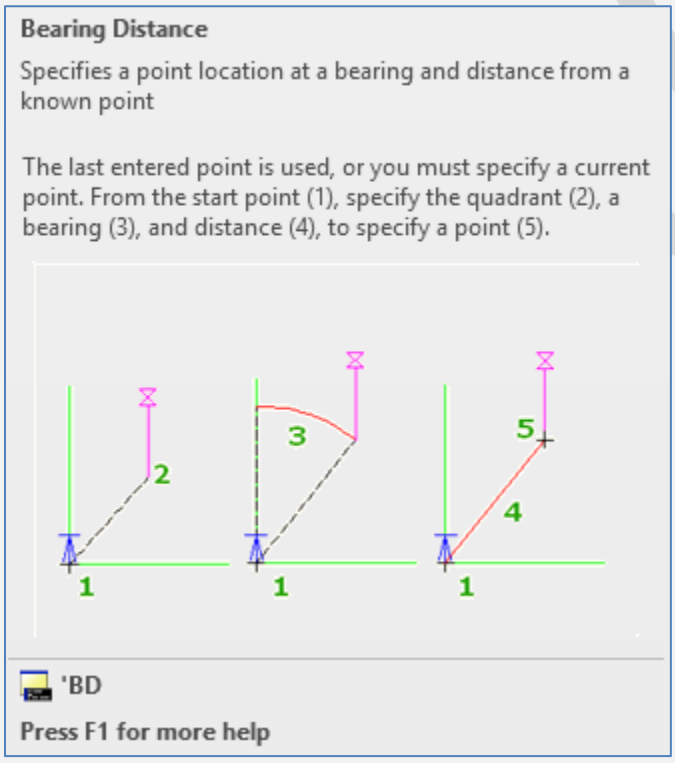




Example:

1. Start another command (for this example we will use PLINE)
2. Follow command line prompt: **`PLINE`** `specify start point:`
3. Enter transparent command: 'BD
4. Follow command line prompt: **`BD`** `>>Specify Quadrant (1-4):`
5. Follow command line prompt: **`BD`** `>>Specify bearing:`
6. Follow command line prompt: **`BD`** `>>Specify distance:`
7. Continue to add additional line segments or press enter to escape 'BD transparent command.

** Hovering over the tool command in the ribbon also provides instruction on how to use the tool.*



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Managing External Data

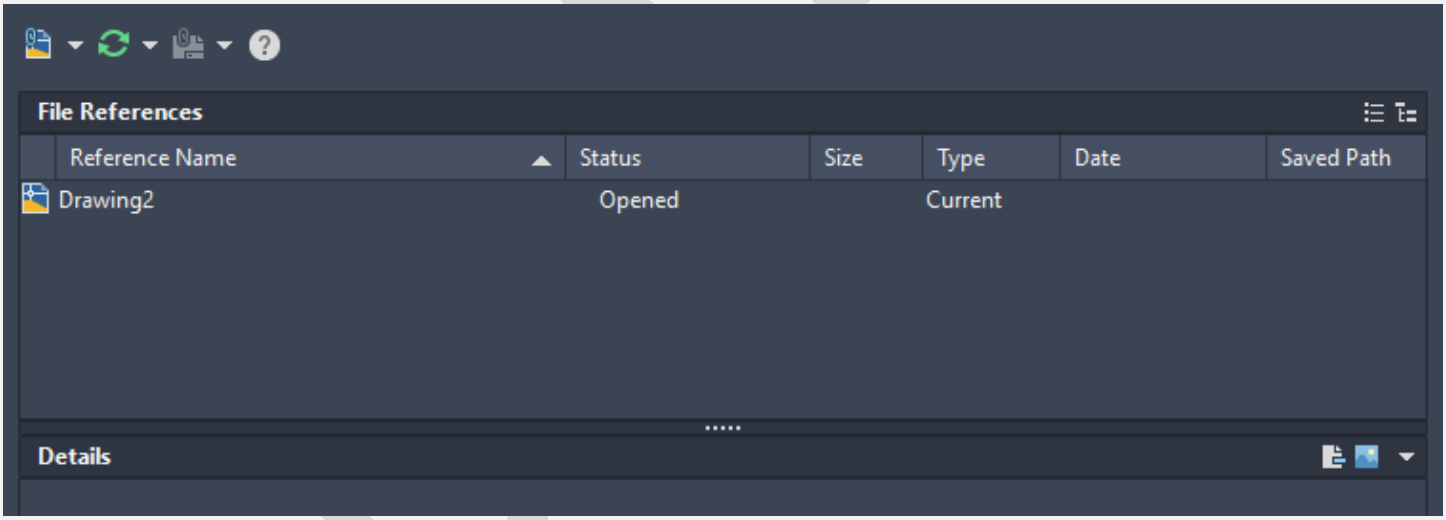
While progressing through a project it will be necessary to reference or add information to your files from multiple different sources. External references, data shortcuts, and copying objects are all methods for adding information to a current drawing from another drawing. External references focus on attaching source information in the same manner it is shown in the source drawing. Data Shortcuts focus on design objects and have more flexibility in terms of presenting how the objects are displayed in the current drawing. Copying objects places the object in the current drawing for manipulation.

** External References and Data Shortcuts have been presented at the beginning of the manual because they may be applicable to many operations within Civil 3D. However, it may be best to revisit this section as you progress through this manual when the topic at hand involves xrefs or data shortcuts.*

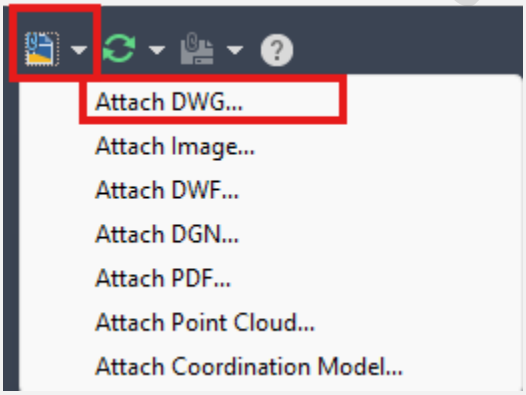
Add External References

An External Reference (XREF) in Civil 3D is a link to another file (like a DWG, PDF, or image) that appears in your current drawing as an overlay, keeping your current file size small and enabling collaboration by letting different users work on separate components. Existing data (like survey data or alignment layouts) can be referenced without embedding the actual content, so changes to the referenced "source" file automatically update in all drawings that use it.

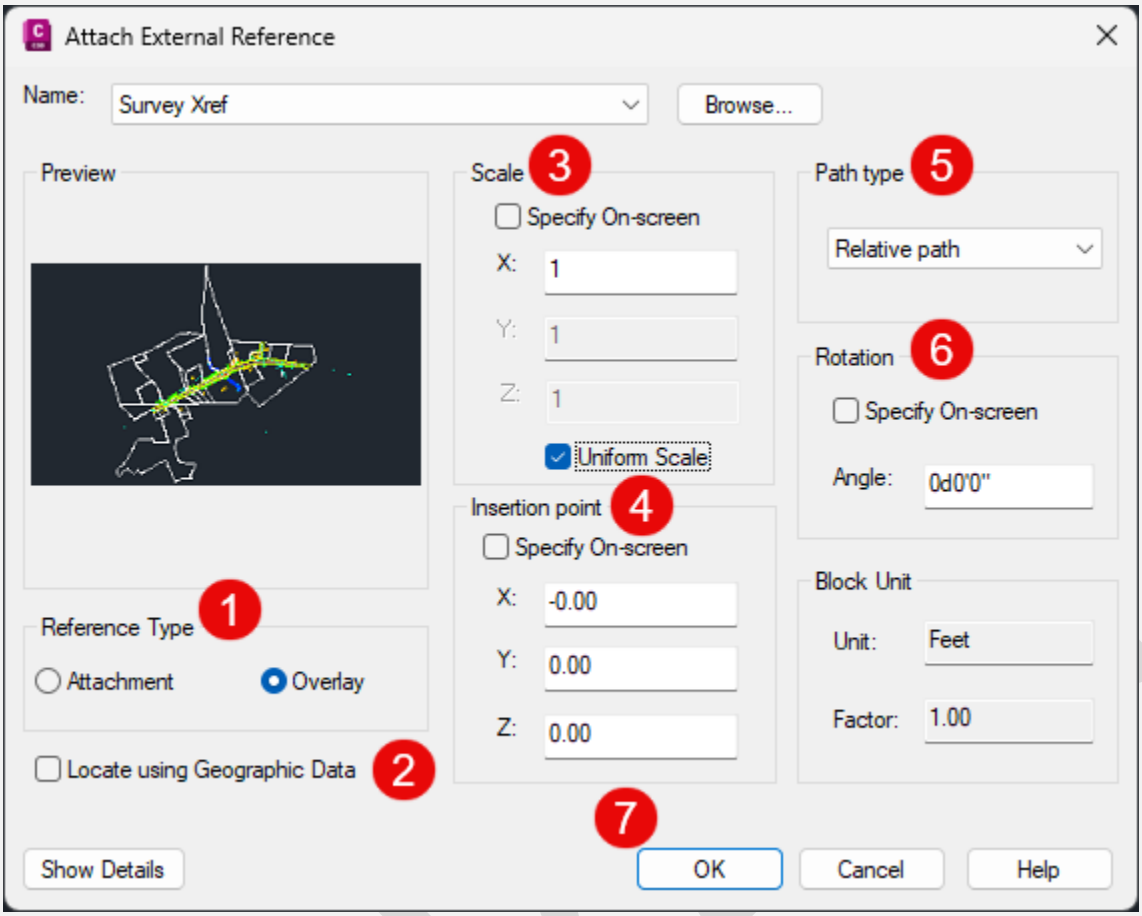
Typing the command XREF into the command line will open the external reference manager. The current drawing will be displayed in the list.



To attach an external reference select the dropdown in the top left corner and for most cases use the Attach DWG option. Select another file type if necessary.

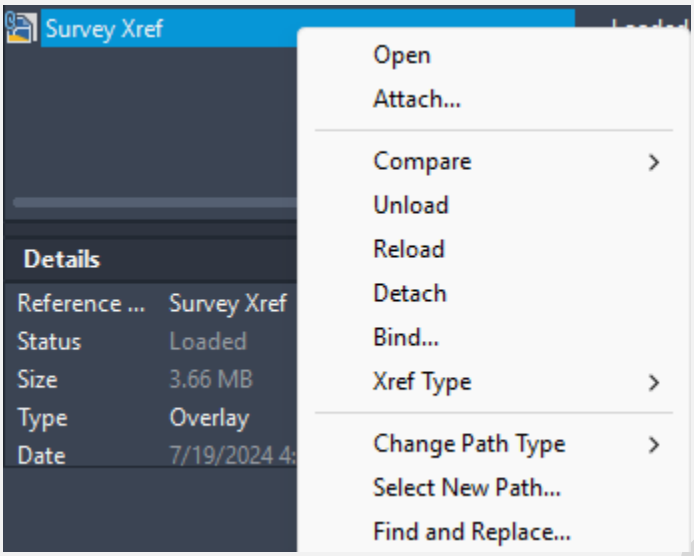


Select the file that is to be referenced from the file explorer.



1. Reference Type: Overlay references only carry the information in the source file to the current file. Attachment reference will carry the source file information as well as any references to the source file. Using overlay references is generally recommended to prevent circular references and file bloat.
2. Locate Using Geographic Data: For this to be available both the source and current drawing have to have a coordinate system set. If that is the case, selecting this will remove all other options except Path type and the coordinate systems will be used to align the files.
3. Scale: The scale can be adjusted here or specified on screen in each axis direction. Best practice would be to leave as 1.
4. Insertion point: The base point from the source drawing will be aligned with the coordinate specified here. Best practice is to maintain at 0,0,0.
5. Path Type: No path will allow the current drawing to search only in its current folder for the given filename. Relative path will assume any referenced files are still in the same relative folder location even if an earlier portion of a file path has changed (ie. parent folder or adjacent folder to current drawing). Full path will search for the source drawing only at the full path given when attached. Best practice is to leave this set to relative path.
6. Rotation: This will rotate the source drawing by the angle specified either here or on screen. Best practice is to maintain at zero degrees.
7. Select OK to attach the reference.

Right click on the external reference for additional options.



Unload: The referenced drawing can be removed from being displayed but still retained as an attachment for future use.

Reload: If the referenced drawing has been unloaded this will return it to a displayed status.

Detach: The referenced drawing can be removed from the current drawing as an attachment.

Bind: See Copy Entire Drawing below.

Copy Objects from External Files

There are multiple different ways to copy objects between files. Three options will be described here with slightly different scopes, there may be other methods as well.

Copy Entire Drawing

One method to copy an entire drawing into your current drawing is to attach the desired drawing as an external reference as previously discussed and then use the bind option.

1. Attach the desired drawing as an external reference.
2. Right click on the external reference in the external reference manager and select Bind.

Bind will bring the objects from the reference file into the current drawing as live objects. There are two options for bind type (Bind or Insert).

- Bind will add a prefix to the layer name of the objects originating from the external reference thereby maintaining the integrity of objects from both drawings
- Insert will merge external reference layers with layers in the current drawing if they match and adopt the current drawings properties.

Copy Multiple Objects

One method to copy multiple objects into your current drawing is to open the drawing with the desired objects in a separate instance then use the COPYBASE command starting from that drawing.

1. Start the COPYBASE command
2. Follow command line prompt: **`COPYBASE`** `Specify base point:`

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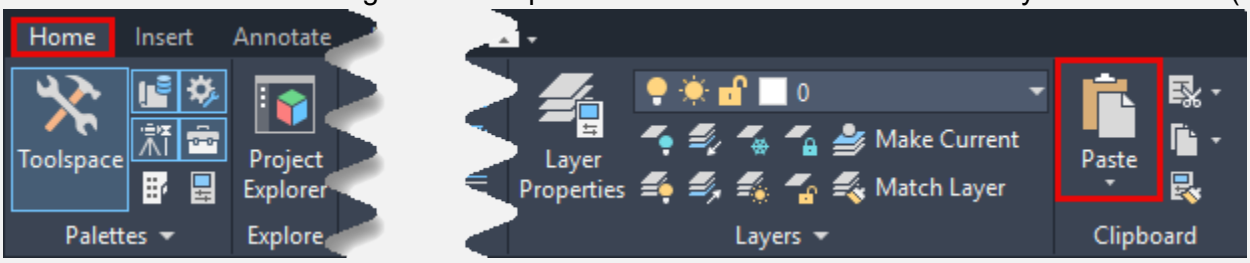
** Select a point that is known in the second drawing or type 0,0,0*

3. Follow command line prompt: **COPYBASE** `Select objects:`
4. Press enter once all desired objects have been selected
5. Switch to the current drawing and select paste from the home tab or use the keyboard shortcut (Ctrl + V)



6. Follow command line prompt: **PASTECLIP** `_pasteclip Specify insertion point:`
   ** Use the same point specified in step 2.*
7. The objects should be copied into the current drawing.

Copy One Object

One method to copy a single object into your current drawing is to attach the desired drawing as an external reference as previously discussed and then use the NCOPY command.

1. Attach the desired drawing as an external reference.
2. Start the NCOPY command
3. Follow command line prompt: **NCOPY** `Select nested objects to copy or [Settings]:`
   ** This command can handle multiple objects but each has to be added individually so it becomes inefficient for more than a few items.*
4. Follow command line prompt: **NCOPY** `Specify base point or [Displacement Multiple] <Displacement>:`
5. Follow command line prompt: **NCOPY** `Specify second point or [Array] <use first point as displacement>:`
6. The object should be copied into the current drawing.

Create Data Shortcuts

In AutoCAD Civil 3D, data shortcuts provide a way to reference and share Civil 3D objects between different drawings without duplicating the objects. Data shortcuts can be used for Surfaces, Alignments (including profiles), Pipe Networks, Pressure Networks, Corridors, and View Frame Groups. By creating a shortcut to an object in a “source” drawing, other drawings can link to that object and receive automatic updates if the original is modified in the “source” drawing.

How Data Shortcuts Work

1. Create Objects: You create your main Civil 3D objects (e.g., an existing ground surface, an alignment, etc.) in a dedicated "source" drawing.

2. Create Data Shortcut: Within that “source” drawing's Toolspace, you right-click on the object and select "Create Data Shortcut".

3. Reference Objects: In other "consumer" drawings, you can reference the data shortcut. The linked object appears in the “consumer” drawing and it’s display can be manipulated using object styles, but its data remains stored in the original “source” drawing. The object cannot be edited from the “consumer” drawing.

4. Dynamic Updates: If the “source” object is edited in the “source” drawing, the data shortcuts in all referenced drawings will show the changes, enabling synchronized project updates.

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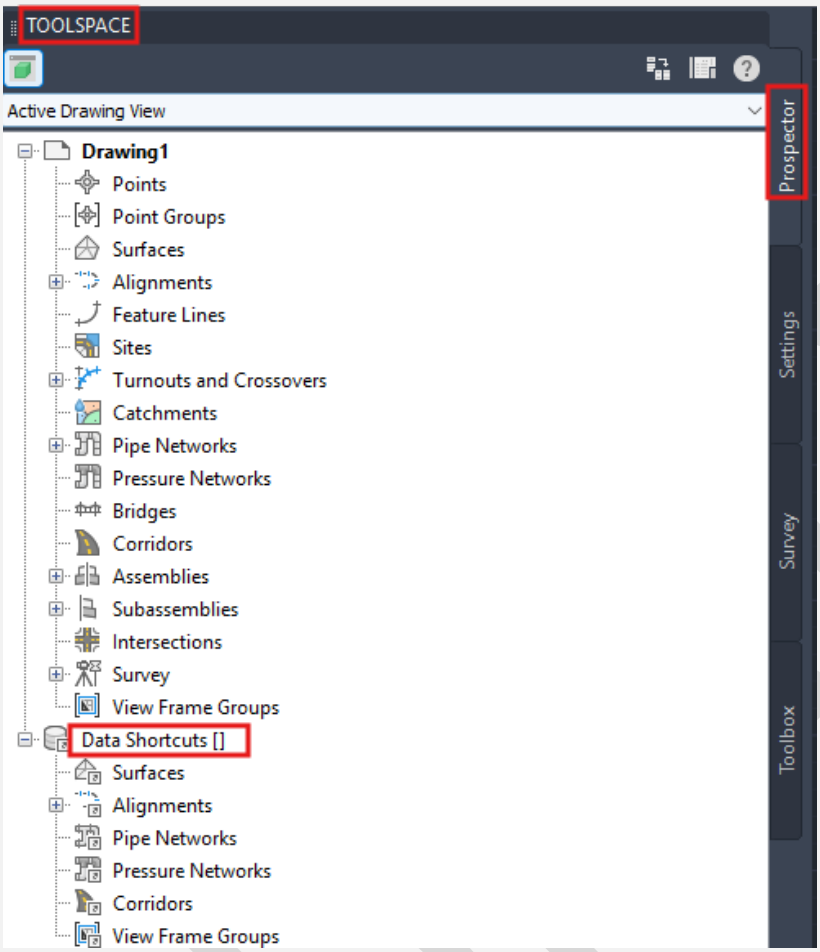
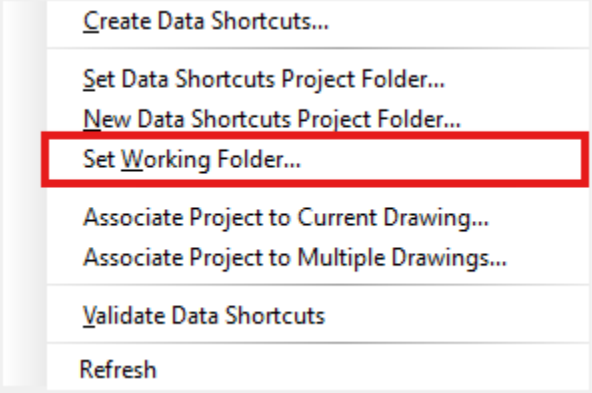
Below are the steps to setup data shortcut folders, add new data shortcuts, and reference the objects into a “consumer” drawing. Depending on whether this is a new project or one that has been worked on previously you may not have to complete all of these steps.

Set Working Folder

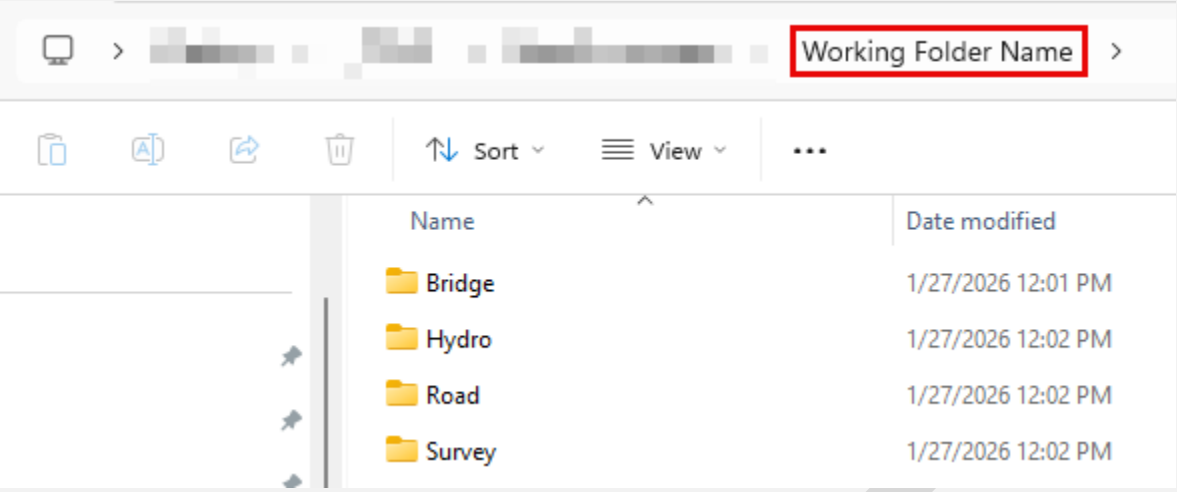
Right click on **Data Shortcuts [ ]** towards the bottom of the prospector tab in toolspace.



Select Set Working Folder (Your working directory)



The working folder will typically be the one that holds all the different disciplines design files or somewhere similar that any project designers would have read/write access to.



The working folder will be one level above the project folder setup in the next step. If the project folder has been setup previously, you may be able to skip directly to step 3 after completing this step.

Set Data Shortcuts Project Folder

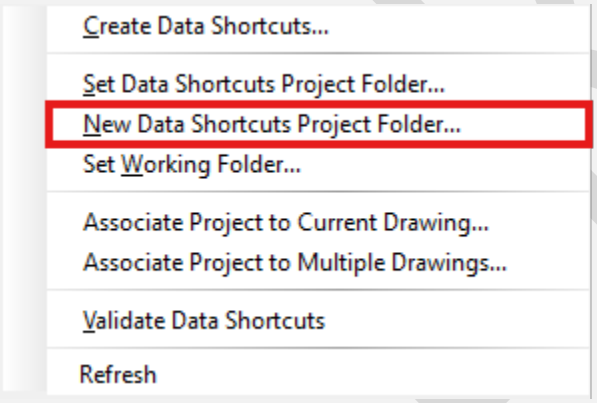
For this step you will either need to use **New Data Shortcuts Project Folder** or **Set Data Shortcuts Project Folder**

a) New Data Shortcuts Project Folder

This step will only need to be completed once for a project, if a project folder has been setup skip to **b)** below to set the Project Folder

Right click on **Data Shortcuts [ ]**.

Select New Data Shortcuts Project Folder…



The working folder should be filled out with the working folder that was just created or selected. Provide the name "**Data Shortcuts**" for the project folder then press OK.
A folder named "Data Shortcuts" will be created within the Working Folder setup previously.

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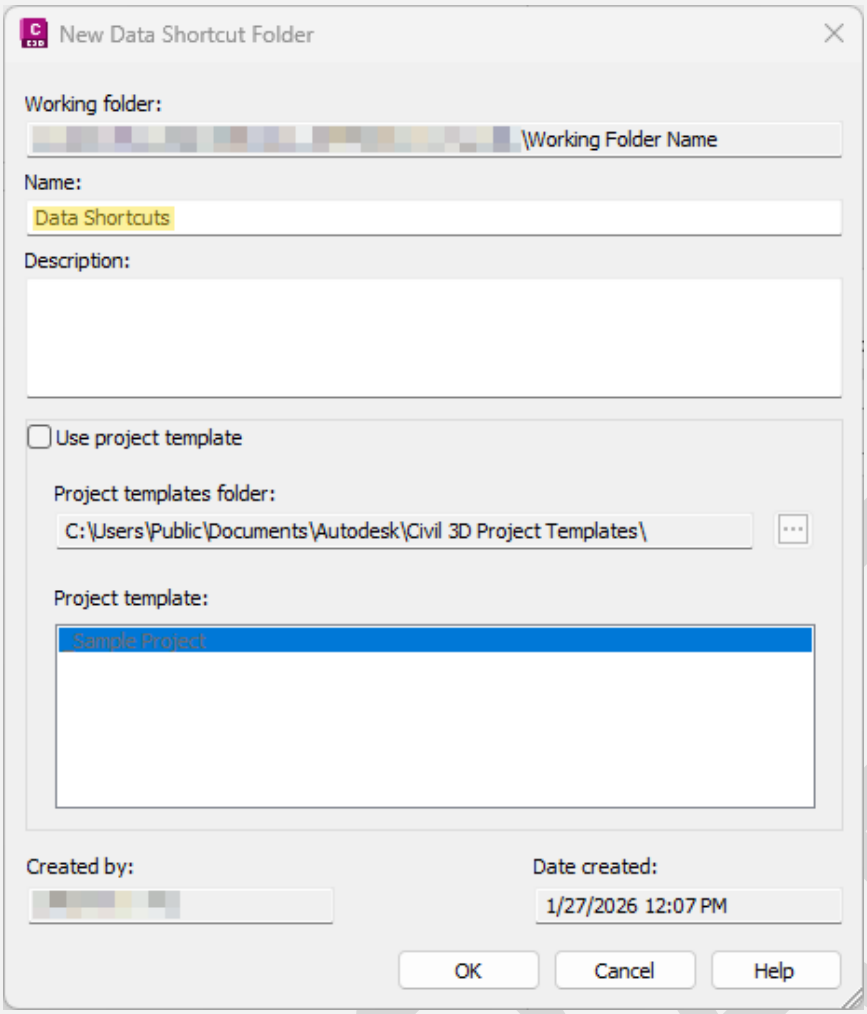
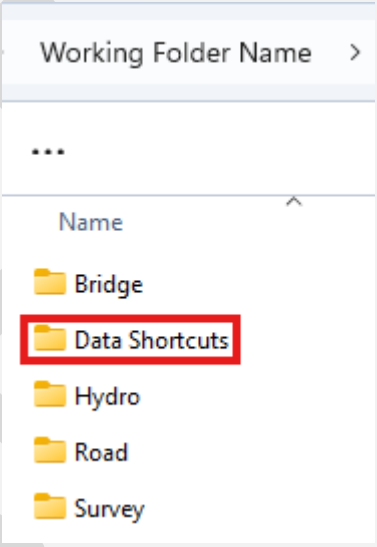
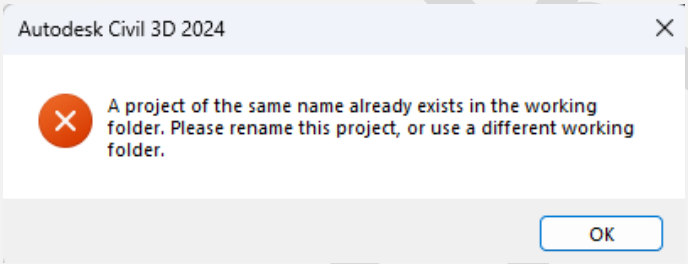




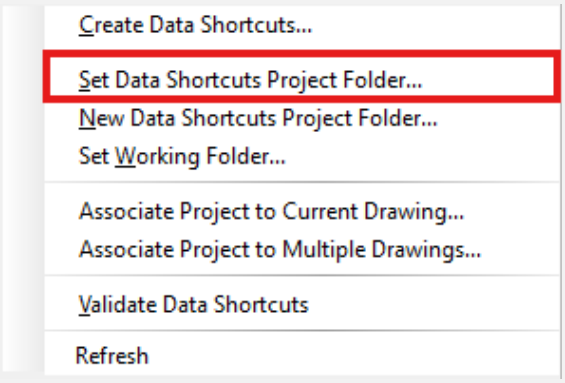
If the name you provide for a folder already exists you will get an error message and you should instead follow the instructions in the next section.



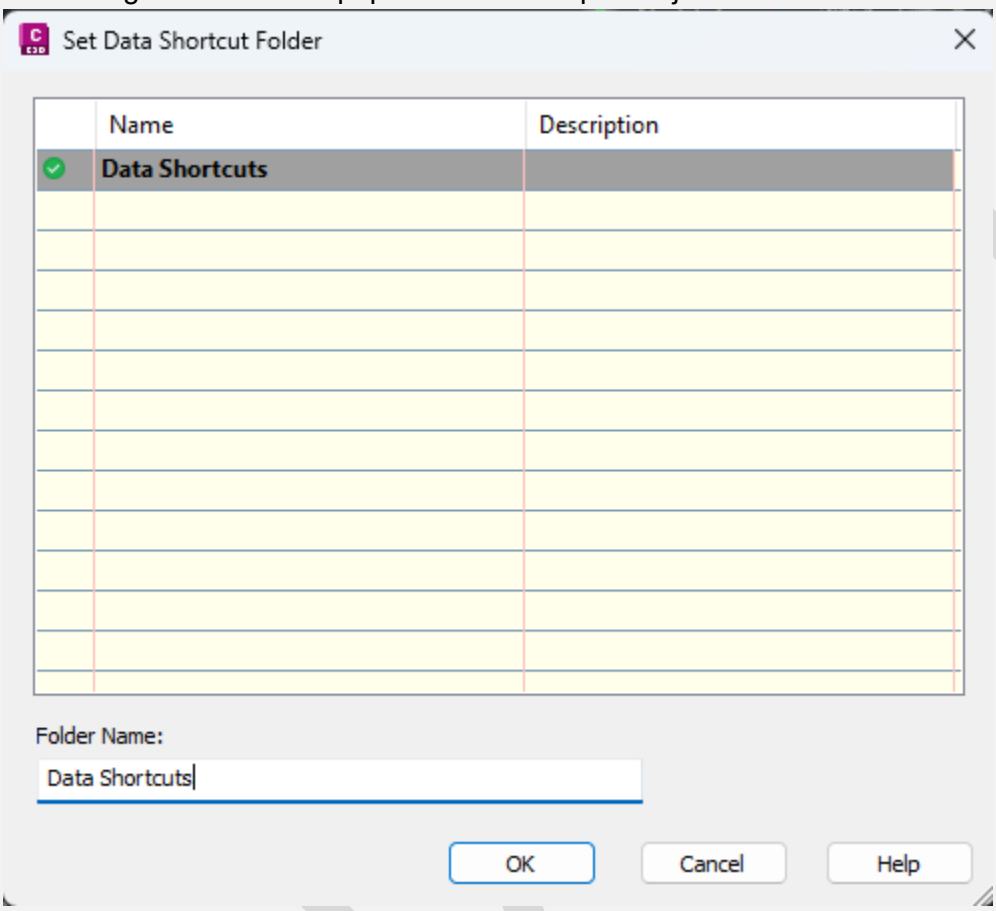
b) **Set Data Shortcuts Project Folder**

Right click on **Data Shortcuts [ ]**.

Select Set Data Shortcuts Project Folder…



The dialog box below will populate with multiple Project Folders if available. Select the appropriate



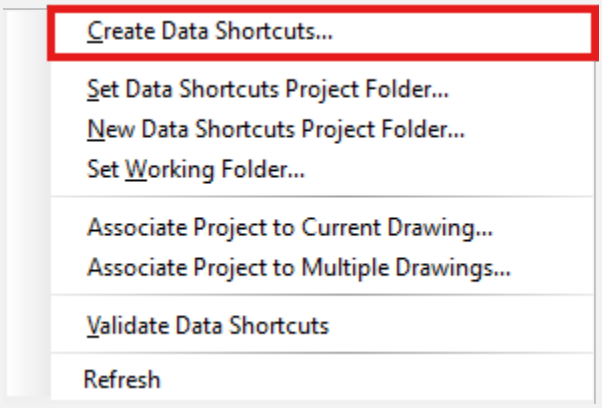
Create Data Shortcut in "source" drawing

If you have any of the items listed below that need to be made available to the rest of the design team a Data Shortcut can be created by following the steps below.

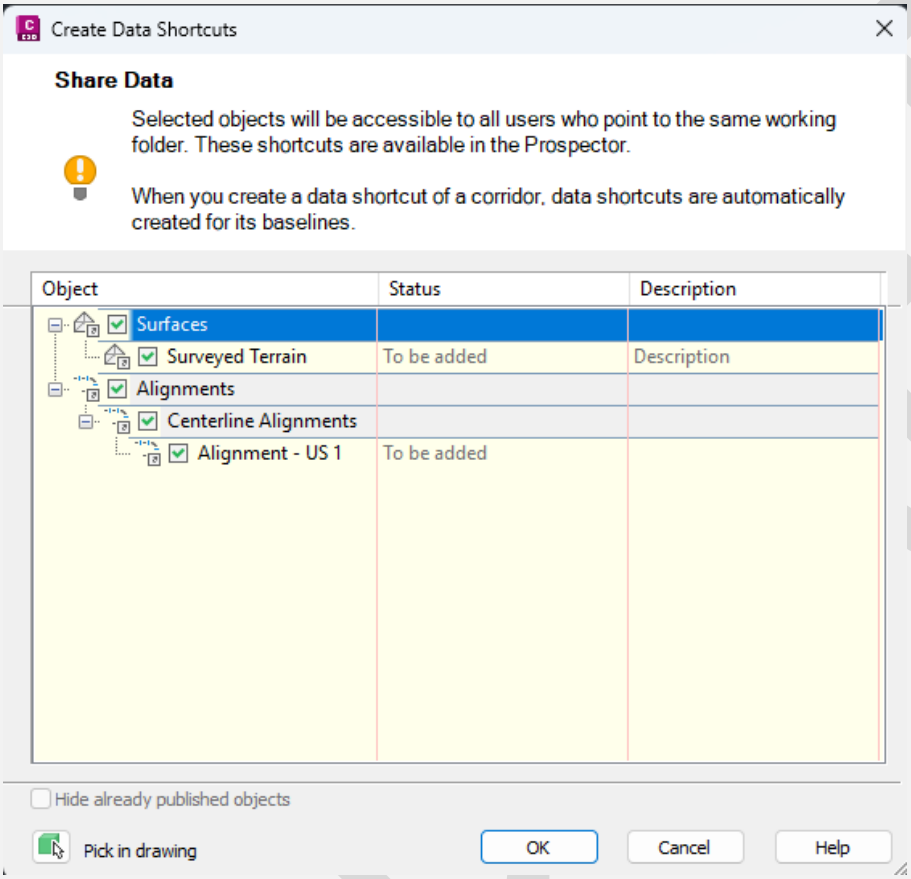
Surfaces
Alignments (including profiles)
Pipe Networks
Pressure Networks
Corridors
View Frame Groups

Right click on **Data Shortcuts [ ]**.

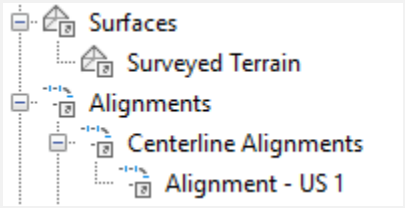
Select Create Data Shortcuts



This dialog will pop up with all available objects in the drawing. Select only the appropriate objects and press OK.



Now if you expand the appropriate categories under **Data Shortcuts [ ]** you will see the objects you just added.

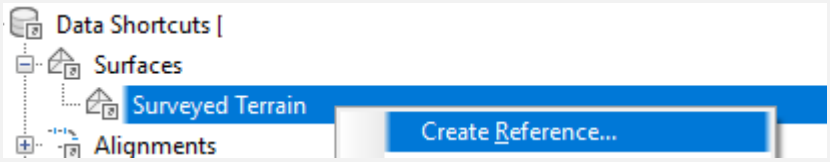


Access Data Shortcuts from "consumer" drawings

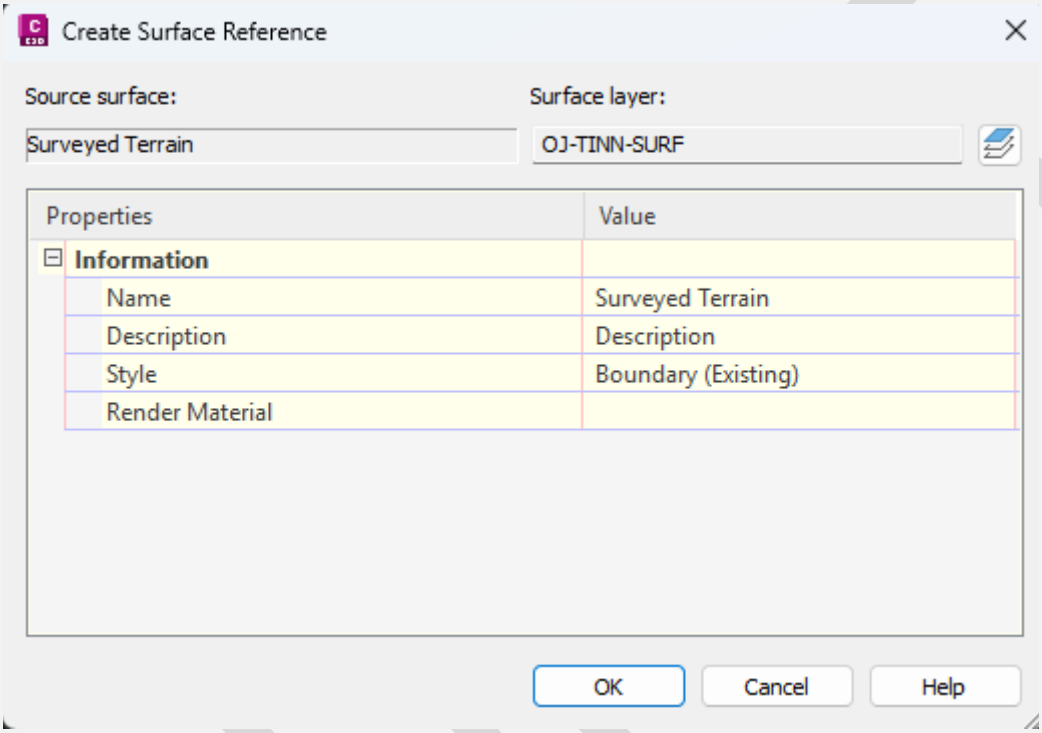
Once a data shortcut has been created it can be accessed from any "consumer" drawing where the same working folder and project folder combination have been selected.

Open the “consumer” drawing by either starting a new file or open an existing file where project design data needs to be linked. See previous steps if working folder and project folder combination are not set to desired location.

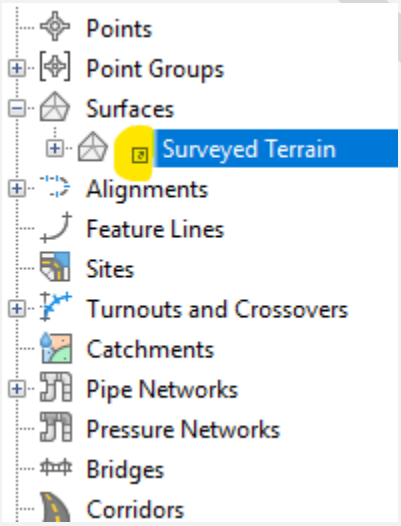
Under **Data Shortcuts [ ]** right click on the object that needs to be linked and select Create Reference



The name, description, style, and render material can all be adjusted if needed or left as is. These can also be changed later via the surface properties menu if needed. Select OK to add the object to the “consumer” drawing.



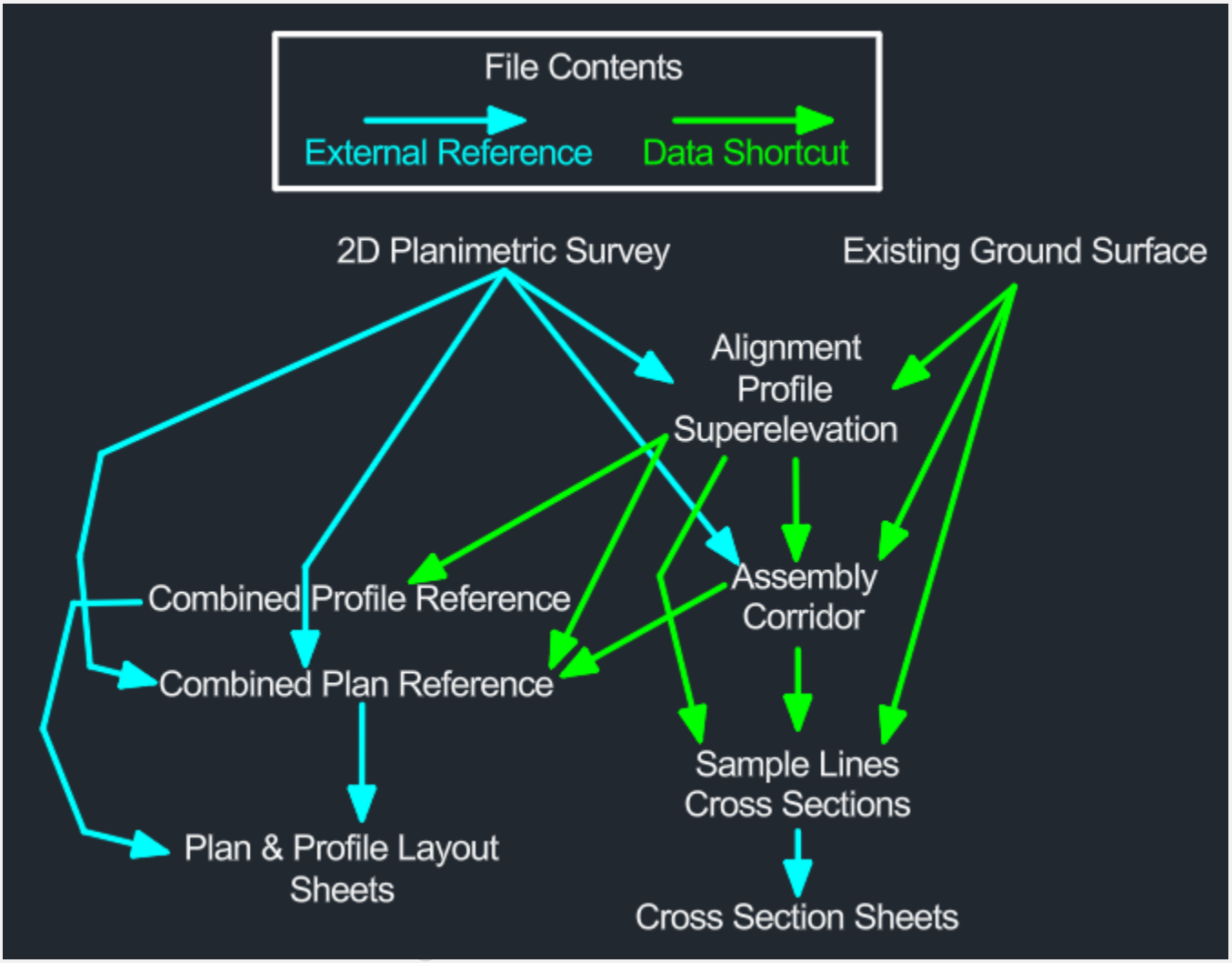
The object should now be available in the in the prospector tab within your “consumer” drawing. Note the shortcut symbol to the left of the object name.



Design

File Management/File Federation

In Civil 3D the objects displayed and used for design are interconnected and reference each other for information. While it is possible to build an entire project within one file (survey data, alignments, profiles, subassemblies, cross sections, etc.), it is recommended to split these design elements into different files to allow multiple users access for design work, keep individual file sizes lower, and provide redundancy in case a file becomes corrupt. The divisions below are suggested based on how the Civil 3D program has been setup to use external references and data shortcuts to share design information.



Folder Naming Conventions

TBD

File Naming Conventions

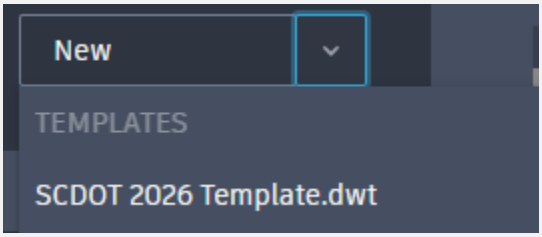
TBD

Setting up a New File

Open Civil 3D using the Civil 3D 2026 SCDOT Shortcut

Start the Civil 3D 2026 application by double-clicking the Civil 3D 2026 Imperial or the Civil 3D 2026 SCDOT icon if available on your desktop or select the program through the Start Menu.

Select: New



Select: SCDOT 2026 Template.dwt

*If this template does not display see the SCDOT Profile section of this manual

Perform a Save As and name the drawing appropriately.

This process will be used to create any new drawings needed while working on a project. It is preferred that new drawings be created rather than using save as. This helps eliminate duplicate information and unnecessary linework that may lead to confusion. In addition within the Civil 3D environment it is essential to reduce the opportunity for files to be referring to duplicate or incorrect objects.

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Setup Project Survey

SCDOT is accepting survey deliverables in the following “native” filetypes Carlson (.dwg), Civil 3D (.dwg), and OpenRoads (.dgn) formats. Therefore, survey setup for projects may look slightly different depending on how the project survey was initially processed. Regardless of which program the survey was “natively” delivered in there should also be the following “neutral” files delivered with the survey, an ascii (.txt) file(s) with point information and multiple (.xml) files with point, alignment and surface information. These additional “neutral” file types will be utilized to help support the survey setup and provide a means of communication between the different softwares.

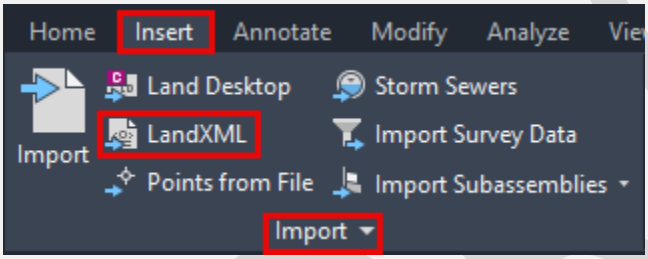
2D Planimetrics

For 2D planimetrics the suggested best practice is to create a copy of the delivered native file into a central folder where it accessible to project designers. This file can then be externally referenced into Civil 3D to be used as a visual aid while designing. While efforts have been taken to reduce discrepancies between these softwares, the programs do not read information the same way. If the file did not originate in Civil 3D there is the potential for the display of an object to be different than originally provided.

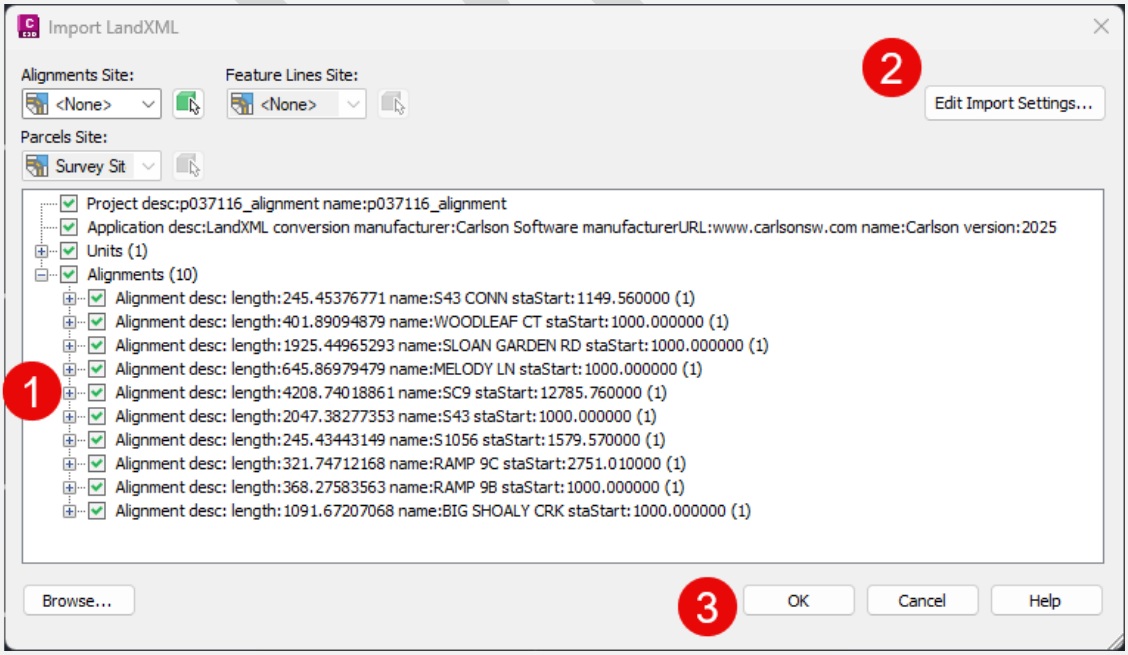
Survey Alignments

Survey alignments may be provided and visible in the native file format, but for the best usefulness as a project progresses importing the alignment to Civil 3D from the delivered .xml is suggested.

To create an alignment from a landxml in Civil 3D, navigate to the “Insert” tab, within the “Import” panel, select “LandXML”.



Select the appropriate .xml file that was delivered with the survey alignment data for the project and select Open.



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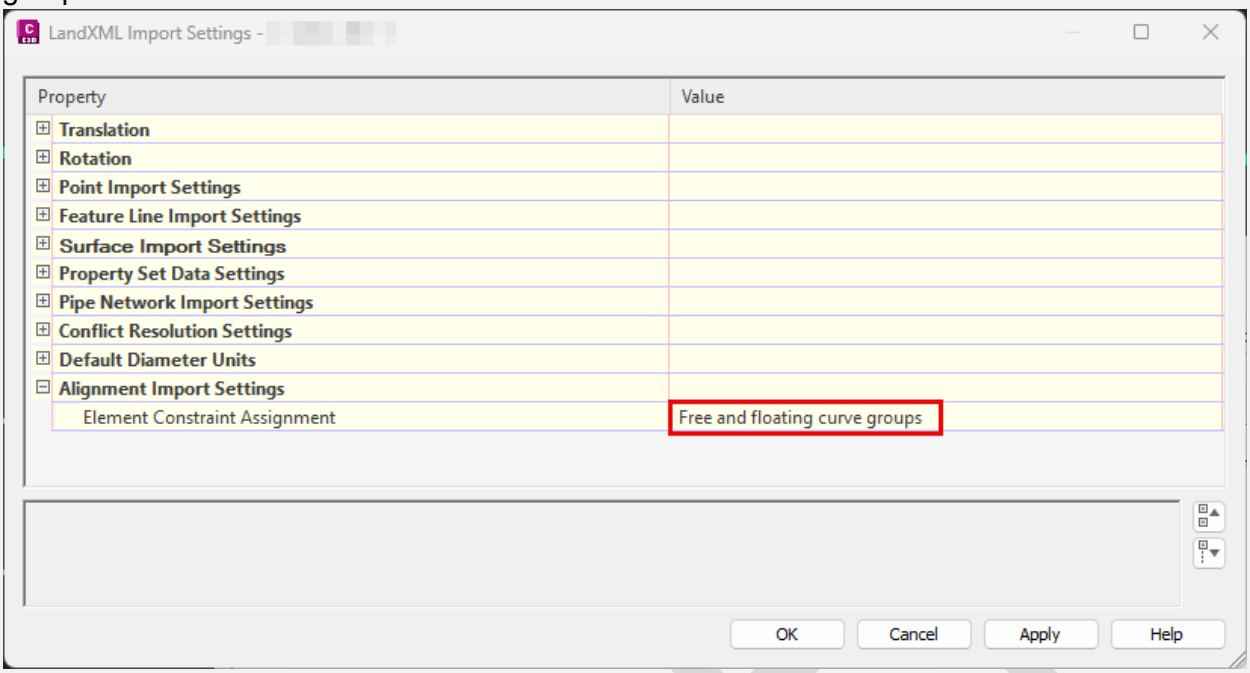
1. Select all appropriate survey alignments for import.
2. Under edit import settings verify that Element Constraint Assignment is set to free and floating curve groups unless otherwise directed.



3. Select OK to import the alignment(s).

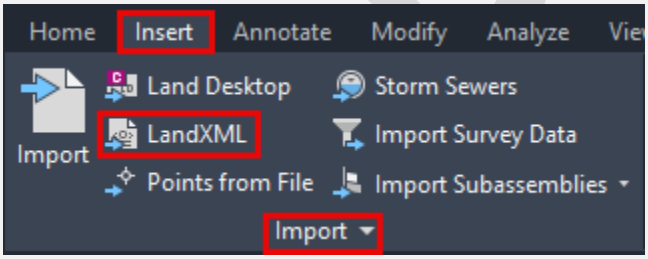
** The alignment style may need to be adjusted see the Create Alignment Dialog Box section for more information on the different alignment styles.*

Once the alignment has been imported a data shortcut can be created so it can be referenced by others designers or in other files.

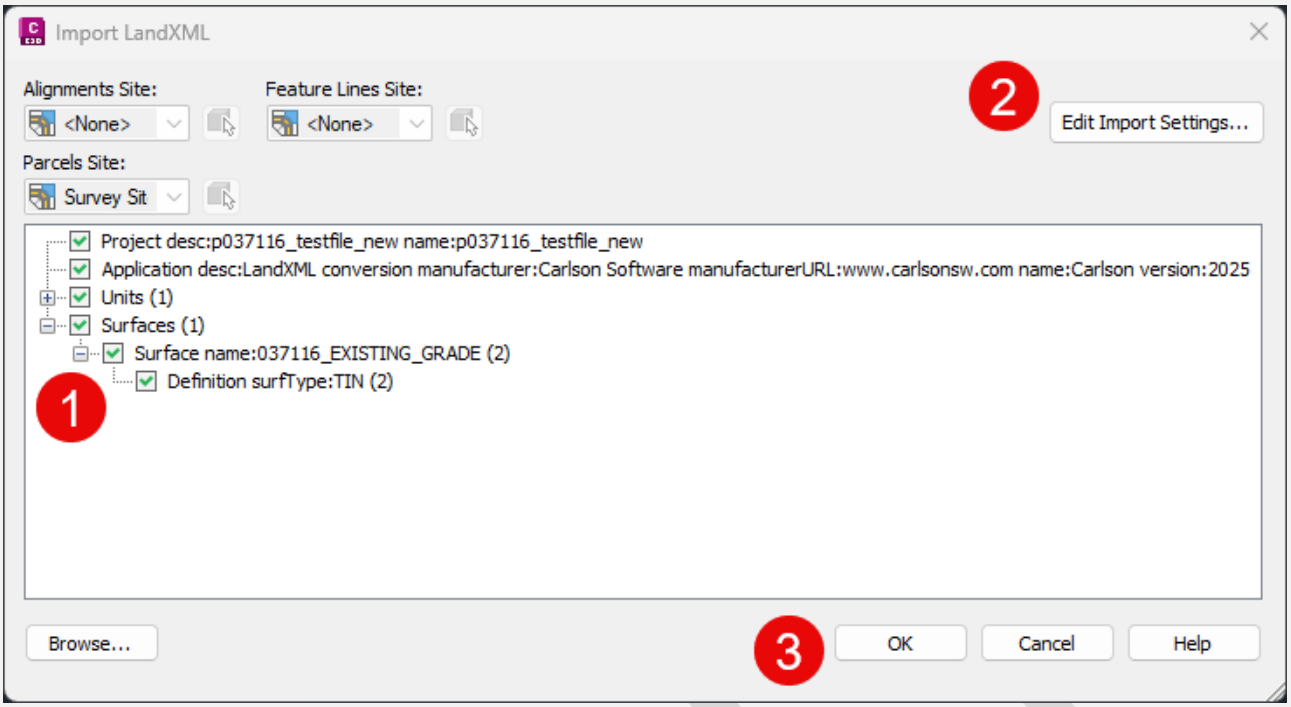
Survey Surfaces

Surveyed existing ground surfaces may be provided and visible in the native file format, but for the utmost functionality as a project progresses, importing the surface to Civil 3D from the delivered .xml is suggested. For existing ground information Civil 3D creates surfaces inside of drawings. These surfaces can then used by alignments and corridors to determine elevations at specific locations.

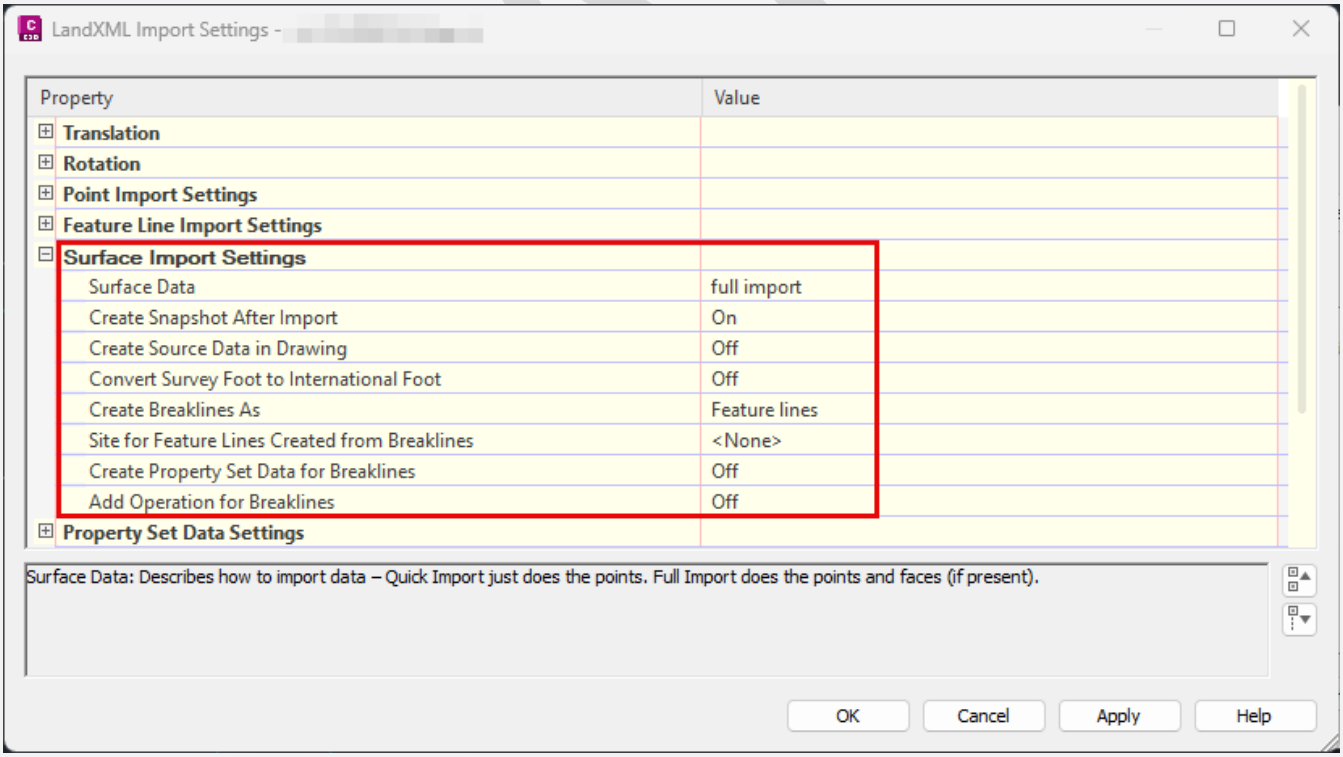
To create a surface from a landxml in Civil 3D, navigate to the “Insert” tab, within the “Import” panel, select “LandXML”.



Select the appropriate .xml file that was delivered with the survey surface data for the project and select Open.



1. Select the appropriate surface information for import.
   Definition data provides point and triangle face information
2. Under Edit import settings verify that the surface import settings are correct. The settings below are provided as a suggested starting point. Project specifics may require adjustments.



3. Select OK to import the surface(s).

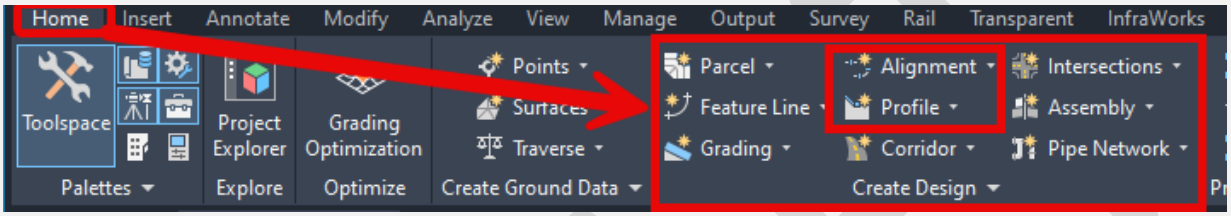
Once the surface has been imported a data shortcut can be created so it can be referenced by others designers or in other files.

Alignments and Profiles

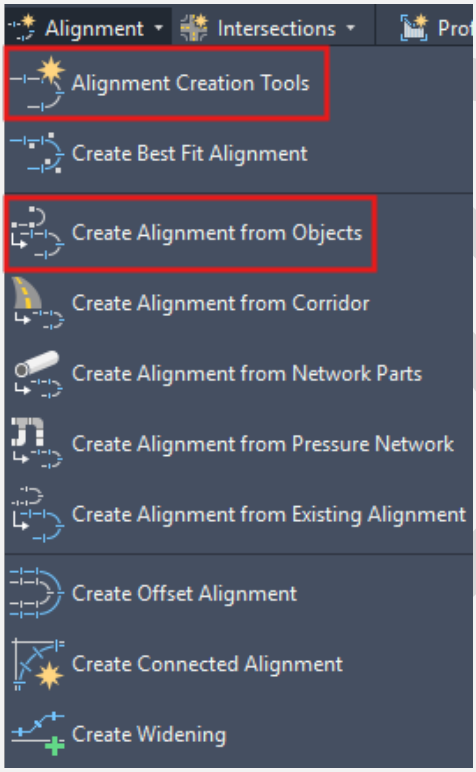
In Civil 3D, creating alignments and profiles are fundamental steps in the design process. An alignment in Civil 3D defines the horizontal path for linear features. The primary linear feature being roadway centerline geometry, but Civil 3D provides additional categories for offset, curb return, and miscellaneous alignments. Alignments can be created from existing lines, polylines, or by using Civil 3D's dedicated layout tools. Once the horizontal alignment is established, profiles can then be generated to define the vertical elevation changes along that alignment. Surface profiles are extracted from existing ground surfaces to visualize the terrain, while layout profiles are designed to represent the proposed finished grade of the project. Both existing and proposed profiles can be superimposed within a profile view, offering a comprehensive understanding of the vertical design.

Alignments

To create an alignment in Civil 3D, navigate to the "Home" tab, within the "Create Design" panel, select "Alignment" to open the menu of options for creating an alignment.



When clicked, the drop-down menu will look like this:



There are many options for how to create an alignment. For this manual Alignment Creation Tools and Create Alignment from Objects will be highlighted and demonstrated. These two processes will cover most of the alignments you may need to create. Each alignment creation method will yield an alignment of equivalent downstream usefulness and quality, therefore the preferred approach is ultimately individual user preference.

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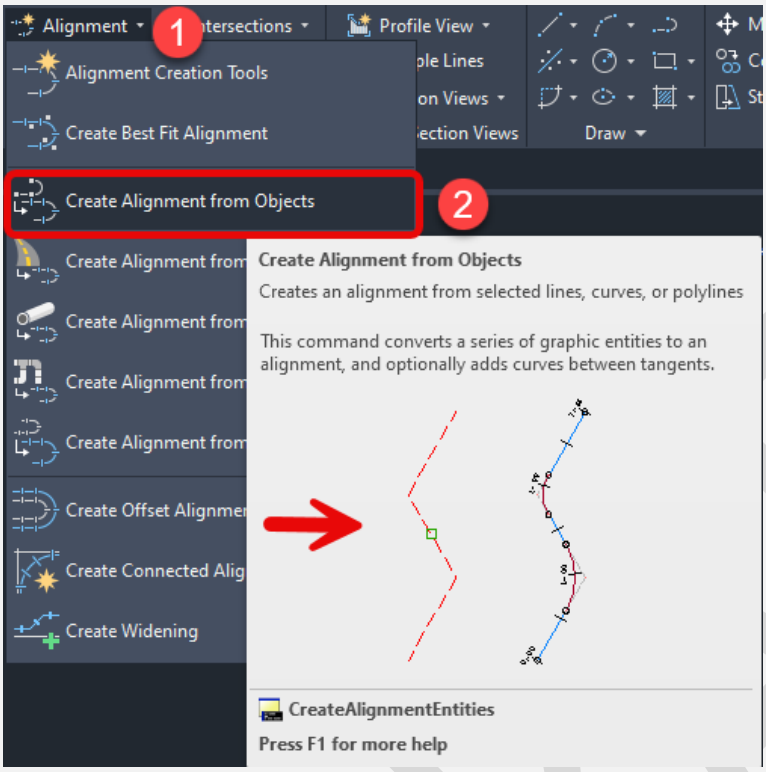
Create Alignment from Objects

When you use the Create Alignment from Objects tool you can convert existing AutoCAD objects, such as lines, arcs, and polylines, into Civil 3D alignment entities. These will either need to be drafted or attached as an xref prior to starting the tool. This method may be more useful when creating surveyed alignments if they have been provided. For additional instruction on drafting alignments from scratch see Appendix B.

Select **Create Alignment from Objects**.



Once selected, you will be prompted at the command line with the following steps:

1. `Select lines/arcs or polylines to create alignment.`

2. `Press Enter to accept alignment direction or [Reverse]` – This option sets the direction of the stationing for the alignment. There will be arrows displayed on the objects showing the direction of stationing if you press Enter. If you type R then hit the Enter key, this will reverse the direction of the alignment and stationing.

3. See Create Alignment dialog box below to input the alignment specific parameters.

4. The alignment will be created in the file once you select OK.

** If an alignment has been created via objects and a PI is not behaving as expected it may be useful to Solve PI. Ensure that under alignment properties on the Point of Intersection tab the selection is set to "By change in alignment direction" If that is set you should be able to hover over the implied PI and choose the Solve PI option.*

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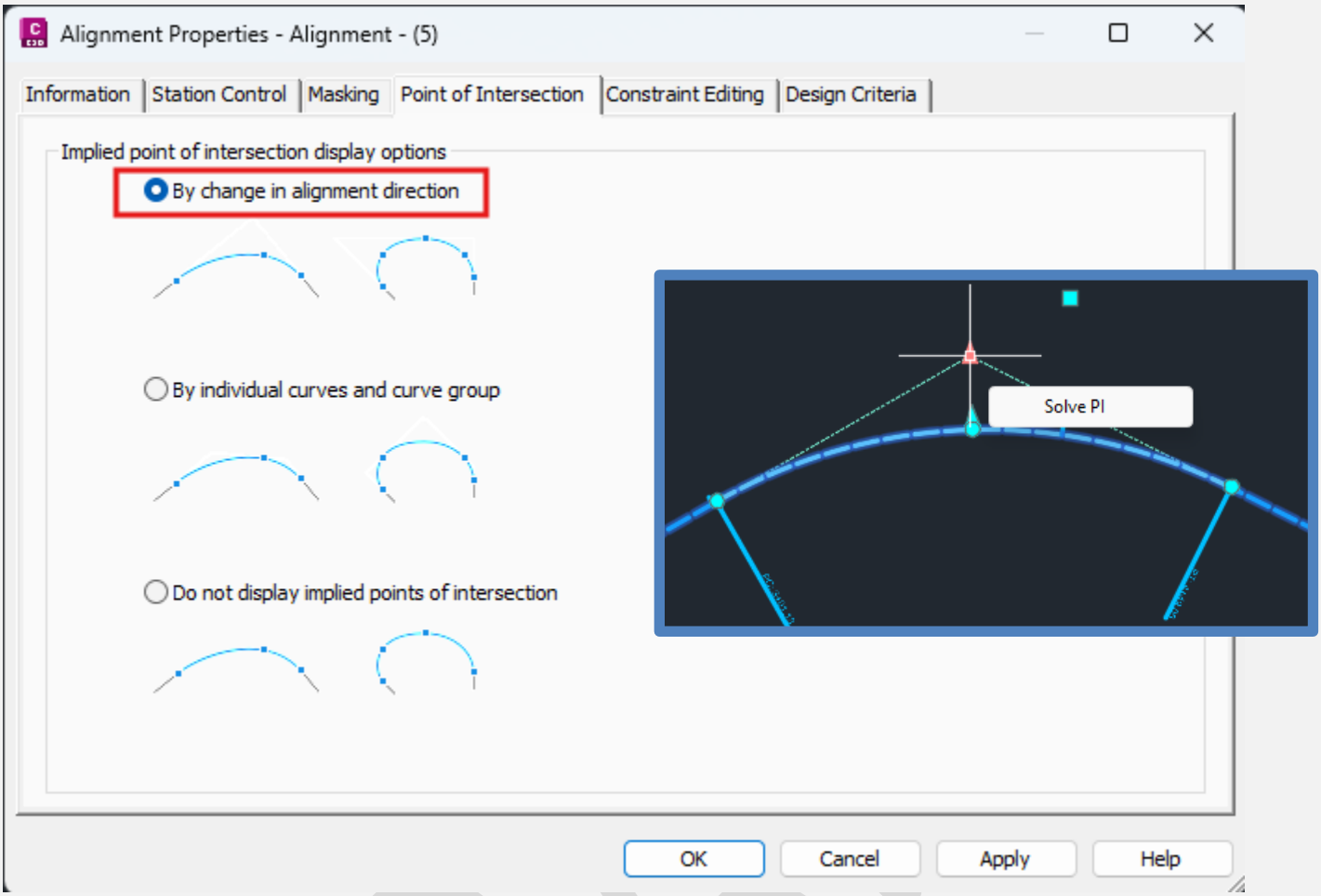
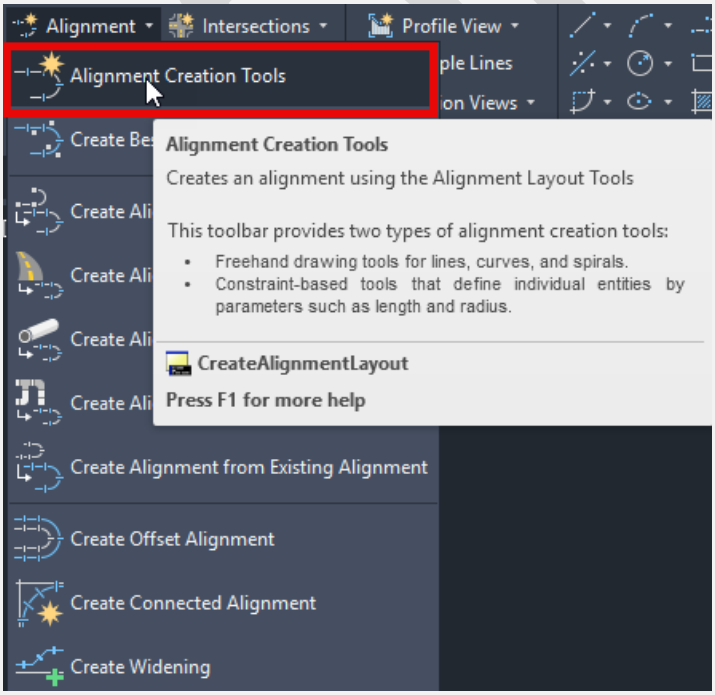


Alignment Creation Tools

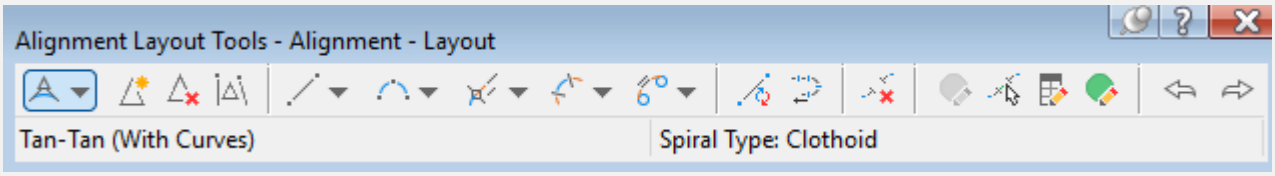
When you create an alignment using the Alignment Creation Tools you will start the tool first and then draft the alignment. This method may be more useful when creating proposed alignments for design.

Select **Alignment Creation Tools**.

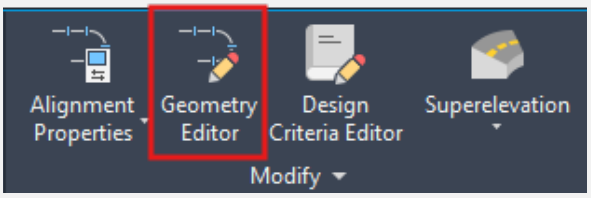


1. See the Create Alignment Dialog Box section to input the alignment specific parameters.

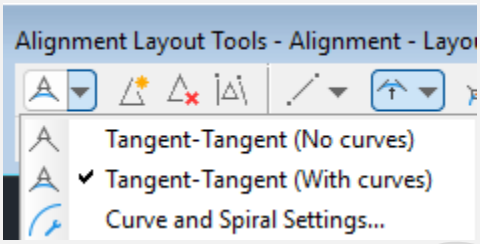
2. The Alignment Layout Tools will appear once you select OK.



** To access Alignment Layout Tools later for alignment edits, select the alignment to be edited, then in the contextual tab modify panel select the **Geometry Editor**.*



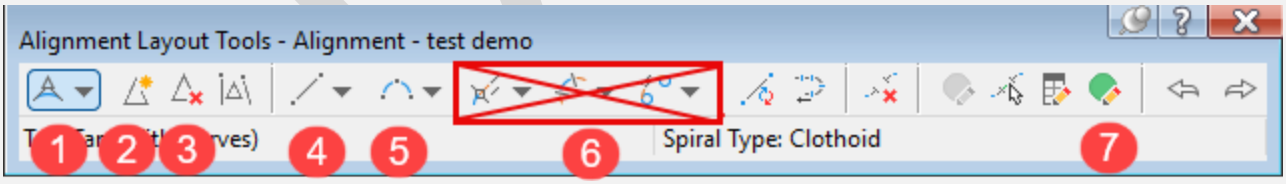
3. For a basic roadway centerline alignment select the **Tangent-Tangent (With Curves)**.



4. You will be prompted with `Specify start point` for the first PI then `Specify next point` for each subsequent PI. The curves will be added based on the default radius provided in the Create Alignment Dialog Box. The curve radii and PI's can be adjusted after the alignment is created to match project constraints.

5. Press enter to end the command.

While the **Tangent-Tangent (With Curves)** tool is a quick way to lay out an alignment with all the entities included, individual lines and curves can be drawn as well. These can be drawn in any order and connected later to form the alignment. Below are descriptions for some of the more frequently used tools.



1. **Tangent-Tangent (No Curves)** or **Tangent-Tangent (With Curves)**: Layout an alignment by selecting PI points in sequential order.
2. **Insert PI**: Add PI to line segment within existing alignment
3. **Delete PI**: Remove a PI from an existing alignment

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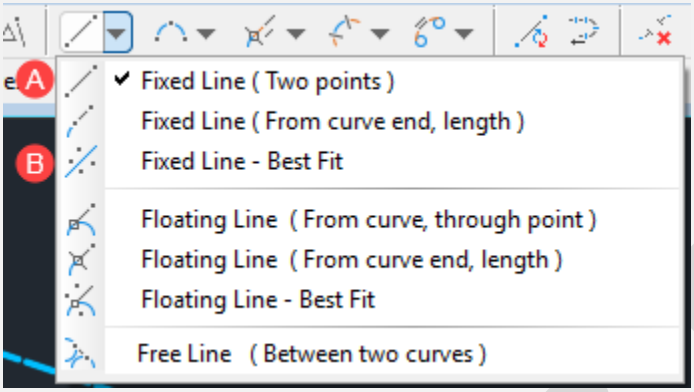
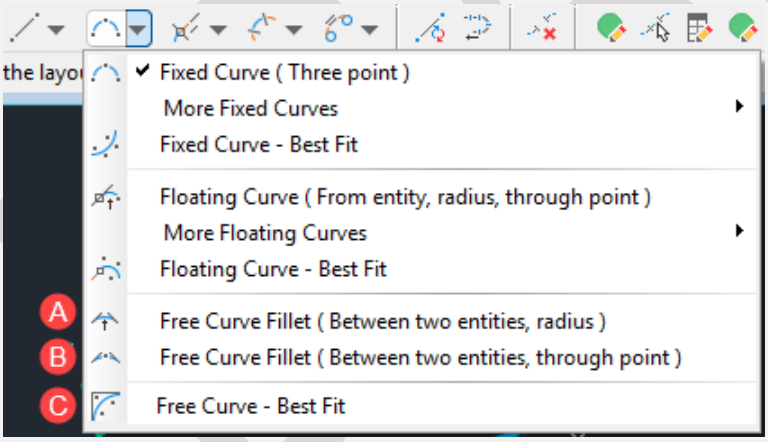
4. Line Commands: Any of these commands may be used to create lines for an alignment. The two described below are likely to be used the most.
    A. **Fixed Line (Two Points)**: Each end of the line has a defined location.
    B. **Fixed Line – Best Fit**: The line will be defined by selecting a group of points which control the best fit. ** After the line is created and added to the alignment it is possible to remove the line's relationship to the points it was created from.*



5. Curve Commands: Any of these commands may be used to create curves for an alignment. The three described below are likely to be used the most.
    A. **Free Curve Fillet (Between two entities, radius)**: The curve will be tangent to the two selected entities with a set radius.
    B. **Free Curve Fillet (Between two entities, through point)**: The curve will be tangent to the two selected entities and pass through a specified point.
    C. **Free Curve - Best Fit**: The curve will be tangent to the two selected entities and the radius defined by selecting a group of points to best fit to. ** After the curve is created and added to the alignment it is possible to remove the curve's relationship to the points it was created from.*



6. Spiral Commands: SCDOT does not use spiral curves for alignments.
7. **Alignment Grid View**: Opens the Panorama window and displays the alignment entities in a table format such that they can be reviewed and/or edited.

Fixed vs. Floating vs. Free

In Civil 3D, alignment entities can be Fixed, Floating, or Free, which determines their Tangency Constraints and how they behave when edited. The terminology can be confusing when first getting started.

- Fixed entities are geometrically defined and are independent of other entities. They have no tangency constraints to other entities and they do not maintain tangency if edited.
- Floating entities are geometrically defined and have a tangency constraint to either the preceding or succeeding entity. They will maintain tangency with the entity they are constrained to if edited.
- Free entities have tangency constraints to both the preceding and succeeding entities, ensuring tangency to both and moving to maintain these relationships.

A typical alignment would have tangency constraints similar to below

No.	Type	Tangency Constraint
1	Line	Not Constrained (Fixed)
2	Curve	Constrained on Both Sides (Free)
3	Line	Not Constrained (Fixed)
4	Curve	Constrained on Both Sides (Free)
5	Line	Not Constrained (Fixed)
6	Curve	Constrained on Both Sides (Free)
7	Line	Not Constrained (Fixed)

** The video link below does a great job of explaining alignment creation and how to use the tools effectively. https://youtu.be/l05LCmv2K2Q?t=465 From 7:45 to 32:00 covers the topics discussed here.*

Create Alignment Dialog Box

In the Create Alignment dialog box, fill out and make the following assignments.

1. **Name:** Provide an appropriate alignment name. For centerline alignments the appropriate road name and number should usually be used (Ex. US 1 (Two Notch Road) or SC 12 (Forest Drive)). This name can be changed later and can also be used with the label tool for automatic labeling.
2. **Type:** Choose the appropriate type for the subject alignment, see below for additional guidance
    a. Centerline: This type can be created from existing geometry or by using the layout tools. It is the most common type and can have design criteria applied to it, such as design speed and superelevation. A centerline alignment can also act as a "parent" to other objects like profiles, corridors, offset alignments, curb return alignments, and intersections.
    b. Offset: This type is dynamically linked to a "parent" alignment (of any type). Changes to the parent alignment's geometry or stationing automatically update the offset alignment's position. A varying offset value can be used by adding widening regions.
    c. Curb Return: This type is designed to connect two intersecting alignments and their corresponding profiles. They are typically created automatically using the Intersection Wizard or the Connected Alignments tool.
    d. Rail: Specialized for railroad design. (Not used for SCDOT Projects)
    e. Miscellaneous: This type is the simplest and most unmanaged. It does not have design criteria properties and is not dynamically linked to other alignments. This offers more editing freedom but lacks the automated rules of other types.
3. **Start Station:** Enter the start station for your alignment. ** This can be edited later.*

General

4. **Site:** Leave this as None unless a site has been setup for the project.
5. **Alignment Style:** Select the appropriate style. This controls the visual display of an alignment by setting layers, colors, line styles and other attributes.
    a. Relocation: Used where an alignment differs from the existing/surveyed centerline.
    b. Surveyed: Displays the existing/surveyed centerline.
    c. Surveyed [Point Markers]: Displays the existing/surveyed centerline and includes PI markers
6. **Alignment Label Set:** Choose the appropriate label set. Label sets should be considered as a starting point for alignment labeling. Project specific adjustments can be made later in Alignment Label Properties
7. **Conversion Options:** ** These options are only displayed when creating an alignment from objects.*
    a. Add curves between tangents: Uncheck this box to retain connected tangents if desired.
    b. Erase existing entities: Uncheck this box to retain the polyline, line, etc. once the alignment object is created.

Design Criteria

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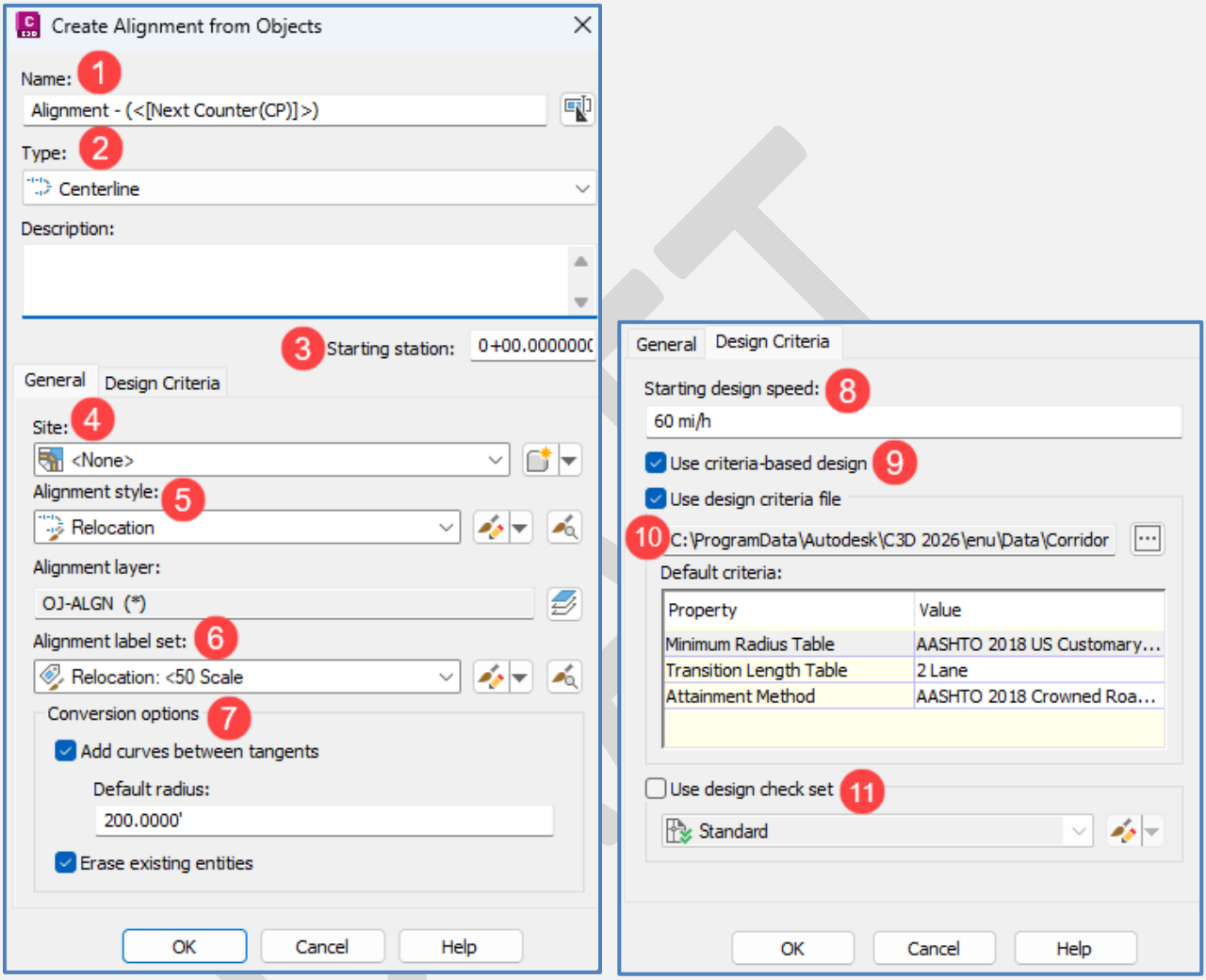
8. **Starting Design Speed:** Set the alignment's design speed. ** The design speed can be split into station ranges later in the Alignment Properties.*
9. **Use Criteria Based Design:** If this is left unchecked the alignment will not be compared against any design criteria.
10. **Use Design Criteria File:** Filepath below, adjust year to match installed Civil 3D version
    a. C:\ProgramData\Autodesk\C3D 2026\enu\Data\Corridor Design Standards\Imperial_Autodesk Civil 3D Imperial (2018) Roadway Design Standards.xml
11. **Use Design Check Set:** Leave unchecked, Not used by SCDOT at this time.

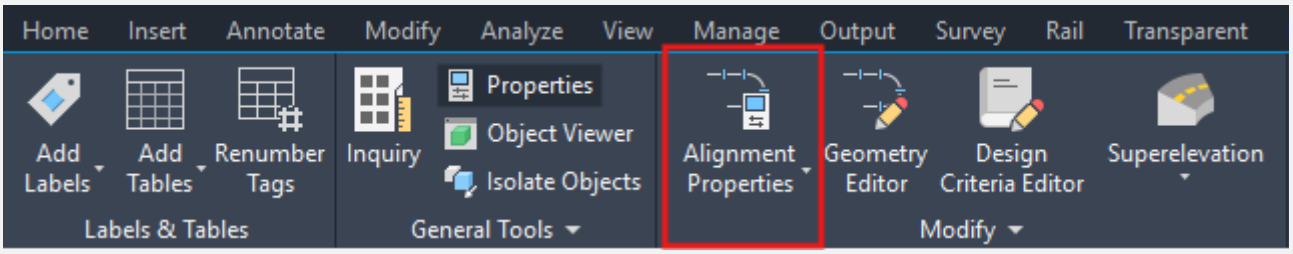


Select OK to proceed.

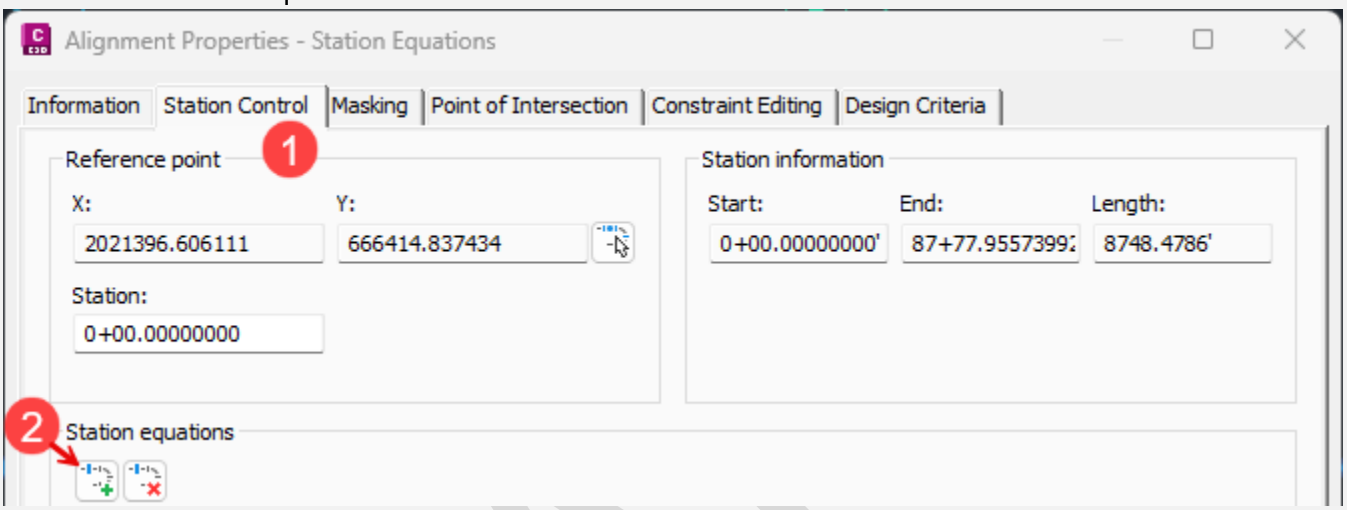
Add Station Equation

If a station equation is needed within an alignment follow the steps below to add it. Once the station equation has been added to the alignment see How To Add Station Equation Labels to adjust the plan labels for proper display.

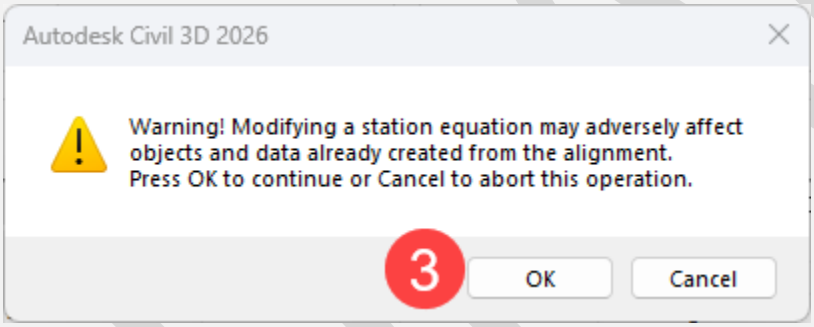
Left click on an alignment to select it.
From the contextual tab select Alignment Properties



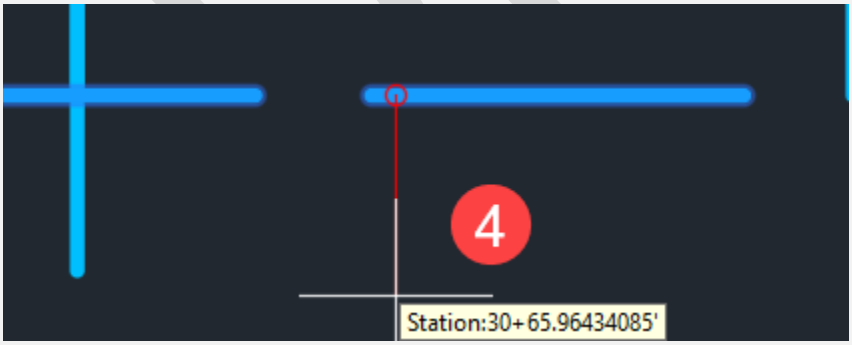
1. Select the Station Control tab
2. Select “Add station equation”



3. Select ok when warning appears if you are sure you want to make this change.

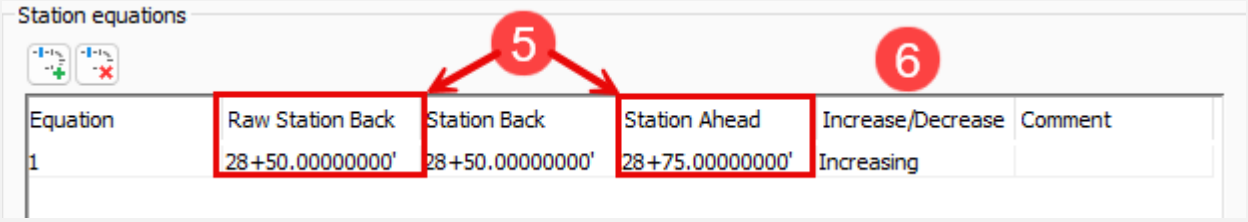


4. `EDITALIGNMENTPROPERTIES Specify station along baseline:`

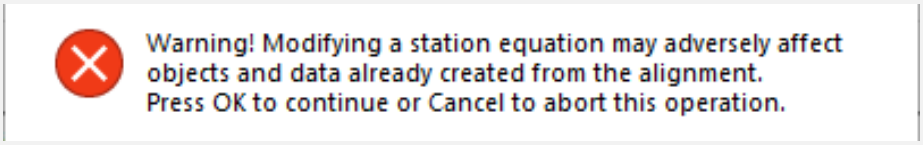


** Either type the station into the command line without the + sign or select a location on the screen.*

5. “Raw Station Back” and “Station Ahead” can be edited to the correct stations as needed.
6. Increase/Decrease should be left as increasing. This specifies whether the ahead stationing increases or decreases.



Select OK, there may be an additional warning.



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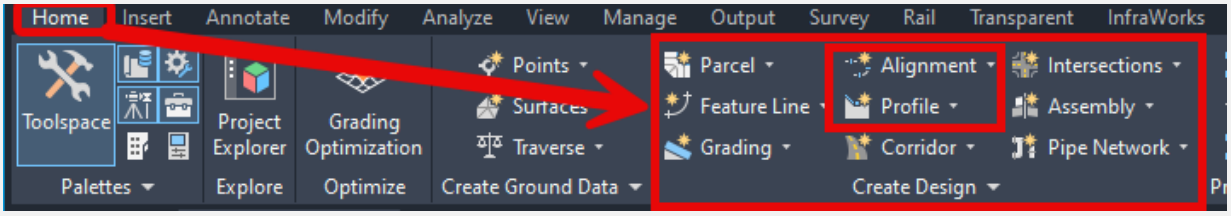
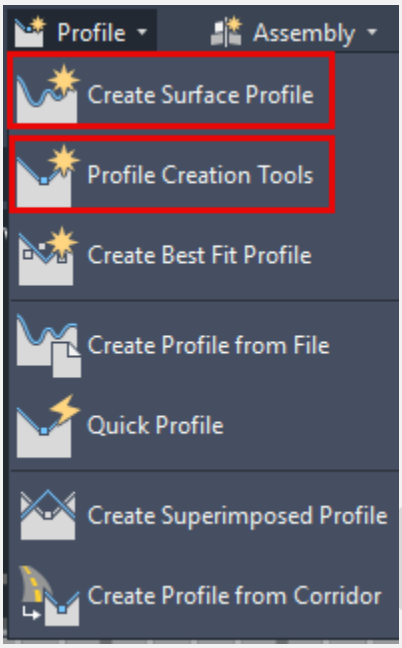
Profiles

To create a profile in Civil 3D, navigate to the "Home" tab, within the "Create Design" panel, select "Profile" to open the menu of options for creating a profile.



When clicked, the drop-down menu will look like this:



There are multiple options for how to create a profile. For this manual Create Surface Profile and Profile Creation Tools will be highlighted and demonstrated. These two processes will cover most of the profiles you may need to create. Create Surface Profile is primarily used for the creation of existing ground profiles and Profile Creation Tools is primarily used for the creation of proposed profiles. The Create Profile View functionality will also be covered in this section, as it is the method for viewing any profiles that have been created and is a prerequisite for the Profile Creation Tools.

Create Surface Profile

The Create Surface Profile tool creates a two-dimensional representation of a chosen surface (usually existing ground surface) along a horizontal alignment. To use it, there will need to be an available surface and horizontal alignment.

Select **Create Surface Profile**.

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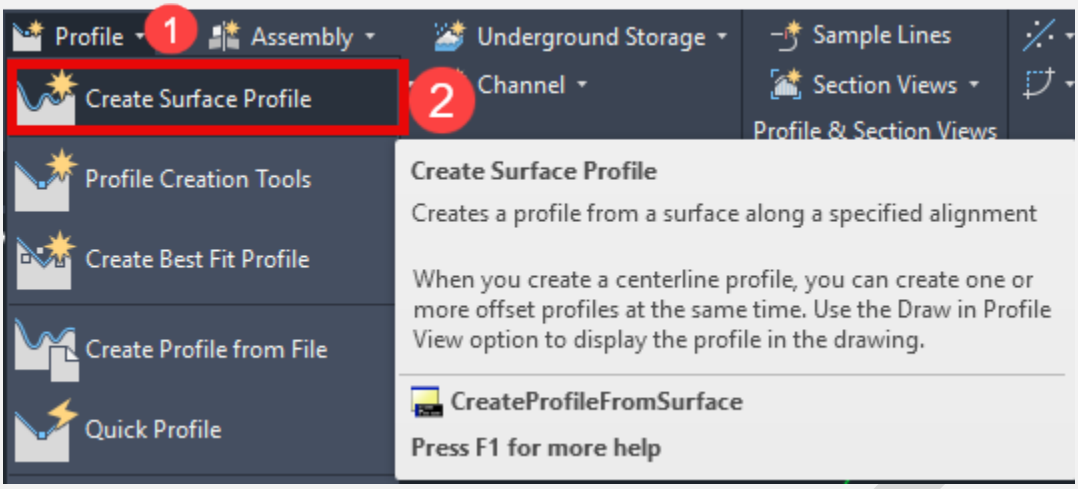


This will create a popup box.

1. Select the desired alignment.

2. Select the desired surface.

3. Select the appropriate station range.

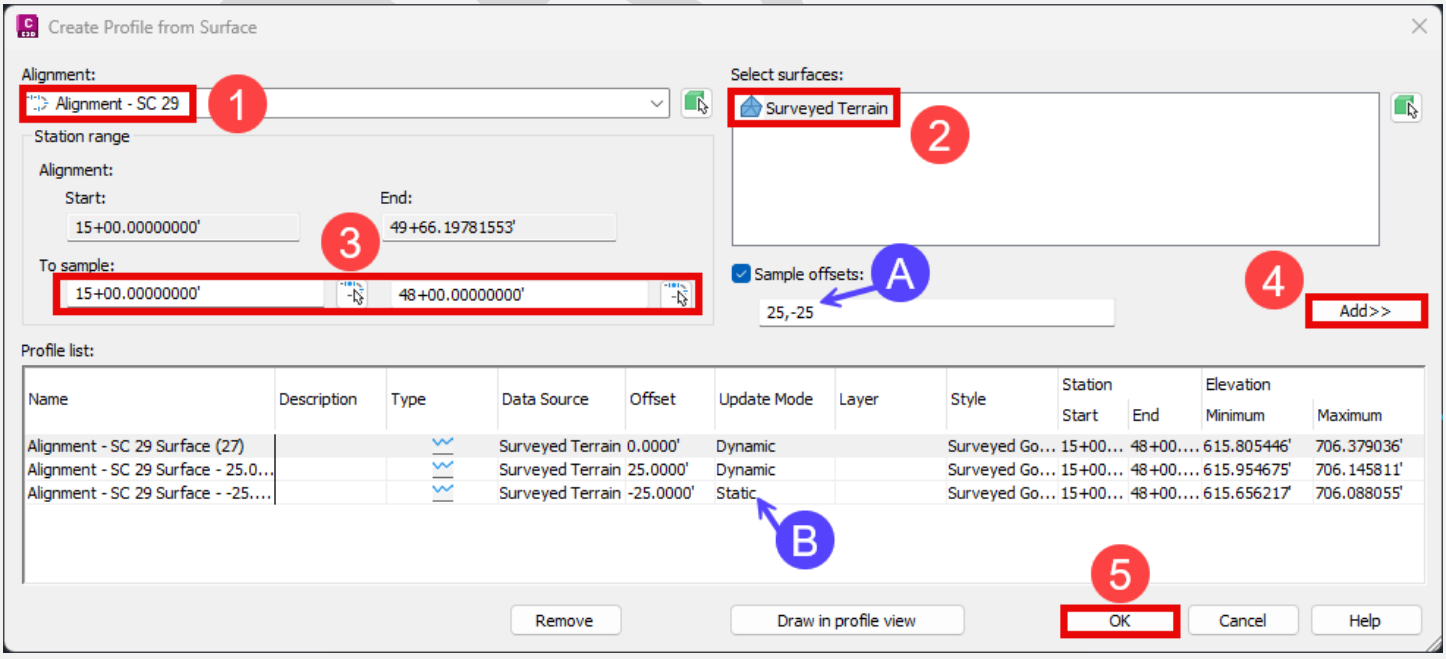
4. Add to the profile list.

    *A. Profiles can also be created that are at an offset from the alignment.

    *B. If the update mode is set to static the profile will not update if the surface is later changed.

5. When you have finished editing the selections, at the bottom of the screen select OK.

** Alternatively, you can select "Draw in Profile View" and you will be presented with the "Create Profile View" dialog discussed in the next section.*



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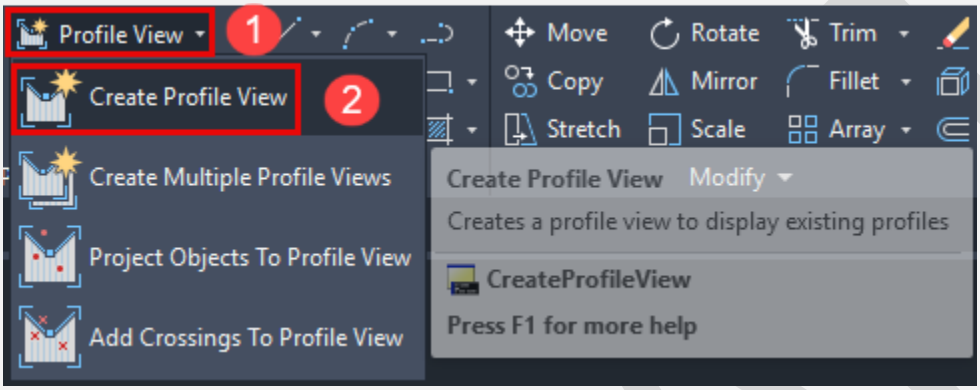
Create Profile View

A profile view is required to visualize the existing ground surface along a selected alignment. The view's appearance-including linestyles, labels, and grid layout-is governed by user-selected display styles. The existing ground profile view will provide the baseline data needed for the subsequent creation and design of the proposed profile.

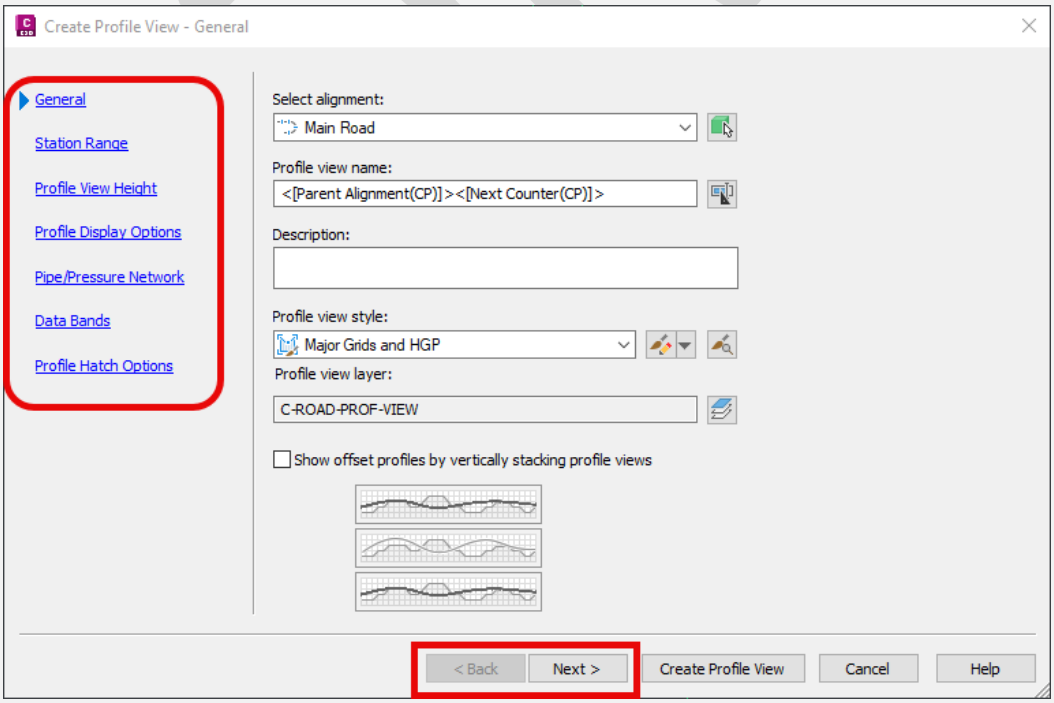
** Profile views may need to be created at various stages or for specific use cases throughout a project lifecycle. For example, it may be useful to create a full-length profile view with wide margins to use for design and then create multiple smaller profile views with specific size grids to use for plan sheets. Some of the selections discussed below may be less important for a design profile vs. a plan sheet profile and vice versa.*

Select **Create Profile View** under the "Home" tab "Profile & Section Views" Panel



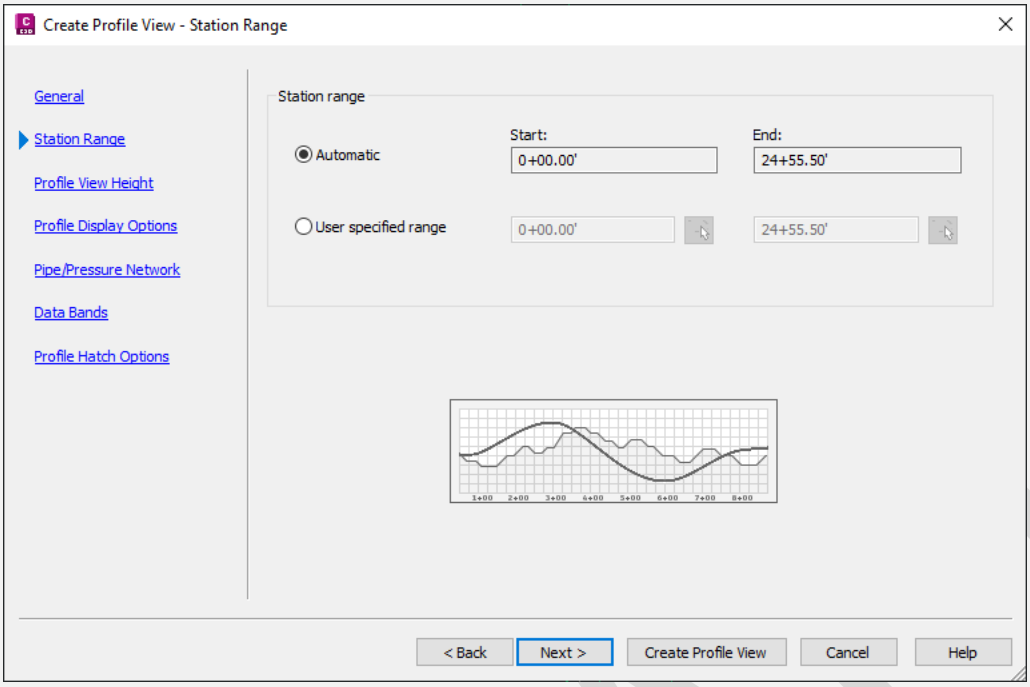
This will open a dialogue box titled "Create Profile View". On the left side are a list of different categories within the dialog that can be edited to meet specific needs. The categories can be navigated either by using the Back/Next buttons at the bottom of the menu to explore in order or by selecting a specific category on the left-hand side.

General- Specify the Alignment, Profile view name, Description, and Profile view style.



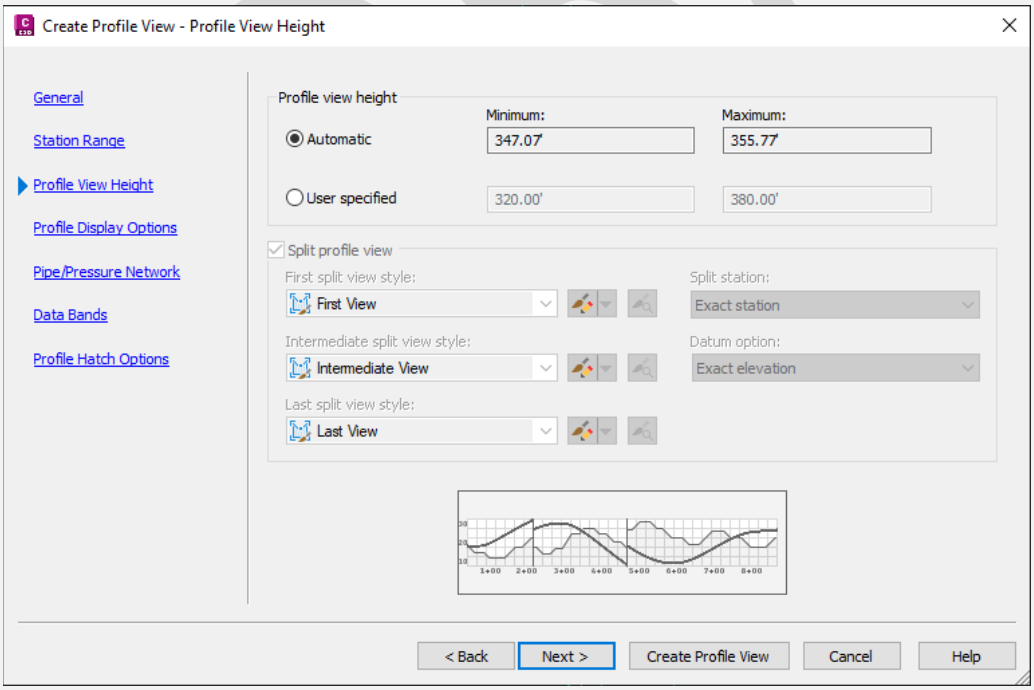
**The "Show offset profiles by vertically stacking profile views" is optional.*

Station Range- Specify the start and end stations either by allowing the program to select automatically or by selecting specific start and end stations.

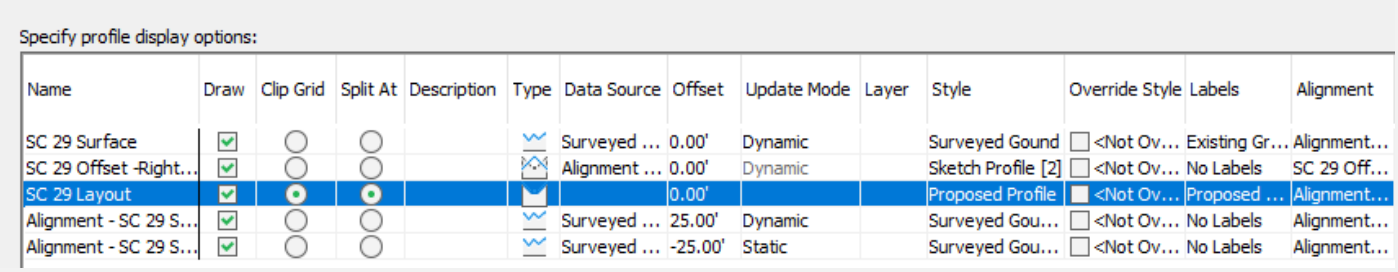


Profile View Height- Specify the profile view height either by allowing the program to select automatically or by selecting specific minimum and maximum elevations.

** The "Split profile view" is optional and may be useful if a profile has a sharp peak or valley that would not fit within the normal vertical bounds. The split may need to be modified in the Profile View properties after the profile view creation if the program makes poor automatic selections.*



Profile Display Options- Specify the profiles to be drawn as well as many other optional adjustments. Some columns are provided as information while others allow edits.


Specify profile display options:

Name	Draw	Clip Grid	Split At	Description	Type	Data Source	Offset	Update Mode	Layer	Style	Override Style	Labels	Alignment
SC 29 Surface	☑	○	○			Surveyed ...	0.00'	Dynamic		Surveyed Gound	☐ <Not Ov...	Existing Gr...	Alignment...
SC 29 Offset -Right...	☑	○	○			Alignment ...	0.00'	Dynamic		Sketch Profile [2]	☐ <Not Ov...	No Labels	SC 29 Off...
SC 29 Layout	☑	◉	◉				0.00'			Proposed Profile	☐ <Not Ov...	Proposed ...	Alignment...
Alignment - SC 29 S...	☑	○	○			Surveyed ...	25.00'	Dynamic		Surveyed Gou...	☐ <Not Ov...	No Labels	Alignment...
Alignment - SC 29 S...	☑	○	○			Surveyed ...	-25.00'	Static		Surveyed Gou...	☐ <Not Ov...	No Labels	Alignment...

Name – (Information) Any profile associated with the selected alignment will be displayed here.

Draw – (Edit) If selected the profile will be drawn.

Clip Grid – (Edit) Specifies which profile controls where the grid is clipped.

Split At – (Edit) Specifies which profile controls where splits are made.

Description – (Edit) ** Provide description if desired.*

Type – (Information) Surface profile, Layout Profile, Corridor Profile, or Superimposed Profile

** In Civil 3D the term Layout Profile is what you may typically refer to as Proposed Profile, PGL, etc.*

Data Source – (Information) Specific data source for Surface, Corridor, and Superimposed profiles.

Offset – (Information) Offset from alignment or offset from source alignment for a superimposed profile.

Update Mode – (Edit) If set to dynamic and source changes the profile will reflect the change.
If set to static and the source changes the profile will not reflect the change.

Layer – (Edit) A specific layer can be specified ** This should be left blank for normal use.*

Style – (Edit) Select the appropriate style to be applied globally when this profile is in a profile view.

Override Style – (Edit) ** Display a different style in one profile view without altering the global style settings.*

Labels – (Edit) Select the appropriate label style to be applied.

Alignment – (Information) Alignment that the profile is following.

Station – (Information) Start and End stations for the profile.

Elevation – (Information) Minimum and maximum elevations for the profile.

Pipe/Pressure Network- Entire pipe networks or specific parts of a network can be displayed on profile views.

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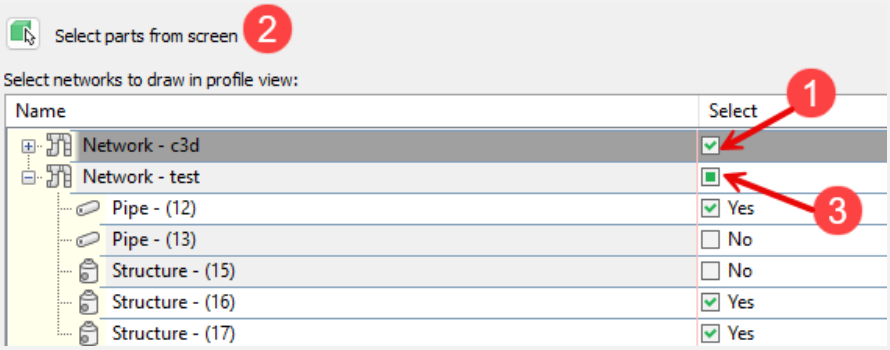


1. By default if the entire network is selected all the network parts will be displayed along the profile.

2. Specific objects can be selected as well by using “Select parts from screen”.

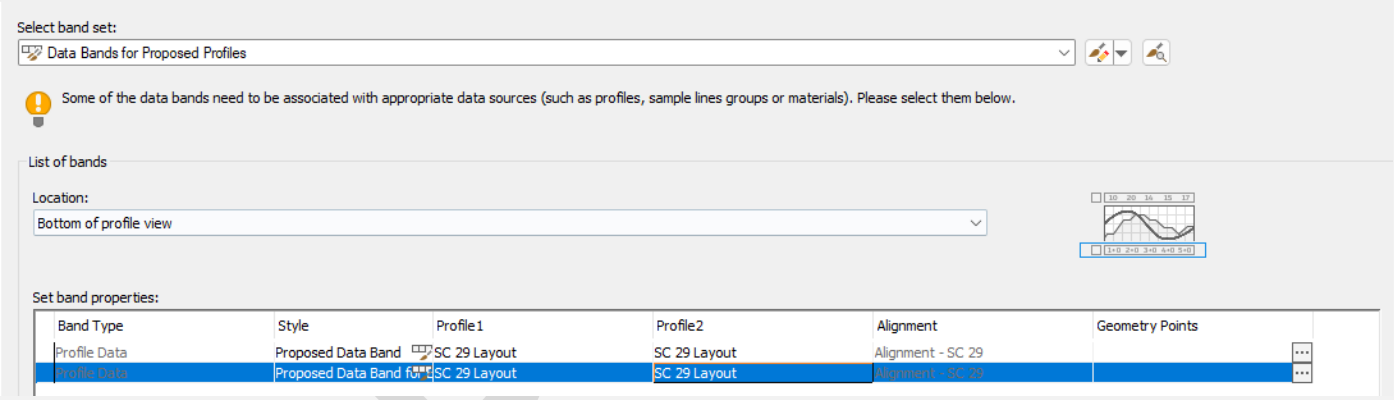
    A. `[pipe Network]` (default) If a network part is selected the entire network is added to the selection.
    `CREATEPROFILEVIEW Select pipe network`

    B. `[individual Parts]` Each network part will need to be selected individually.
    `CREATEPROFILEVIEW Select pipe network part`

    C. `[Series of parts]` If two network parts are selected every part in between will also be selected.
    `CREATEPROFILEVIEW Select first network part`
    `CREATEPROFILEVIEW Select next network part`

3. If only certain objects are selected within a network the selection box will display as solid.

Data Bands- Select an appropriate data band set and adjust the properties if needed.



Profile Hatch Options- Specifies how to mark areas between two profiles on the profile view, such as where terrain must be cut or filled to create the design profile. SCDOT does not use this function currently.

Once each of the categories have been filled out, click “Create Profile View”.

`CREATEPROFILEVIEW Select profile view origin:`

In model space click a location for the lower left corner (origin) of the profile view grid. The profile view will be drawn. Most of the selections made through the profile view creation process can be edited later by opening the profile view properties. Select the profile view then from within the contextual tab select “Profile View Properties”

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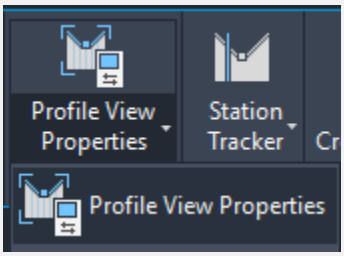
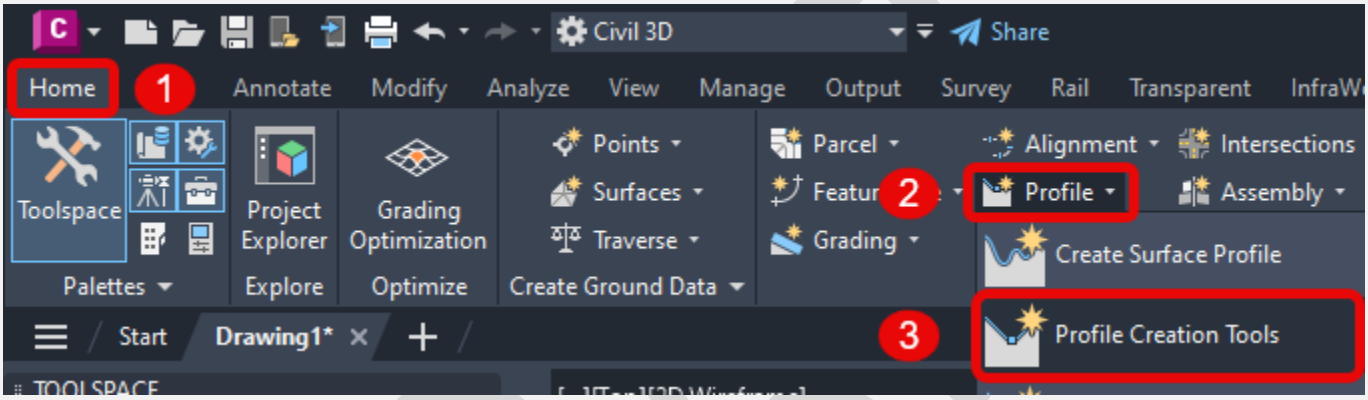


Profile Creation Tools

The profile creation tools allow the user to draft layout profiles along selected alignments and make edits to those profiles later as needed. Profile creation tools operate in a similar fashion to how the previously discussed alignment creation tools operate. To use this function there will need to be a profile view available and, in most cases, an appropriate surface profile that is already displayed in the profile view.

Select: **Profile Creation Tools**



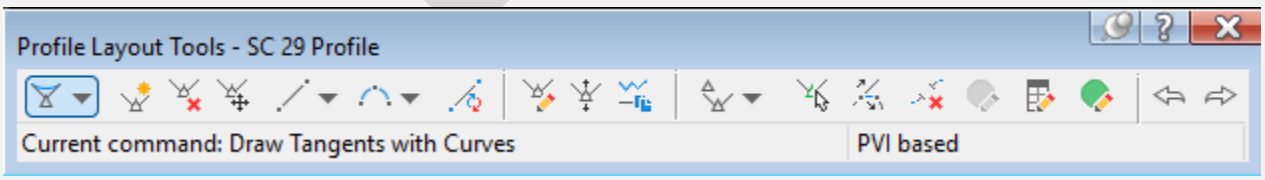
`CREATEPROFILELAYOUT Select profile view to create profile:`

Select the appropriate profile view where the layout profile is to be drafted.

** Since profile views are tied to a specific alignment, if there are multiple profile views displaying that alignment, any new layout profiles added to one profile view will be added to others as well. As covered previously the display of each profile can be toggled in the profile view properties but each new profile will default to being displayed.*

1. See the Create Profile Dialog Box section to input the profile specific parameters.

2. The Profile Layout Tools will appear once you select OK.



** To access Profile Layout Tools later for profile edits, select the profile to be edited, then in the contextual tab modify Profile panel select the **Geometry Editor**.*

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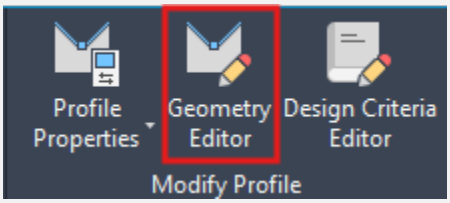
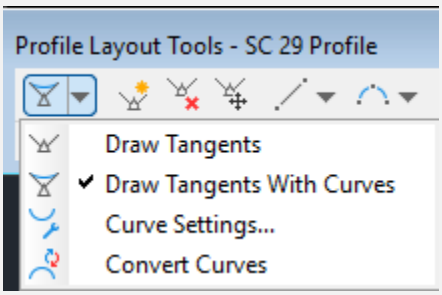


3. For a basic roadway profile select the **Draw Tangents With Curves**.



4. You will be prompted with `Specify start point` for the first PVI then `Specify end point` for each subsequent PVI. The curves will be added based on the default K-value or length provided in the Create Profile Dialog Box The curve parameters and PVI's can be adjusted after the profile is created to match project constraints.

5. Press enter to end the command.

While the **Draw Tangents With Curves** tool is a quick way to lay out a profile with all the entities included, individual tangents and curves can be drawn as well. These can be drawn in any order and connected later to form the alignment. Below are descriptions for some of the more frequently used tools.

1. **Draw Tangents** or **Draw Tangents With Curves**: Layout a profile by selecting PVI points in sequential order.
2. **Insert PVI**: Add PVI to tangent segment within existing profile.
3. **Delete PVI**: Remove a PVI from an existing profile.
4. **Move PVI**: Select a PVI and move it to a specified location.
5. Tangent Commands: Any of these commands may be used to create tangents for a profile. The three described below are likely to be used the most.
    A. **Fixed Tangent (Two Points)**: Each end of the tangent has a defined location.
    B. **Fixed Tangent – Best Fit**: The tangent will be defined by selecting a group of points which control the best fit. If COGO points are chosen the points will be selected from the model space within the plan view objects and will need to have the appropriate elevations assigned ** After the tangent is created and added to the profile it is not possible to fully remove the tangent's relationship to the points it was created from. To remove this relationship, delete the entities and recreate via other methods.*
    C. **Solve Tangent Intersection**: If during the profile creation process there are two adjacent tangents created that are not connected at the PVI this tool can be used to connect the tangents at the correct location.

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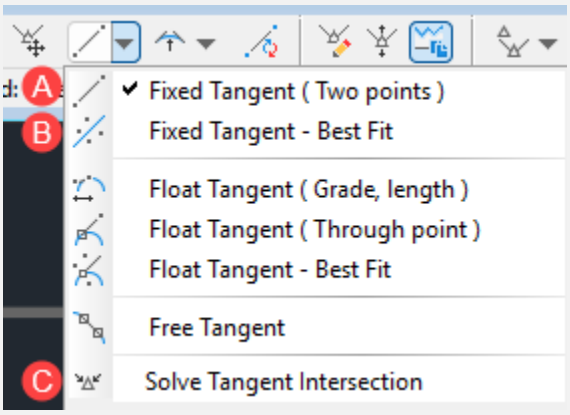
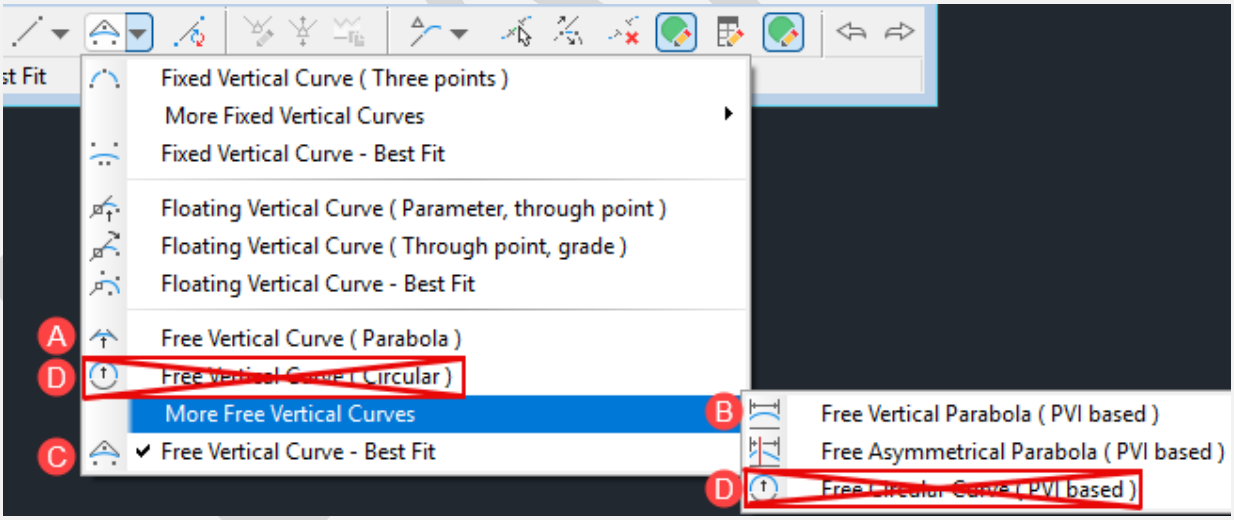


6. Curve Commands: Most of these commands may be used to create curves for a profile. The three described below are likely to be used the most.
    A. **Free Vertical Curve (Parabola)**: Select two adjacent tangents and provide curve parameters. The curve will be tangent to the two selected entities with a set length or K value.
    B. **Free Vertical Parabola (PVI based)**: Select a PVI and provide curve parameters. The curve will be tangent to the two selected entities with a set length or K value.
    C. **Free Vertical Curve - Best Fit**: The curve will be tangent to the two selected entities and the length and K value defined by selecting a group of points to best fit to. If COGO points are chosen the points will be selected from the model space within the plan view objects and will need to have the appropriate elevations assigned ** After the tangent is created and added to the profile it is not possible to fully remove the tangent's relationship to the points it was created from. To remove this relationship, delete the entities and recreate via other methods.*
    D. SCDOT does not use circular vertical curves.



7. **Insert PVIs – Tabular**: PVIs can be manually inserted by providing stations, elevations and curve parameters. ** Press enter after filling in the last column's data to create an additional row.*
8. **Raise/Lower PVIs**: Quickly adjust profile vertically while holding grades and curve parameters. Limits can be set by station or to the full length of the profile.
9. **Copy Profile Data**: This tool can be used to rapidly copy a specific station range or full length of a profile. When toggled to "Create new profile" the new profile will be superimposed on the original one in the current profile view and will appear in the Toolspace Prospector tab under the parent alignment. If using for alternative analysis and an alternative profile materializes to replace the current profile, this tool can be used as well. To replace the current profile with an alternative, select this tool and choose the "Overwrite existing profile" option*. * This could be helpful for preliminary design, ditch profiles, curb grades, and when alternatives/revisions are needed.*

10. **Delete Entity**: Used to delete entities one at a time from the profile. A tangent entity that has a curve attached to it cannot be deleted, any dependent curves must be deleted first.
11. **Edit best fit data for all entities**: Only available if there are best fit elements within the profile. When selected the Regression Data tab will be opened in the Panorama window for editing chosen points.
12. **Profile Grid View**: Opens the Profile Entities tab in the Panorama window to be used for tabular editing of the profile.
13. **Displays entity based data in grid and layout parameter editors**: Toggles the Profile Entities tab in the Panorama window between displaying the data either ordered by PVIs or ordered by entities.

** See Fixed vs. Floating vs. Free in the alignments section for clarity on how constraints are applied if needed.*

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Create Profile Dialog Box

In the Create Profile dialog box, fill out and make the following assignments.

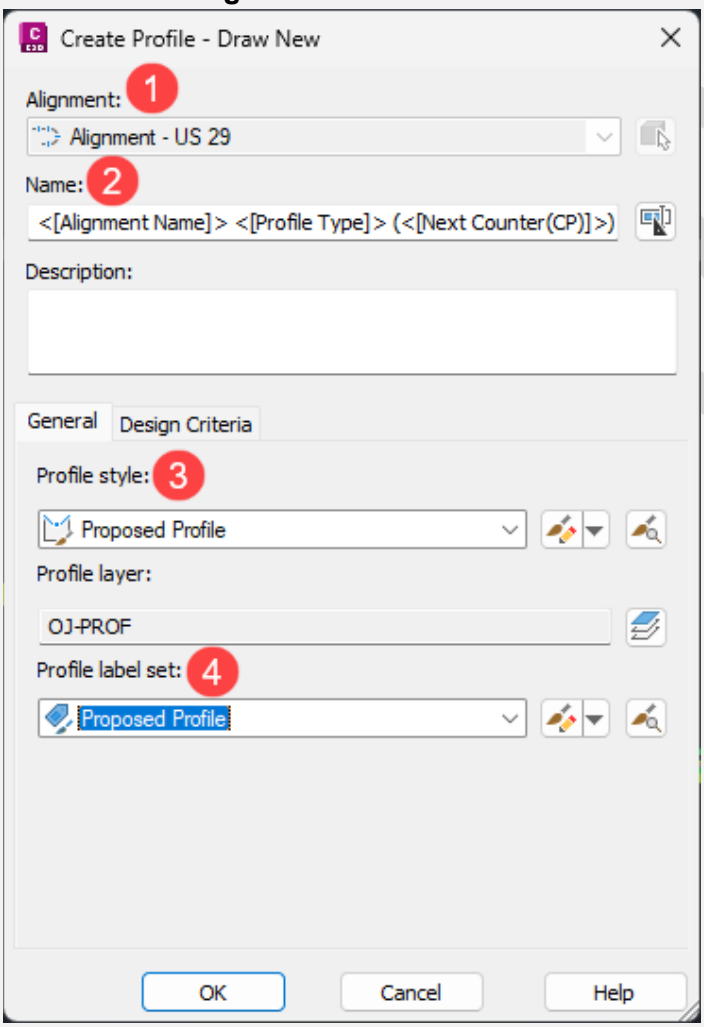
1. **Alignment:** The alignment will have usually been selected. If not select from the list of available alignments.
2. **Name:** Provide an appropriate profile name. For centerline profiles the appropriate road name and number should usually be used (Ex. US 1 (Two Notch Road) or SC 12 (Forest Drive)). In addition it is helpful to add either existing/surface or proposed/layout to the name. This name can be changed later and can also be used with the label tool for automatic labeling.

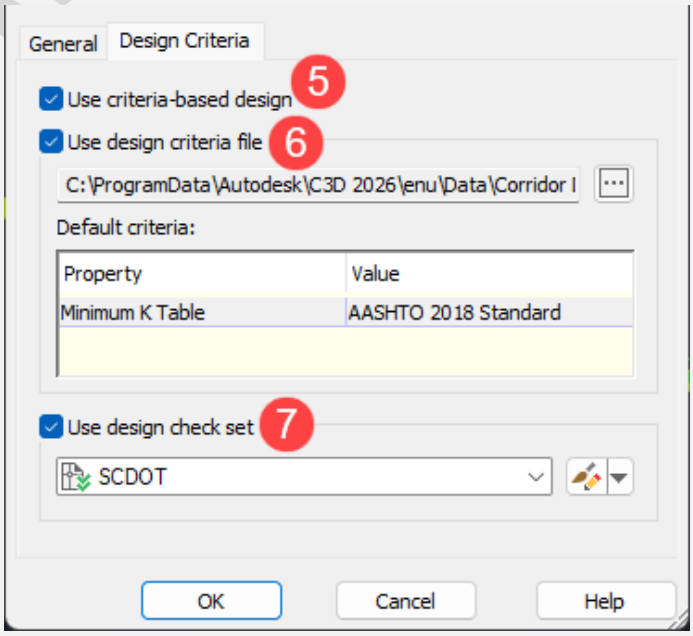
General

3. **Profile Style:** Select the appropriate style. This controls the visual display of a profile by setting layers, colors, line styles and other attributes.
4. **Profile label set:** Choose the appropriate label set. Label sets should be considered as a starting point for profile labeling. Project specific adjustments can be made later in Profile Label Properties

Design Criteria

5. **Use Criteria Based Design:** If this is left unchecked the profile will not be compared against any design criteria.
6. **Use Design Criteria File:** Filepath below, adjust year to match installed Civil 3D version
    a. C:\ProgramData\Autodesk\C3D 2026\enu\Data\Corridor Design Standards\Imperial_Autodesk Civil 3D Imperial (2018) Roadway Design Standards.xml
7. **Use Design Check Set:** SCDOT





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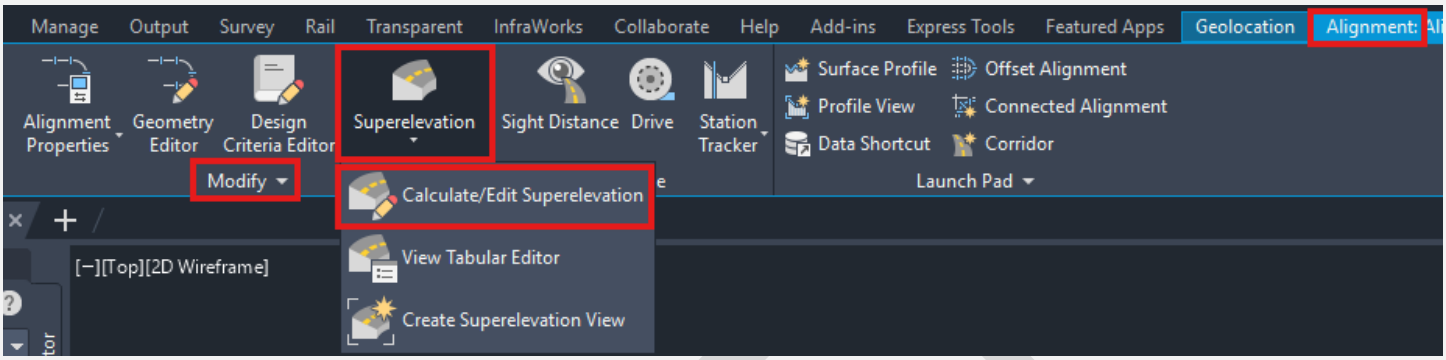
Superelevation

Superelevation in Civil 3D is attached to the alignment object, therefore the steps below need to be completed in the file that holds the alignment object, not a file where the alignment is referenced as a data shortcut

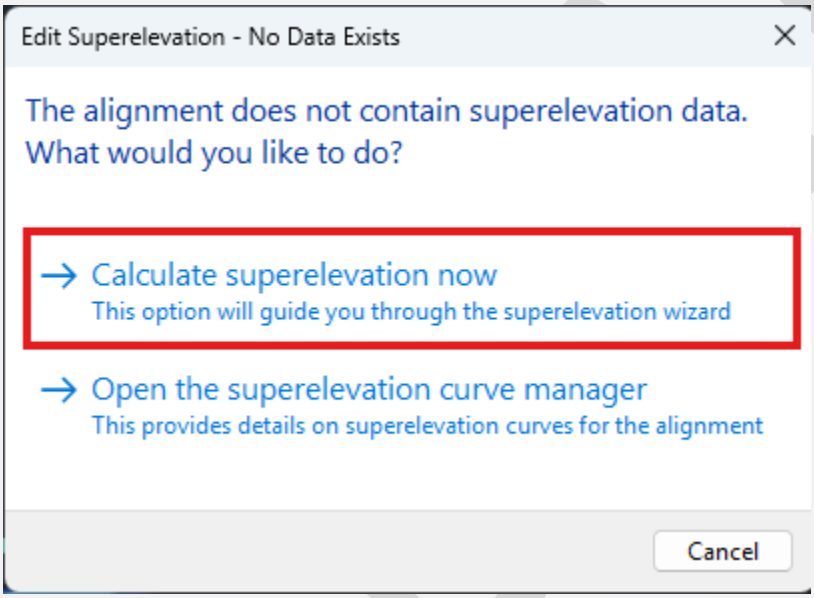
Calculate/Edit Superelevation

Select the alignment object that the superelevation is to be applied to, then on the contextual tab and “Modify Panel” select “Superelevation” then select “Calculate/Edit Superelevation”.



Choose “Calculate superelevation now”.

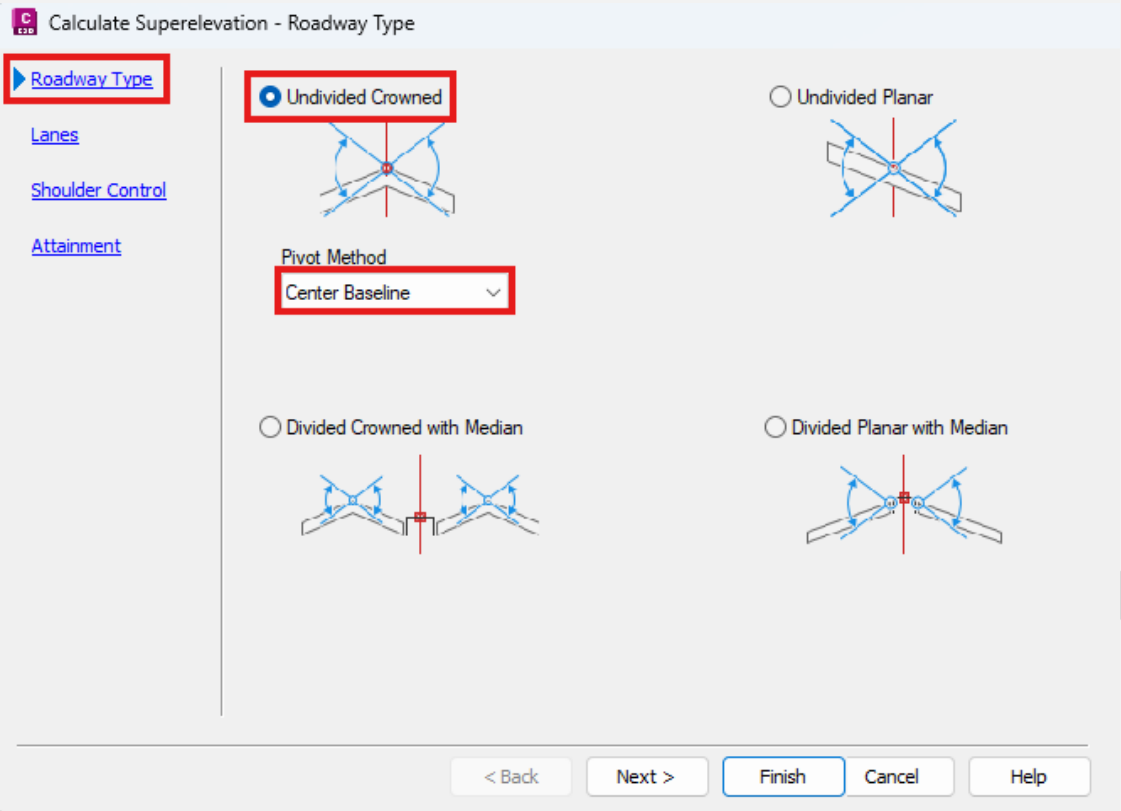
** This will only appear if superelevation has not been applied to the alignment previously.*



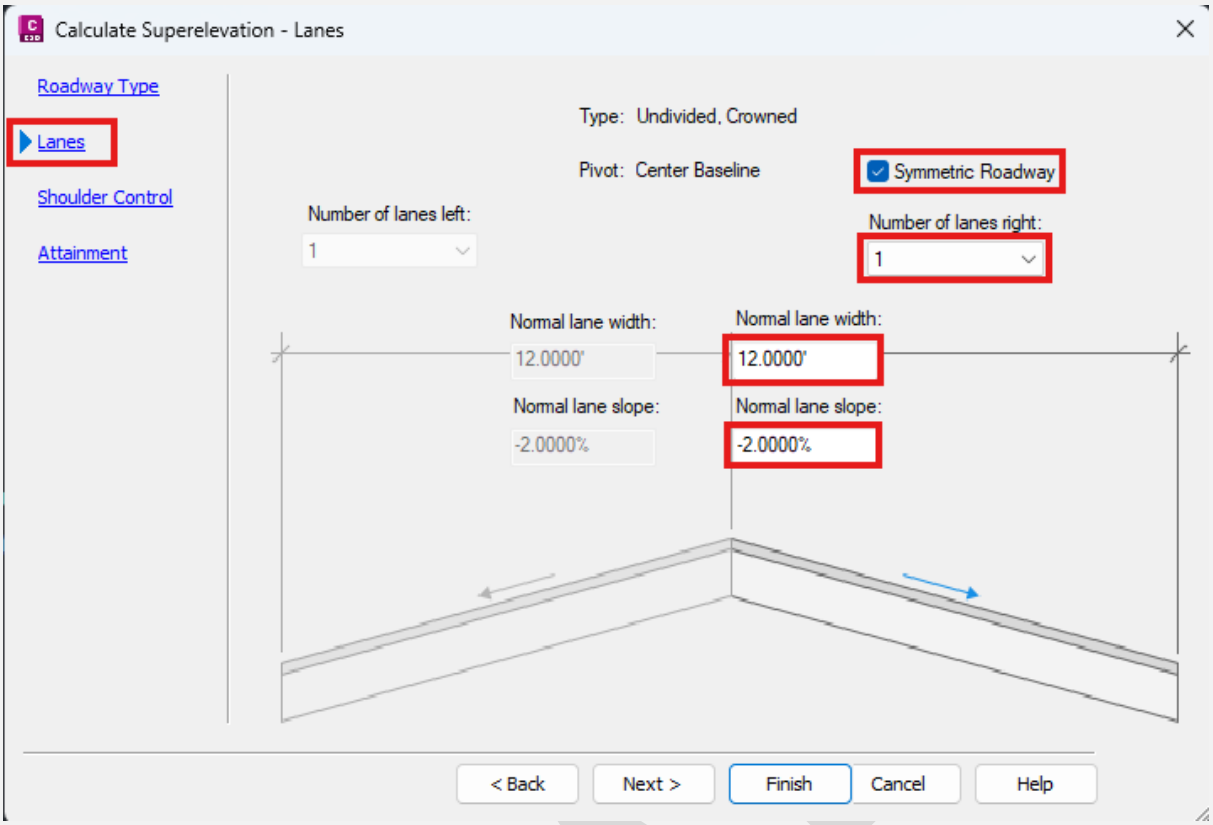
Roadway Type: Undefined Crowned about the Center Baseline should cover most project scenarios. If another type or method is needed for a project Autodesk has documentation on all the different combinations that may be used.

About Superelevation on Undivided Roads

About Superelevation on Divided Roads



Lanes: The information supplied here influences the calculations for transition lengths etc. Input project specific cross section information to match the roadway typical section.



Shoulder Control: The information supplied here influences how shoulder cross slopes are calculated. Input project specific shoulder information to match the roadway typical section. See RDM Section 5.3.5 for additional information. Inside median shoulders will only be available for edit if the roadway type is divided.

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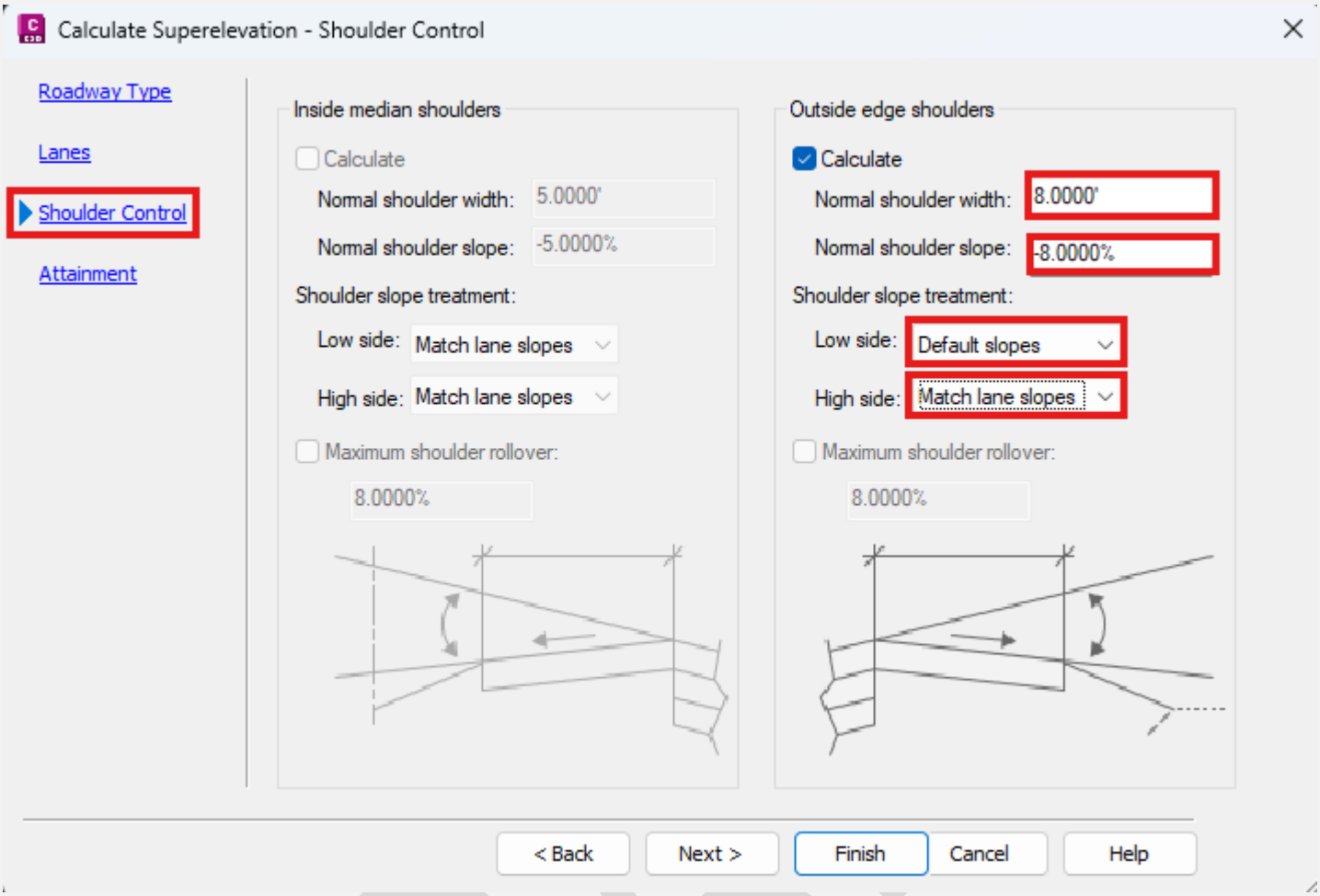
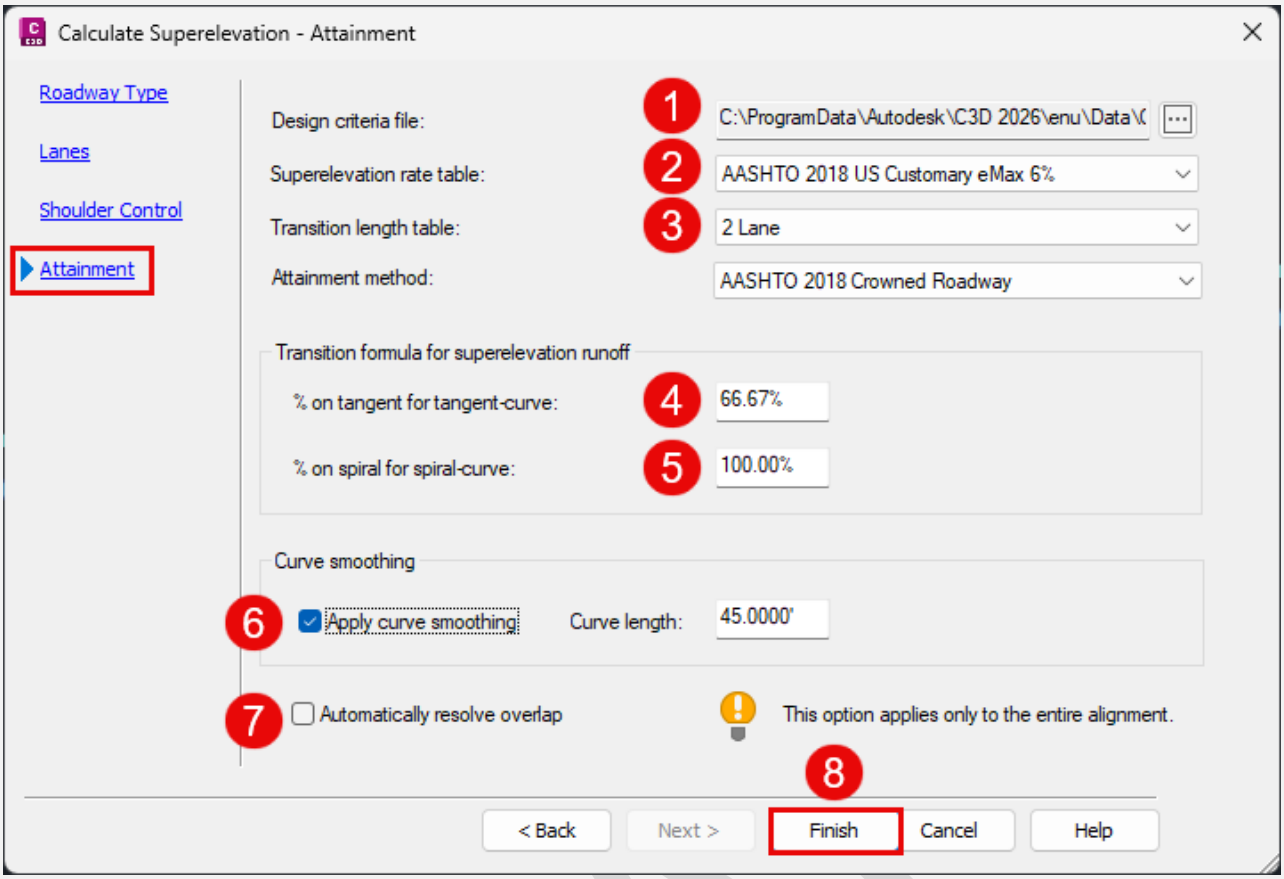


Attainment: The information supplied here selects the superelevation rate and adjusts the transition length calculations.

1. Verify the design criteria file matches the project design standard.
   _Autodesk Civil 3D Imperial (2018) Roadway Design Standards.xml
2. Select the design superelevation rate.
3. Select the appropriate transition length table if available.
   ** There are only two transition length tables available (two lane and four lane). If your roadway falls outside of these options the transition lengths will need to be manually edited after they are created.*
4. Input the percent of superelevation runoff length to be placed on the tangent.
5. Spiral curves not used on SCDOT projects.
6. Add a length for apply curve smoothing as appropriate. See RDM section 5.3.4.2 Item #2 for additional information.
7. Civil 3D can make corrections if adjacent curve transition lengths overlap. Whether this option is used or not, it is suggested that the designer review any areas where overlaps may occur to ensure compliance with the RDM.
8. Select finish.



View Tabular Editor

The Superelevation Tabular Editor will pop up in the Panorama window after finish is selected. This both provides a summary of the superelevation calculations and the opportunity to make edits.

1. Lines can be manually added or subtracted for locations where the superelevation makes a transition.
2. The shoulder transitions do not automatically calculate to match the RDM. These can be manually adjusted to transition at the correct locations here.
3. Some items are duplicates and are displayed in multiple locations.
4. All of the values in the columns can be edited as needed.
5. Take note of the superelevation lanes listed at the top. These will need to match the superelevation input selected when applying superelevation to a Subassembly.

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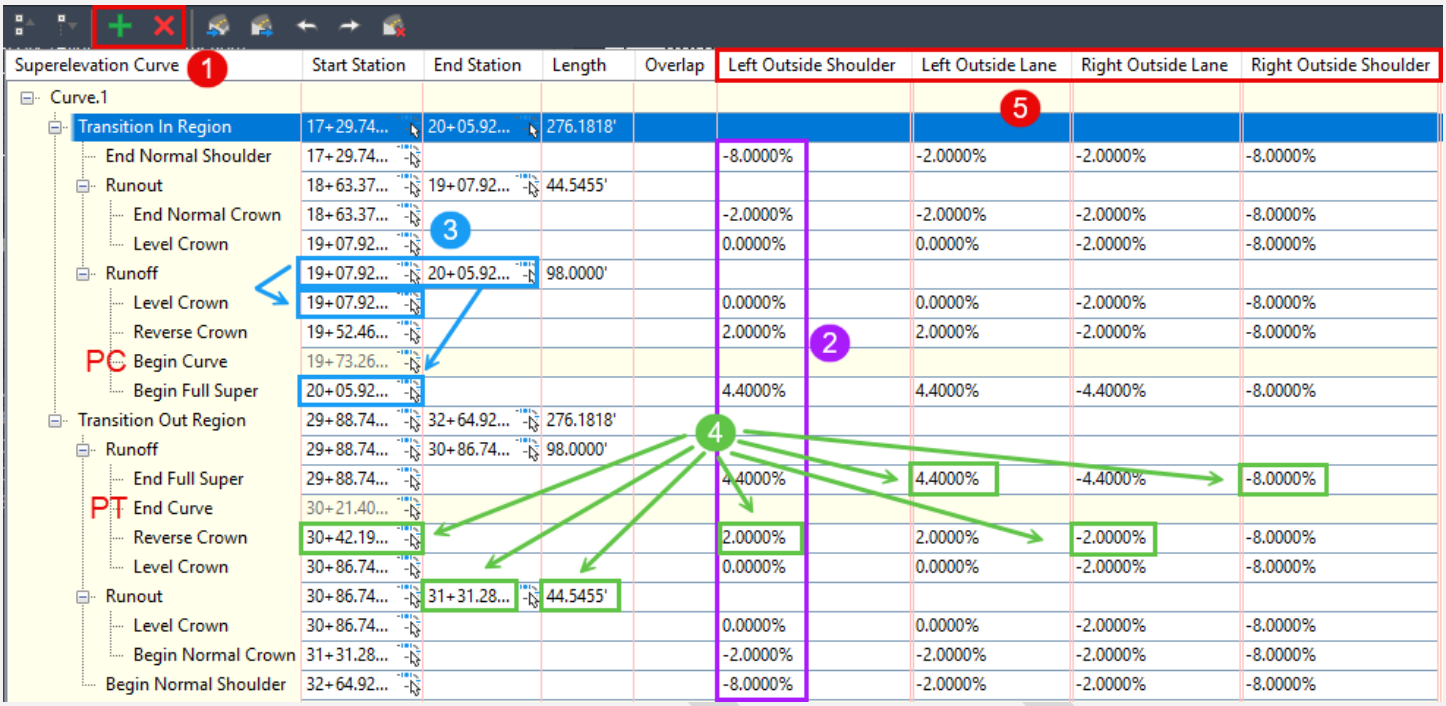


Assemblies and Subassemblies

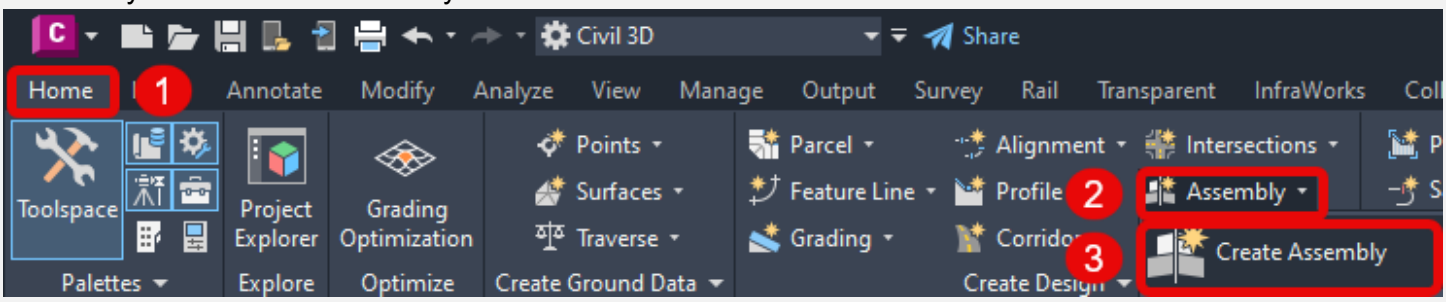
Assemblies and subassemblies are used together to form the core of a 3D corridor model. Subassemblies are the individual parts, such as lanes, curbs, sidewalks, and slopes, that connect to create the complete assembly. Assemblies are applied to an alignment and profile over specific station intervals to generate a 3D corridor model, representing the design of a roadway. The assemblies and subassemblies discussed below are provided with the SCDOT state kit. These subassemblies are designed to manage a majority of typical scenarios for road design and include built in functionality to streamline downstream uses of the corridor (surface creation, quantity takeoff, etc.) If additional functionality is needed for a project, there are subassemblies available from Autodesk within the Tool Palettes, or the Autodesk Subassembly Composer can be used to develop new subassemblies.

Assemblies

In Civil 3D, an assembly is a collection of subassemblies that when used together define a typical cross-section for a corridor. Under the assembly properties, the separate subassemblies can share information and link together to create more dynamic and flexible assemblies.

Create an Assembly

To create a new assembly in Civil 3D, navigate to the "Home" tab, within the "Create Design" panel, select "Assembly" then “Create Assembly”.



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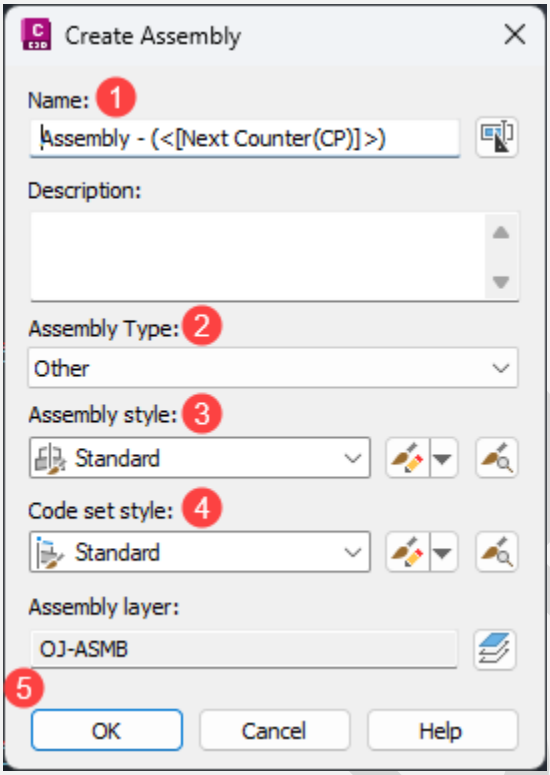
Create Assembly Dialog Box

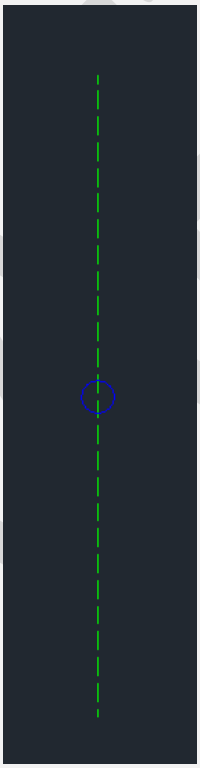
In the Create Assembly dialog box, fill out and make the following assignments.

1. **Name:** Provide an appropriate assembly name. Road name and station range may be appropriate items to include in the name. This name can be changed later if needed.
2. **Assembly Type:** Choose the appropriate type for the subject assembly. In most cases “Undivided Crowned” or “Other” can be selected here. see the Superelevation section for additional guidance if another type was used when calculating superelevation.
3. **Assembly style:** Select the appropriate Assembly style.
4. **Code set style:** The Corridor Code set style has been created to display assemblies according to SCDOT codes. See code set styles for more information.
5. Select OK to create the assembly then follow the command line prompt.

```
CREATEASSEMBLY Specify assembly baseline location:
```

6. The assembly baseline has been created. Follow the subassemblies section to build out the desired assembly section.





Subassemblies

Subassemblies are the fundamental geometric building blocks used to define a road's cross-section within an Assembly. Subassembly input parameters and targets allow them to adapt to complex and dynamic design scenarios. Input parameters control the geometry and behavior of components, allowing flexibility by replacing hardcoded values for dynamic adjustments to corridor models. Subassembly targets allow pre-defined points (existing pavement edges, lane edges, face of curbs, etc) to automatically connect or adjust to other design elements (the target) like alignments, profiles, surfaces, 3D polylines, or feature lines, ensuring the corridor geometry adapts to site conditions and changes without manual editing of the subassembly, easily controlling widths, elevations, and slopes for realistic road design.

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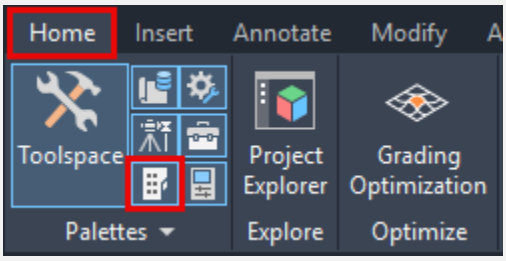
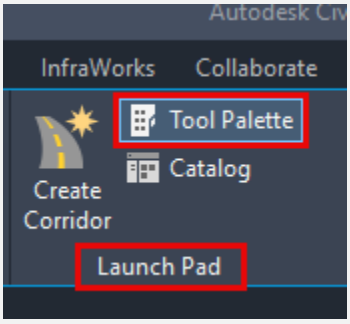
Subassemblies are accessed through the “Tool Palettes”. There are multiple ways to access the “Tool Palettes”.

1. On the “Home” tab under “Palettes” select “Tool Palettes”



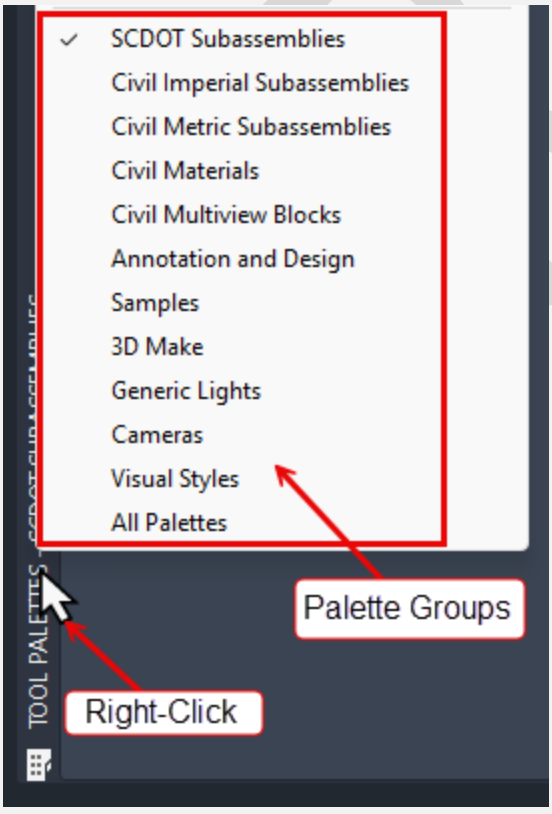
2. Select the assembly that was just created. In the contextual tab in the “Launch Pad” panel select the “Tool Palettes”



3. Press “Ctrl” + “3” on the keyboard

Once the “Tool Palettes” is open it should default to the SCDOT Subassemblies tab.

1. If the “SCDOT Subassemblies” tab is not displayed or if you would like to access some of the default Autodesk Civil 3D Subassemblies right-click on “Tool Palettes” and a list of available palette groups should be available.



2. If you are in a palette group and are looking for a specific tab that is not displayed, left-click on the three lines at the bottom to open the full list of available tabs within that palette group.

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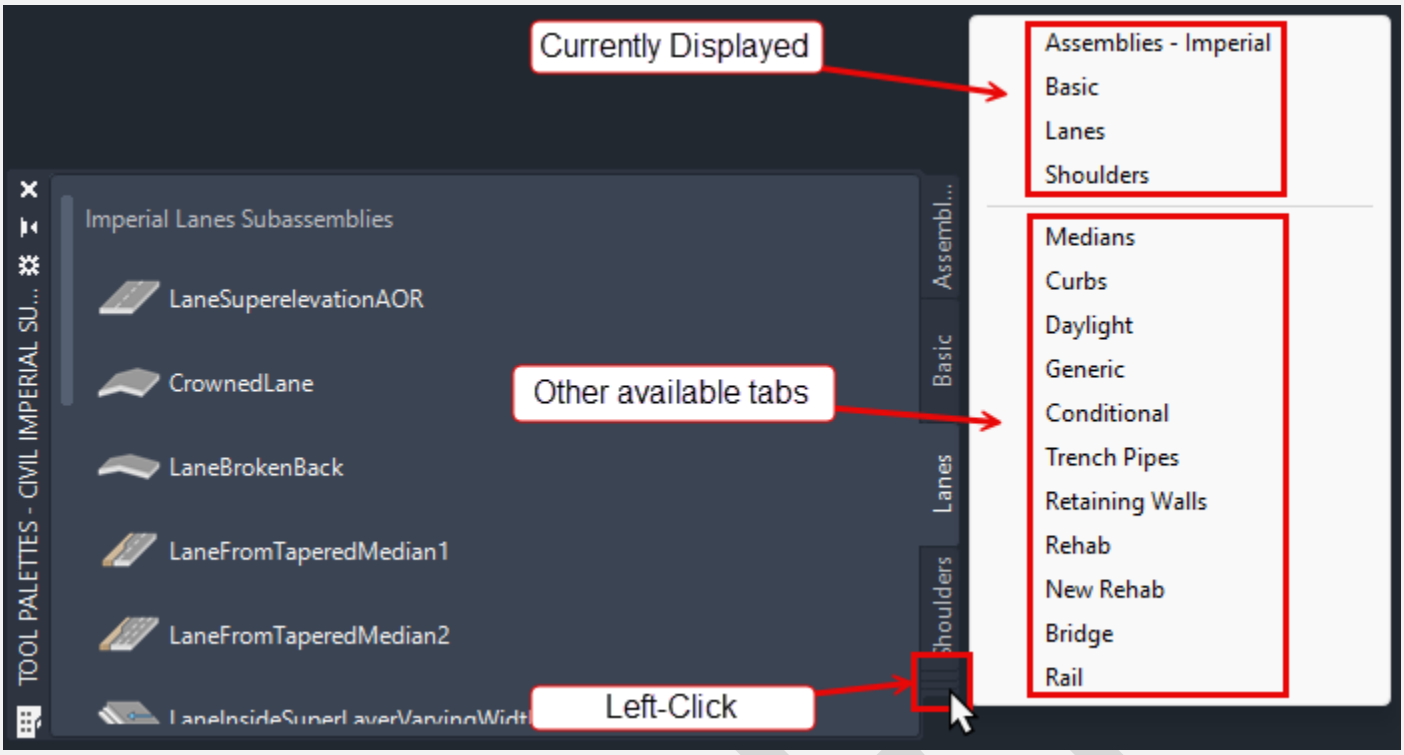
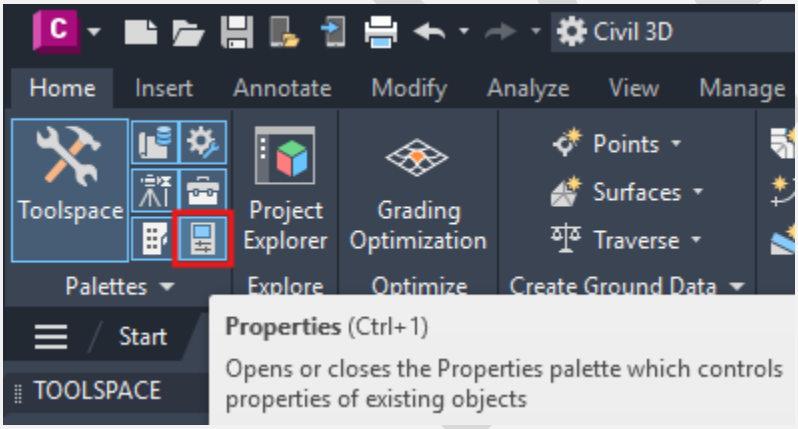


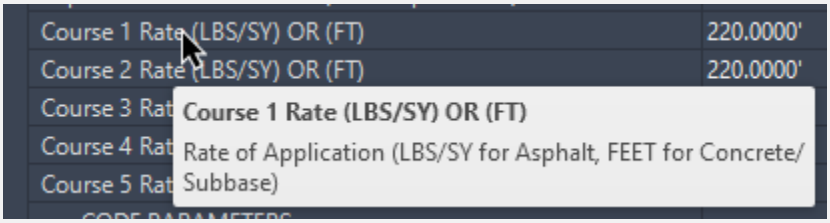
Subassembly Placement

To place a subassembly there must first be an assembly baseline created. See the previous section for assemblies if this has not been created yet. It is also suggested to have the properties palette open for the ability to make edits to the subassemblies as they are inserted.

On the “Home” tab under “Palettes” select “Properties” to open the properties palette.

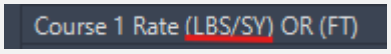


1. In the Tool Palette select the first subassembly to be inserted.
2. Review the Advanced Parameters in the Properties Palette to verify the subassembly matches the desired parameters. These can be edited after the subassembly is placed if there are design changes.
   ** If additional information is needed to understand how a parameter functions, hover over the parameter and a description will be displayed.*



The layout under Advanced Parameters is split into four distinct sections.

1. **Output:** Each subassembly may have read only output parameters that can be passed to other subassemblies as input parameters to help connect the total assembly together. This is discussed further in the Connect Subassembly Parameters section of this manual.
2. **Geometry:** These are the parameters that change the actual geometry of the subassembly to control widths, slopes, depths, etc.
   ** Civil 3D by default displays the Drawing Unit symbol(') behind these parameters. If the parameter's unit differs from feet it will be listed in the parameter name for clarification and the (') can be ignored.*

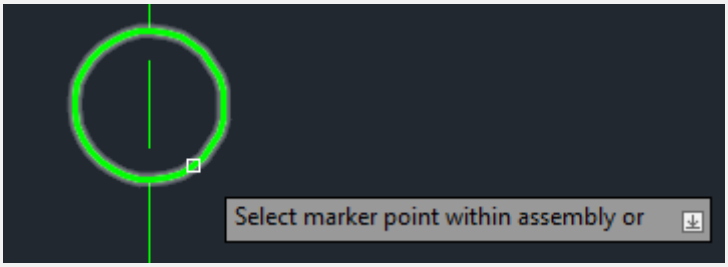
   

   ** Civil 3D will accept input as inches and convert to the appropriate length in feet if the (") symbol is added to a value.*

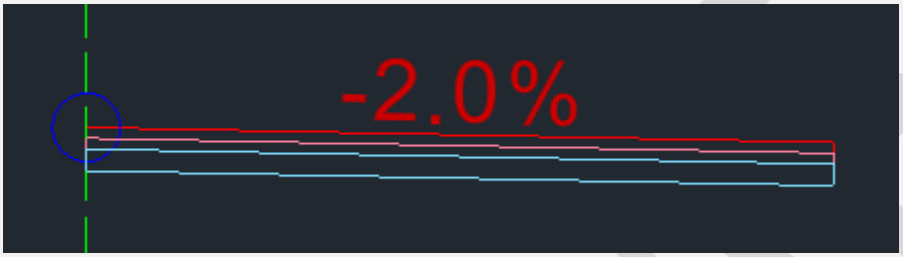
3. **Codes:** These parameters set standardized point, link and shape code names for the parts of a subassembly that can be used to control the display of a corridor, manage how labels are displayed, generate surfaces, develop quantity takeoffs.
4. **Optional Codes:** Additional codes can be added by the user to facilitate project specific modeling tasks.

3. Follow the prompt in the command line.

```
CREATESUBASSEMBLYTOOL Select marker point within assembly or [Insert Replace Detached]:
```



The subassembly will be placed appropriately.

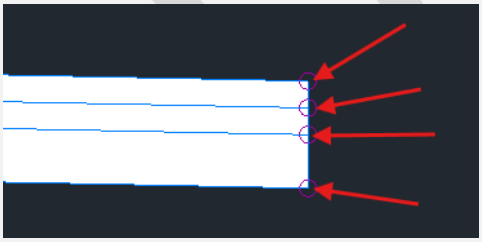


Other options

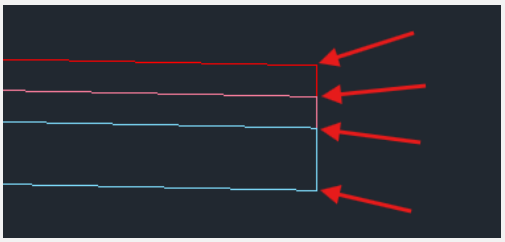
a. `Insert` – A Subassembly can be placed between two existing subassemblies.
b. `Replace` – A Subassembly can be swapped into the same location as a current Subassembly.
c. `Detached` – A Subassembly can be placed unattached to an Assembly.

4. To add additional subassemblies repeat steps 1-3.

** Depending on which Code Set Style the Assembly is set to, the additional marker points may or may not be displayed. They will be present and function even if they are not visible.*



Visible



Not Visible

Connect Subassembly Parameters

Once subassemblies have been compiled into an assembly, outputs and inputs can be linked between subassemblies to carry information throughout the entire assembly. Some of the subassemblies have been built to reference information from an adjacent subassembly (ex. Vertical face curb references adjacent travelway slope to switch between catch and spill curb in appropriate areas)

Select the Assembly baseline

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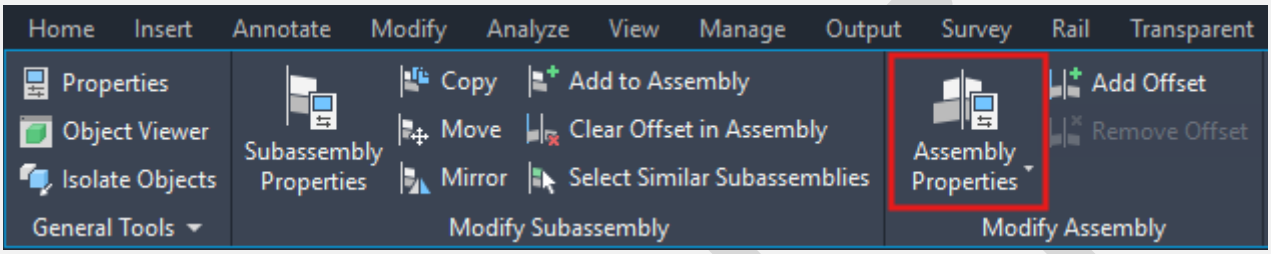
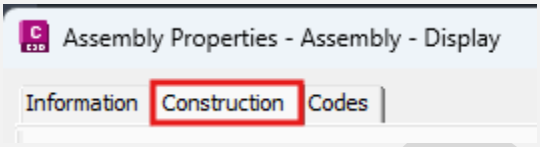
In the Contextual tab under the “Modify Assembly” panel select the “Assembly Properties”



Inside the Assembly Properties Dialog select the Construction tab.



Overview of Construction tab

1. Item: The left and right side of the subassembly are separated out and distinct from each other. Subassembly Input values cannot cross over the baseline.
   ** Rename the subassemblies here with descriptive names to help differentiate them later.*
2. Input Values (Default): All the default input values for each of the subassemblies (seen under advanced parameters when initially placing a subassembly) are available for manual editing here.
3. Input Values (Parameter Reference): A parameter reference in an assembly is a dynamic link that allows one subassembly's input parameter to automatically adopt the value of another subassembly's output parameter within the same assembly
   ** The first subassembly attached to the baseline on either side cannot have a parameter reference because there are no prior subassemblies to pass down output variables.*

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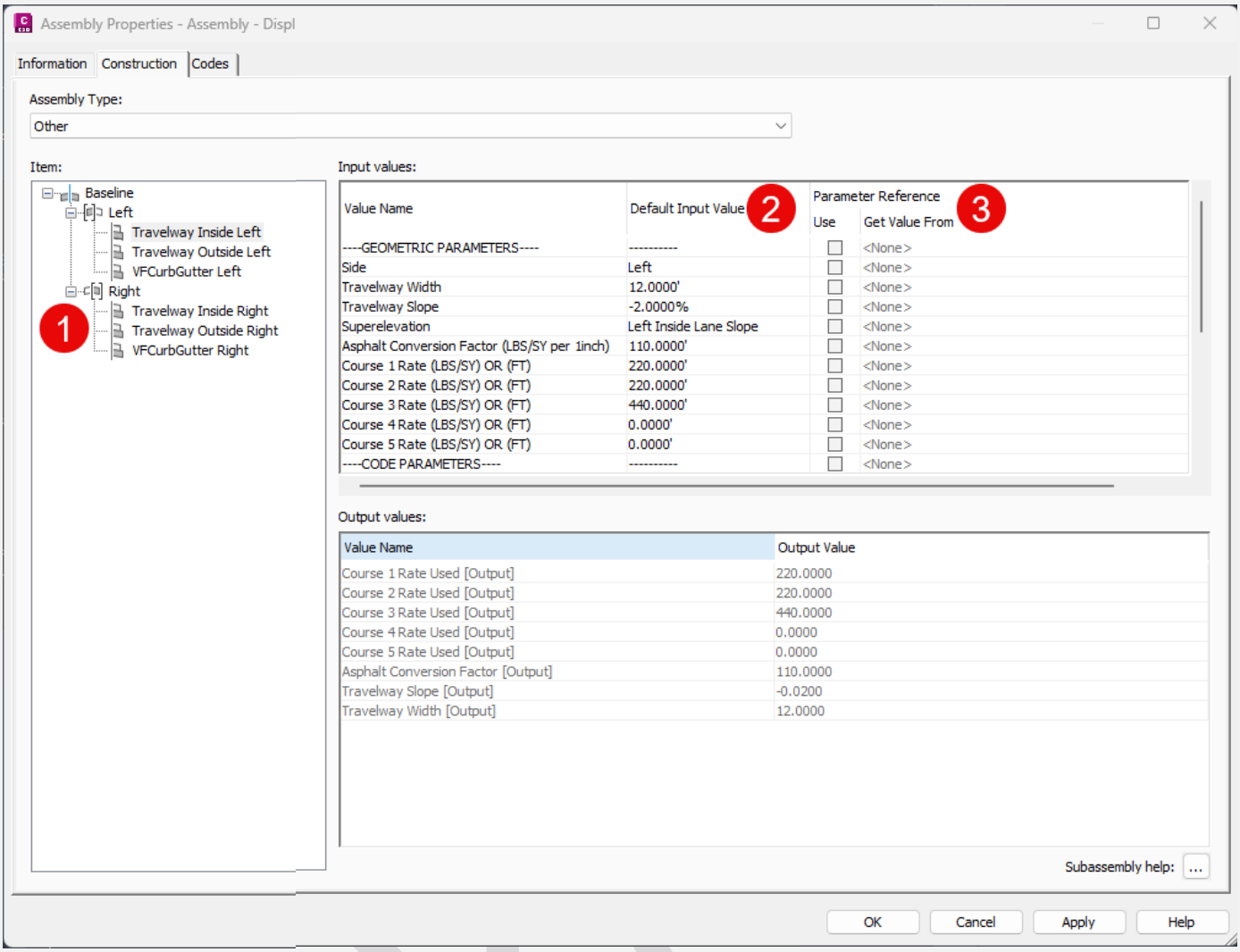
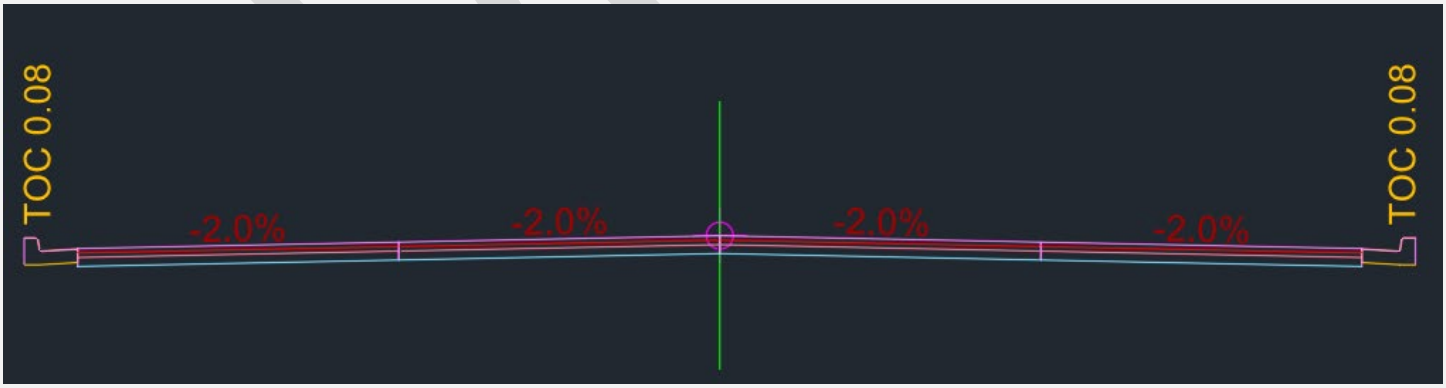


Example: Adjusting Input Parameters and parameter References

The assembly section below will be edited on the right side to demonstrate how adjusting inputs and parameter references interact within an assembly. This assembly is built with two travelway subassemblies and a curb subassembly on each side.



Edit Travelway Inside Right input values as shown below.

** For this example the Travelway Slope was set to 3% so the assembly display would adjust. For a project, unless the intent is to have a constant slope, the Superelevation Lane needs to be selected so the cross slope will follow the superelevation calculations.*

Input values:

Value Name	Default Input Value	Parameter Reference	
		Use	Get Value From
----GEOMETRIC PARAMETERS----	----------	☐	<None>
Side	Right	☐	<None>
Travelway Width	12.0000'	☐	<None>
Travelway Slope	*3.0000%	☐	<None>
Superelevation	Right Outside Lane Slope	☐	<None>
Asphalt Conversion Factor (LBS/SY per 1inch)	110.0000'	☐	<None>
Course 1 Rate (LBS/SY) OR (FT)	350.0000'	☐	<None>
Course 2 Rate (LBS/SY) OR (FT)	350.0000'	☐	<None>
Course 3 Rate (LBS/SY) OR (FT)	880.0000'	☐	<None>
Course 4 Rate (LBS/SY) OR (FT)	0.0000'	☐	<None>
Course 5 Rate (LBS/SY) OR (FT)	0.0000'	☐	<None>
----CODE PARAMETERS----	----------	☐	<None>

Edit Travelway Outside Right parameter references as shown below.

** Special note on superelevation: If the superelevation lane is selected on the first subassembly and the second needs to match, set the Travelway Slope input to match rather than the Superelevation input. Notice that the default input values do not change. Setting the parameter reference overrides the defaults to match the linked subassembly.*

Input values:

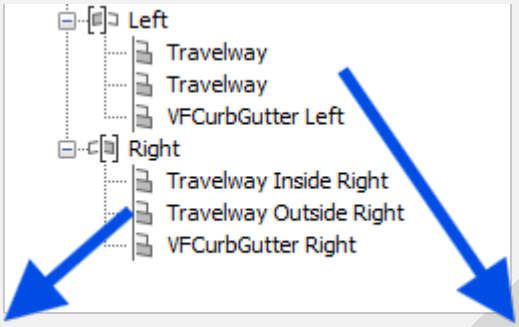
Value Name	Default Input Value	Parameter Reference	
		Use	Get Value From
----GEOMETRIC PARAMETERS----	----------	☐	<None>
Side	Right	☐	<None>
Travelway Width	12.0000'	☐	<None>
Travelway Slope	-2.0000%	☑	Travelway Inside Right.Travelway Slope [Output]
Superelevation	None	☐	<None>
Asphalt Conversion Factor (LBS/SY per 1inch)	110.0000'	☐	<None>
Course 1 Rate (LBS/SY) OR (FT)	220.0000'	☑	Travelway Inside Right.Course 1 Rate Used [Output]
Course 2 Rate (LBS/SY) OR (FT)	220.0000'	☑	Travelway Inside Right.Course 2 Rate Used [Output]
Course 3 Rate (LBS/SY) OR (FT)	440.0000'	☑	Travelway Inside Right.Course 3 Rate Used [Output]
Course 4 Rate (LBS/SY) OR (FT)	0.0000'	☐	<None>
Course 5 Rate (LBS/SY) OR (FT)	0.0000'	☐	<None>
----CODE PARAMETERS----	----------	☐	<None>

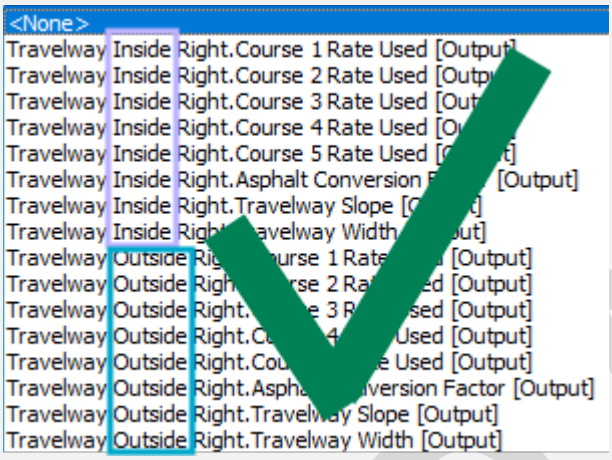
Edit VFCurbGutter Right parameter references as shown below.

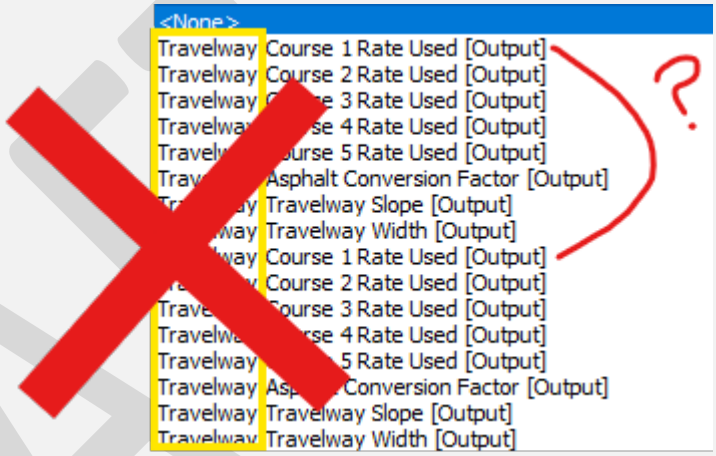
Input values:

Value Name	Default Input Value	Parameter Reference	
		Use	Get Value From
----GEOMETRIC PARAMETERS----	----------	☐	<None>
Side	Right	☐	<None>
Curb Type	Vertical Face Custom	☐	<None>
Curb Width (Custom)	2.0000'	☐	<None>
Travelway Slope [Inherited]	3.0000%	☑	Travelway Outside Right.Travelway Slope [Output]
Roadway Curb Height (0-100%)	100.0000'	☐	<None>
Bridge Transition Curb Height (0-100%)	0.0000'	☐	<None>
Catch to Spill Transition Percent (0-100%)	100.0000'	☐	<None>
----CODE PARAMETERS----	----------	☐	<None>

** Some parameters have "[Inherited]" included as part of the name. These parameters will need to be linked for the subassembly to function correctly. When selecting the parameter reference all available outputs will be displayed, this is where providing descriptive names for the subassemblies helps clearly define which output to select.*

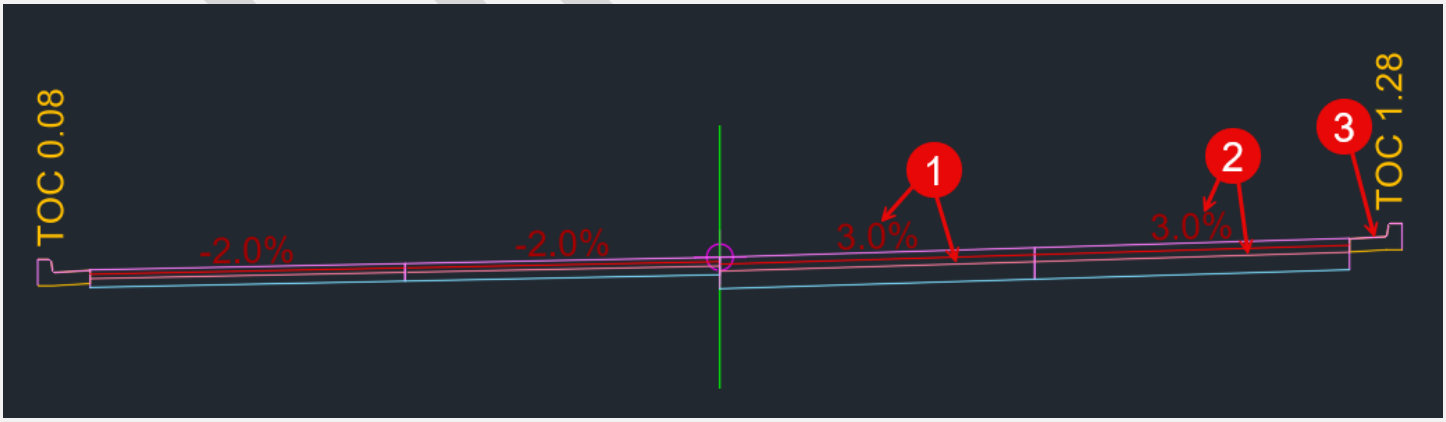






Assembly section after edits have been made.

1. Slope and pavement depths adjusted based on default input value modifications.
2. Slope and pavement depths adjusted to match adjacent based on parameter reference selections.
3. Curb and Gutter switched to spill curb based on slope selected by parameter reference.



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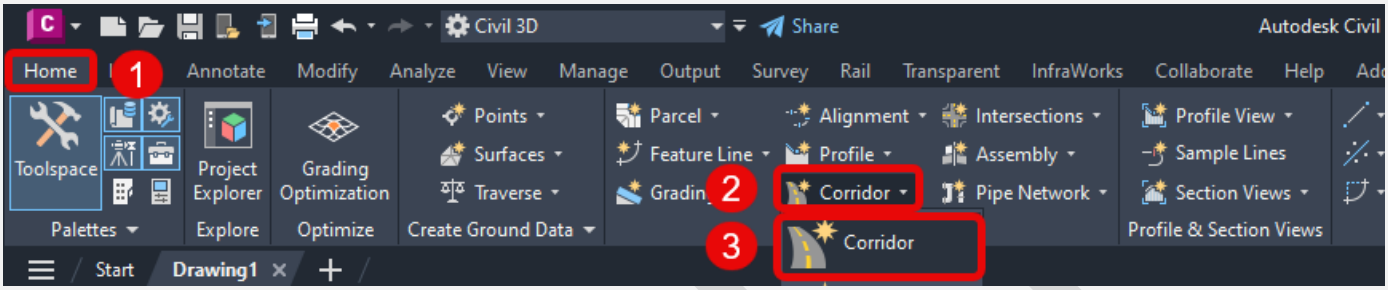
Corridors

Corridors are dynamic 3D models built from the alignment, profile, superelevation, assembly and subassembly objects covered so far. The corridor can then be used for surface creation, quantity takeoff, dynamic cross section creation, and detailed visualization once it is built. The corridor should be created in it's own file and use Data Shortcuts to reference in other design information such as Alignments, Profiles, Surfaces.

Create a Corridor

To create a corridor in Civil 3D, navigate to the "Home" tab, within the "Create Design" panel, select "Corridor" to open the menu of options then select "Corridor" again to open the create corridor dialog box.



In the Create Corridor dialog

1. Provide a descriptive name for the corridor.
2. Select the alignment, profile, and assembly that are to be connected. If the corridor will have multiple assemblies along an alignment and profile those can be added in the next step or later under the Parameters tab of the corridor properties. Selections can be made either by using the drop down list of objects or by clicking the icon and then following the command line directions to select an object from the drawing.
   ** If a new file has been created for the corridor and no information is populating in the drop downs, verify that the appropriate alignment and profile data shortcuts have been added to the drawing.*
3. Select the appropriate code set style.
4. Select the surface that is to be used as a surface target (typically the existing ground survey).
5. Feature lines should not be used for a roadway centerline geometry, however it is important to note here that feature lines can be used as a baseline for an assembly in lieu of an alignment and profile combination. This may be useful to model certain linear elements that do not strictly follow a roadway centerline.
6. Select OK

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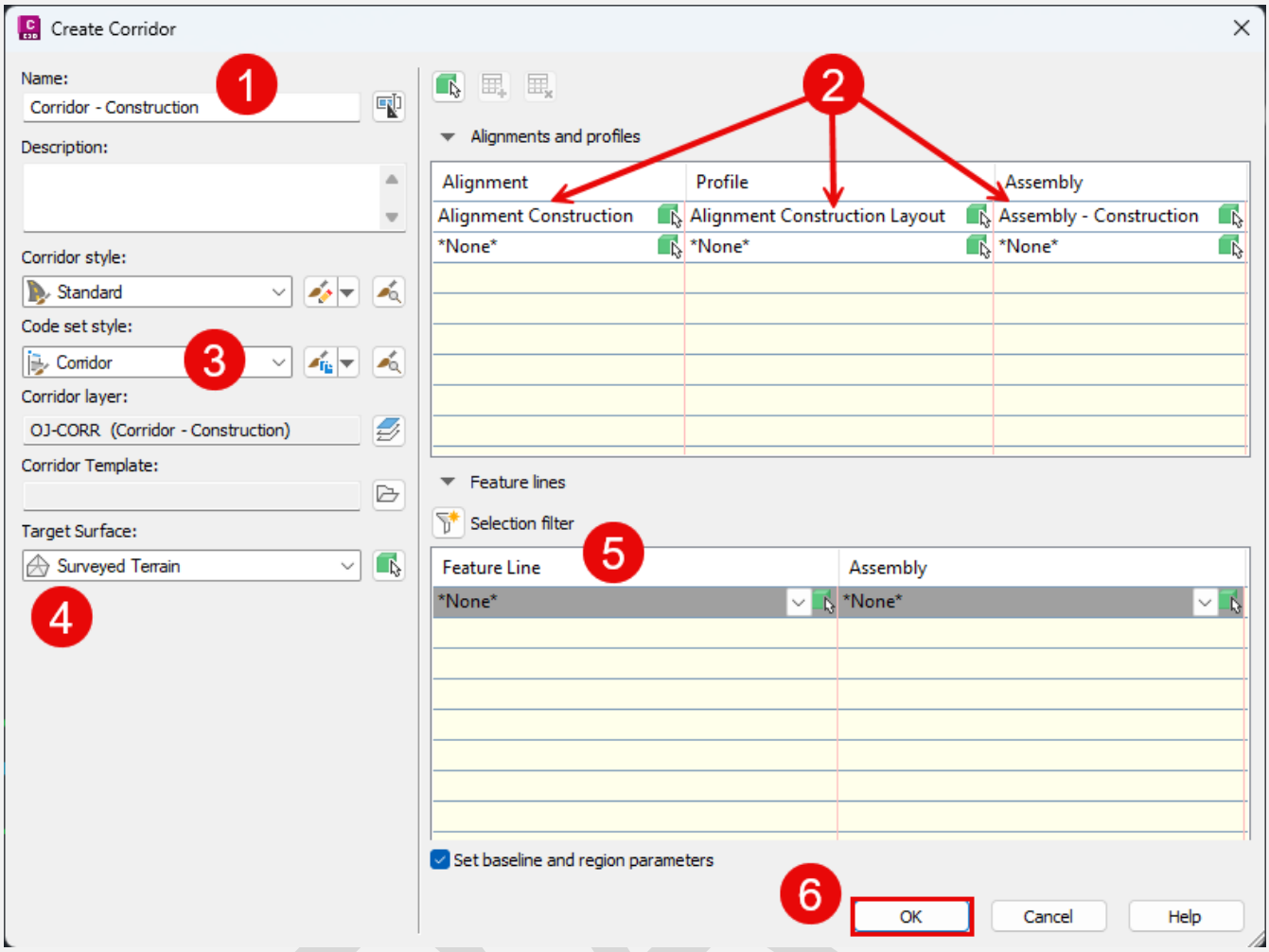
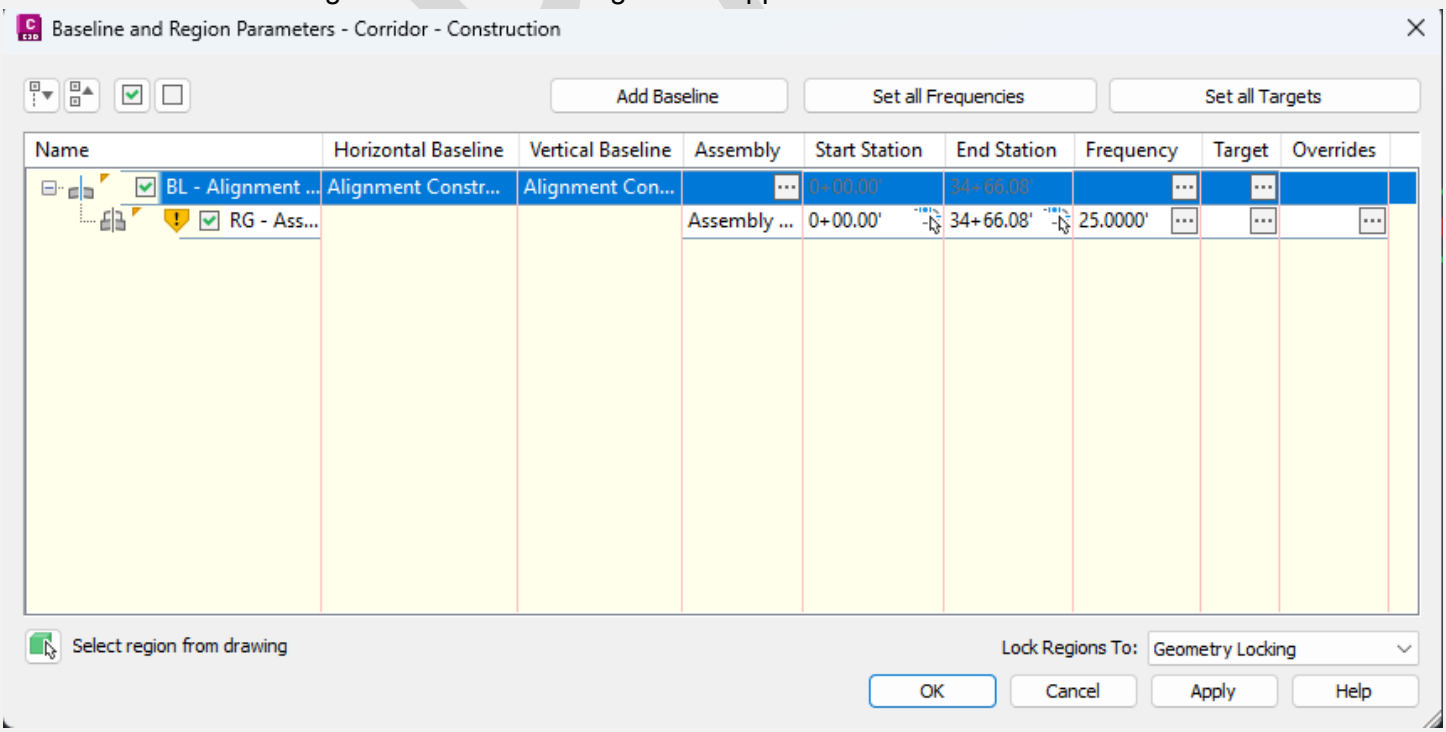
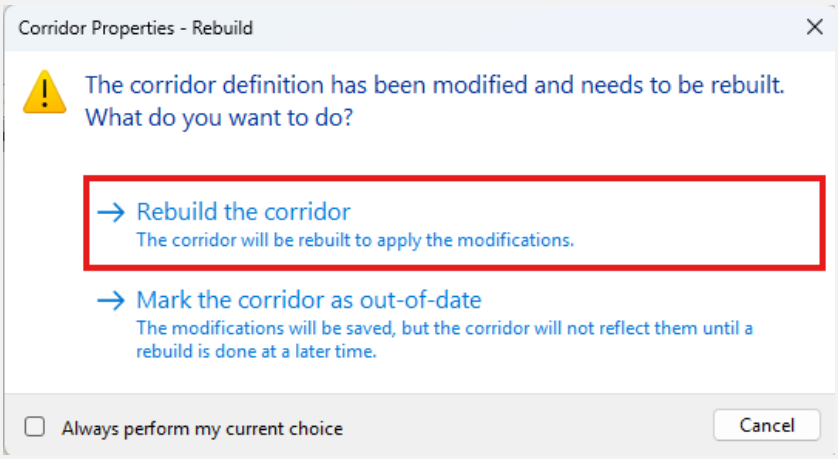


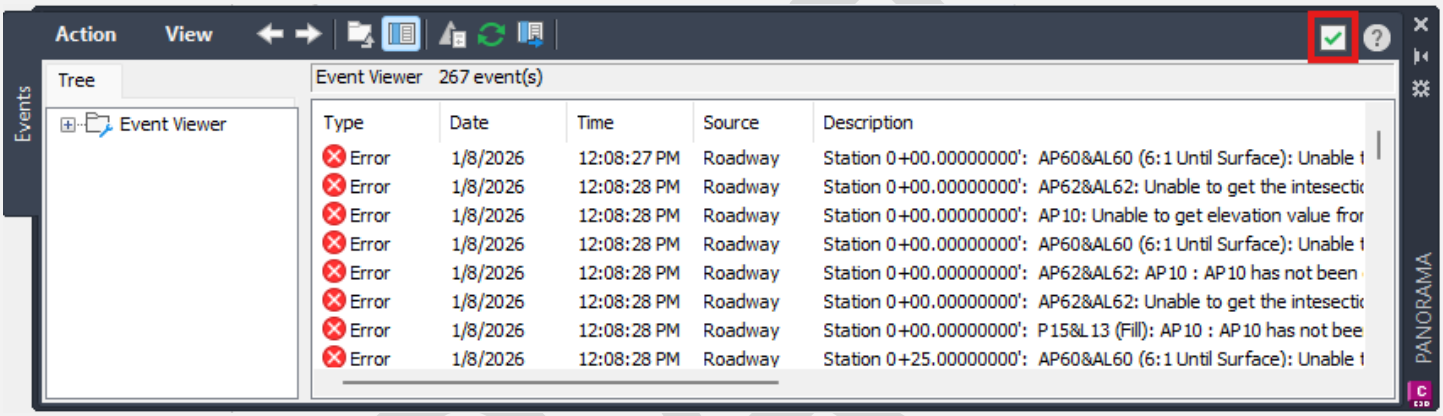
The Baseline and Region Parameters dialog should appear and look similar to the below.



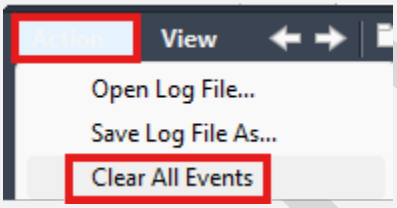
This is where additional assemblies can be added as mentioned previously. The options present in this dialog will be covered in detail below, for now select OK or Apply. When the dialog below appears, select Rebuild the corridor. Select OK again if needed.



The corridor should now be built. There may be a long list of errors that populate in the panorama window. This can be cleared by selecting the green check in the top right.



These errors will be recalculated and added to the list each time the corridor is rebuilt, potentially creating many duplicate errors. In the top left, selecting “Action” > “Clear All Events” will remove all the errors such that the next time the corridor is rebuilt only current errors will be present.



Corridor Properties

The Corridor Properties menu in Civil 3D is a central location for managing all aspects of a corridor model. It is organized into the following tabs: Information, Parameters, Codes, Feature Lines, Surfaces, Boundaries, and Slope Markings. Within this menu it is possible to view and modify general settings, define regions with different assemblies, set targets (such as surfaces or feature lines), manage code sets for display, create corridor surfaces, add boundaries, and apply slope patterns, providing comprehensive control over the corridor design.

To access the corridor properties select the corridor. Then through the contextual tab on the Modify Corridor Panel select Corridor Properties.

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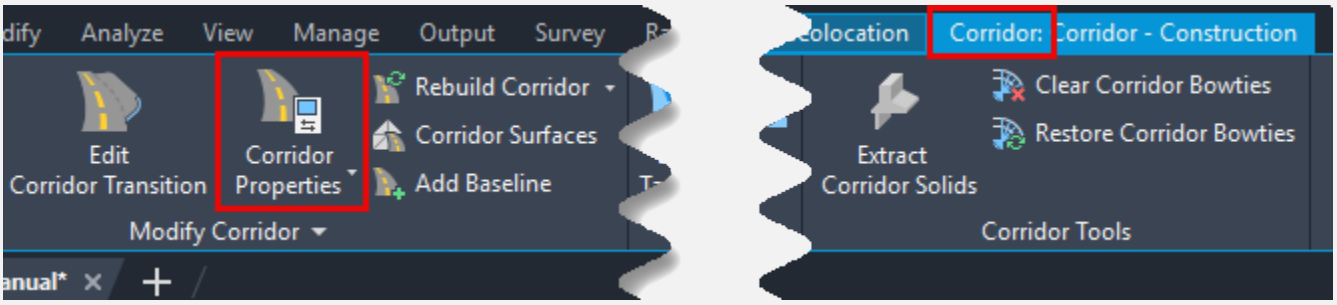


Information

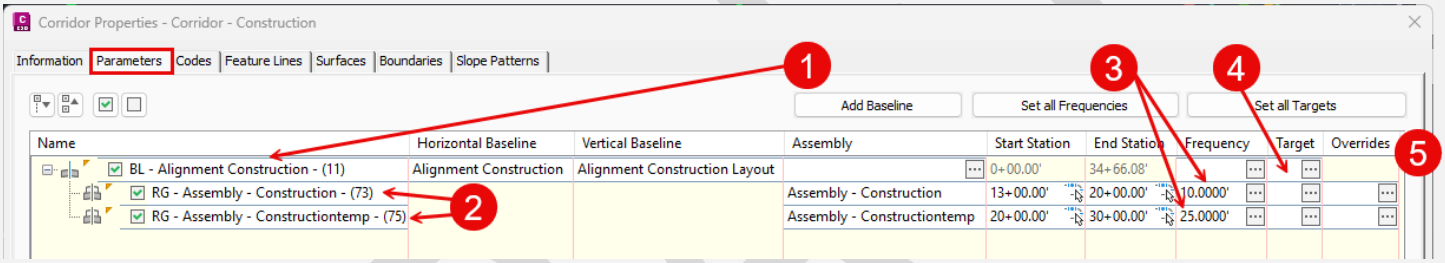
[Autodesk Information Tab]

On this tab there is the option to change the name, provide a description and select the object style of the corridor. The object style controls the display of the corridor information that is shown at elevation zero.

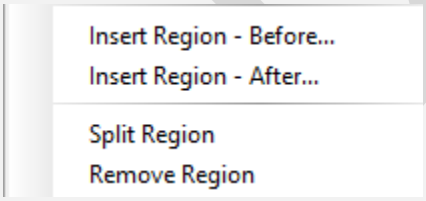
Parameters

[Autodesk Parameters Tab]

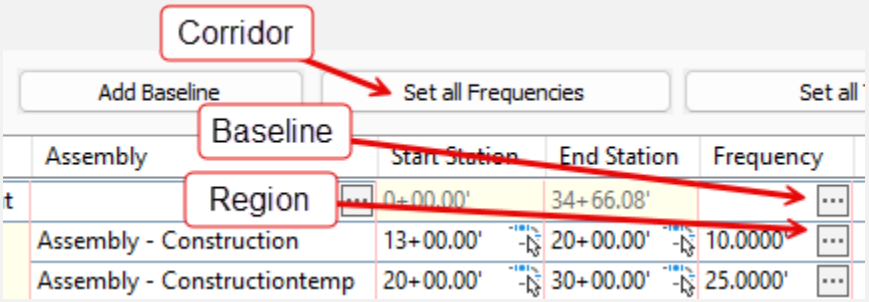
This tab controls the core geometry and layout of the corridor model with the ability to view and edit baselines, regions, frequencies, targets, and overrides. This graphic demonstrates the topics that will be covered on the following pages.



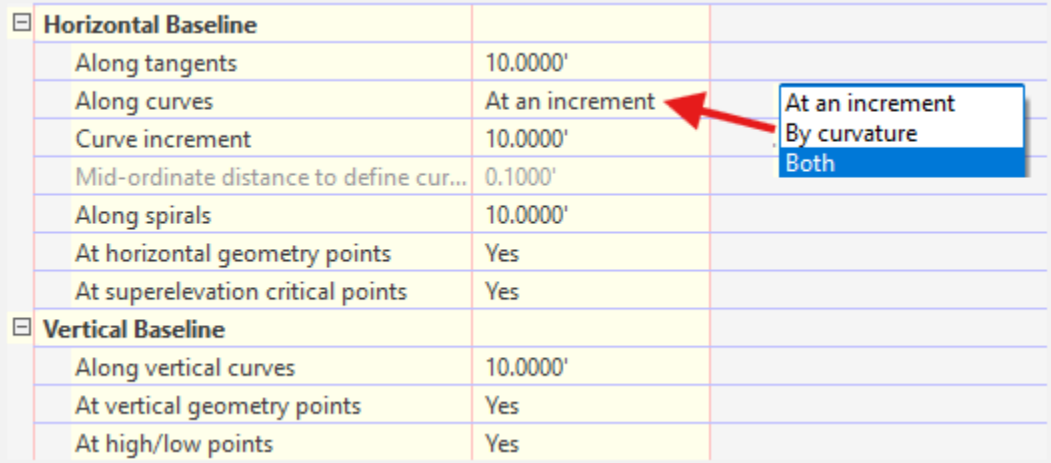
1. Baselines: A baseline is composed of either an alignment & profile combination or a feature line and is proceeded by the text “BL”. Selecting add baseline will open a dialog similar to when first creating a corridor, see the [Create Corridor] section for additional information.
2. Regions: A baseline can be split into multiple regions which are denoted by the text “RG”. Regions are identified by selecting an assembly and providing start and end stations for that assembly. Splitting into regions opens the opportunity to incorporate multiple assemblies for different typical sections or have gaps in the corridor (ex. Bridges). Regions can be modified by right-clicking on an existing region name. The options below will be available.



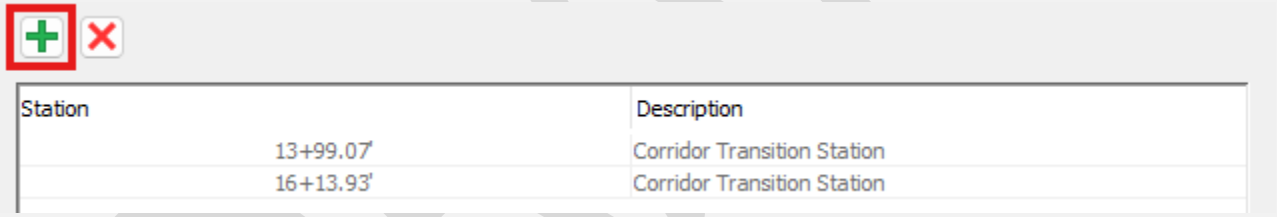
3. Frequencies: Frequencies define how often a section perpendicular to the baseline will be computed within a corridor. Frequency intervals can be set based on location within a curve or tangent, and they can be set at the region, baseline or corridor level.



Increments along a curve can be defined by a length increment, the mid ordinate distance (maximum perpendicular distance from the midpoint of a chord to the actual arc), or both.



Additional stations can be added as well if there is a need for a section at a location that does not fall at a regular interval.

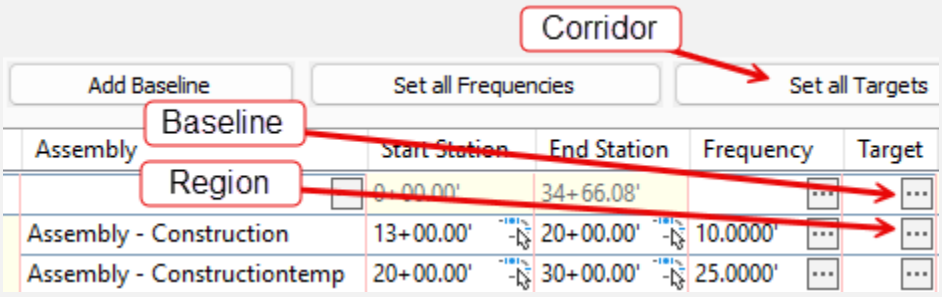


After selecting the + follow the command line prompts to select a station.

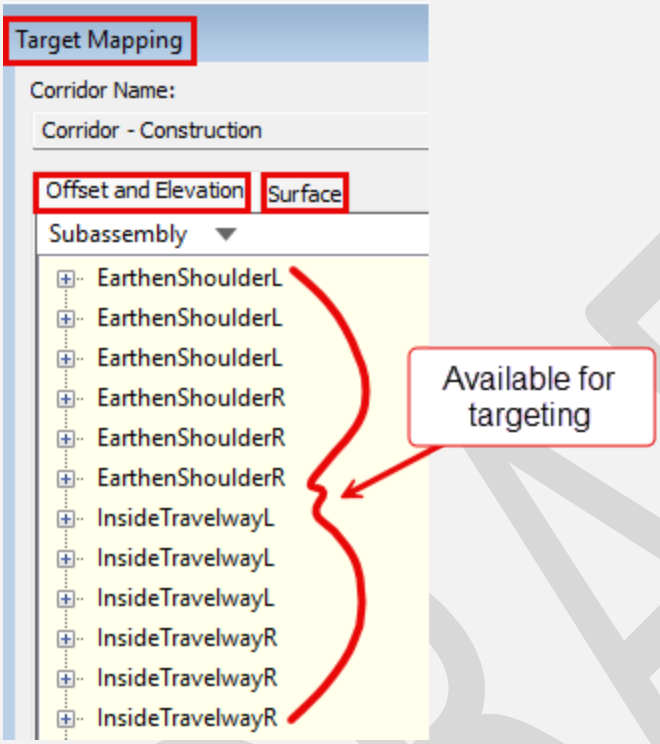
```
EDITCORRIDORPROPERTIES Specify station along baseline:
```

** Sections computed according to the frequency settings provided here do not govern where cross sections for plan production are placed. Sample lines and section views determine station locations for plan production cross sections. With that in mind, if a sample line is defined at a station where a section has not been computed according to the frequency settings, the result will be interpolated between the two nearest sections.*

4. Targets: Targets in Civil 3D are objects (alignments, feature lines, polylines, survey figures, surfaces, etc.) that a subassembly can reference to dynamically define the geometry of the corridor rather than using fixed dimensions. There are three types of targets available: Offset, Elevation, and Surface. Similar to frequencies, targets can be set at the region, baseline or corridor level by accessing the target mapping menu.



Once in the target mapping menu, any targets available within a subassembly will be displayed. It is important to note here that Surface targets are on a different tab than Offset and Elevation targets.



Example: Defining Offset Target

What the corridor ditchline looks like before a target is defined.

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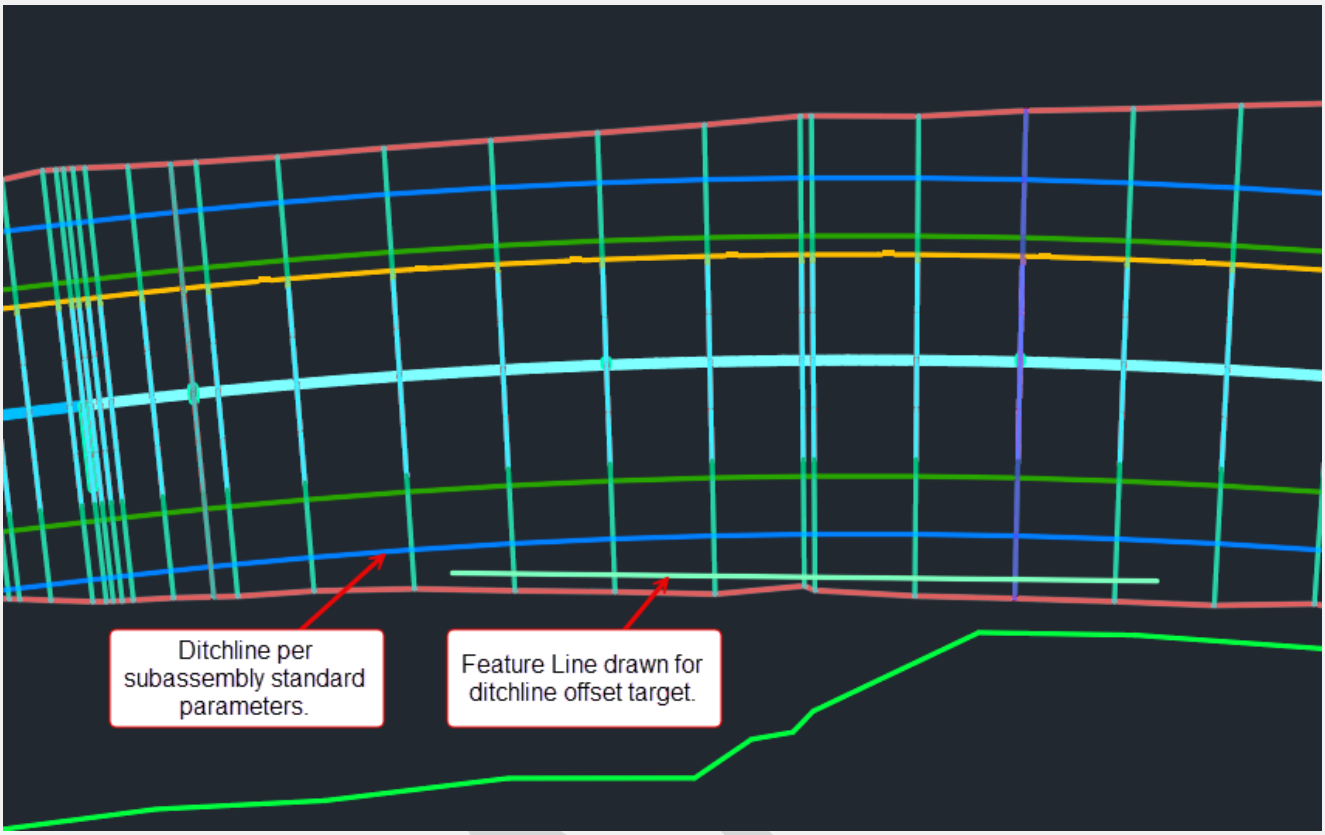
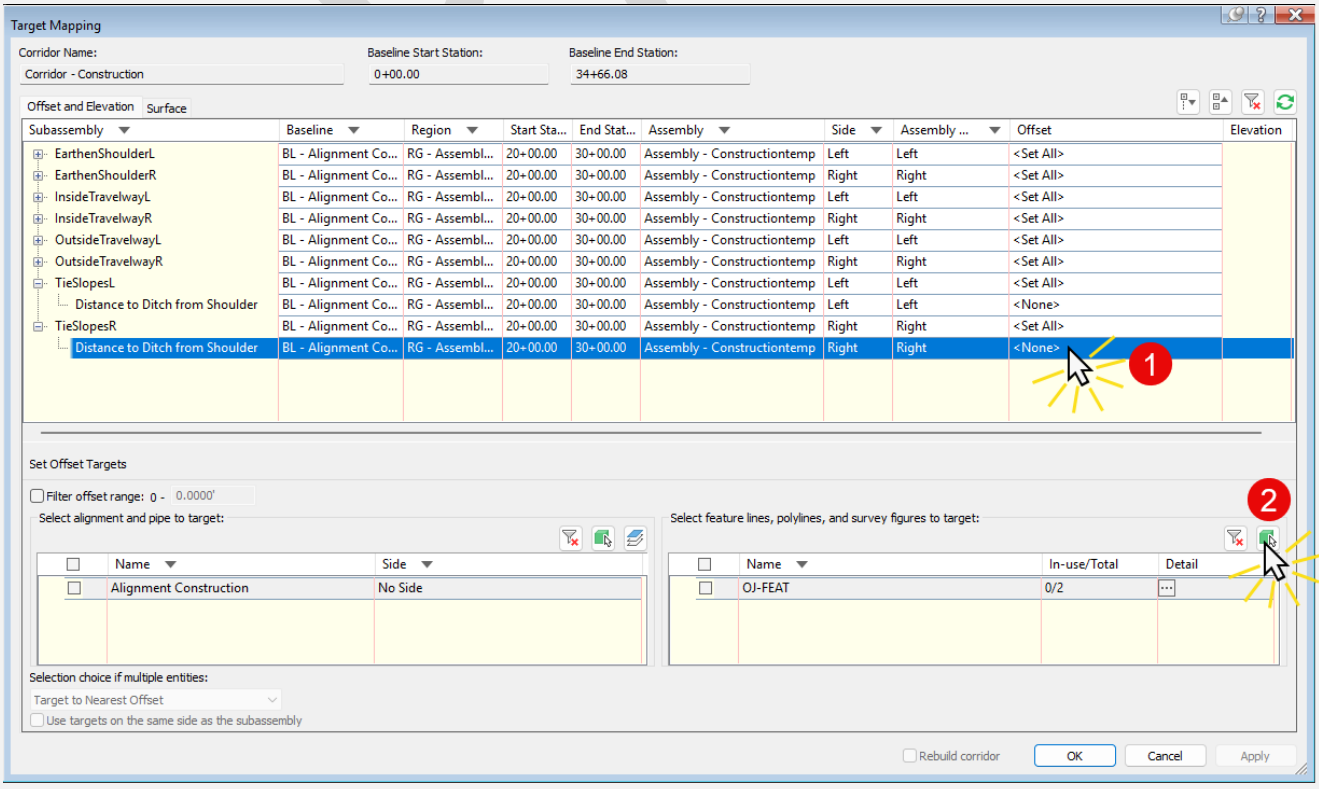
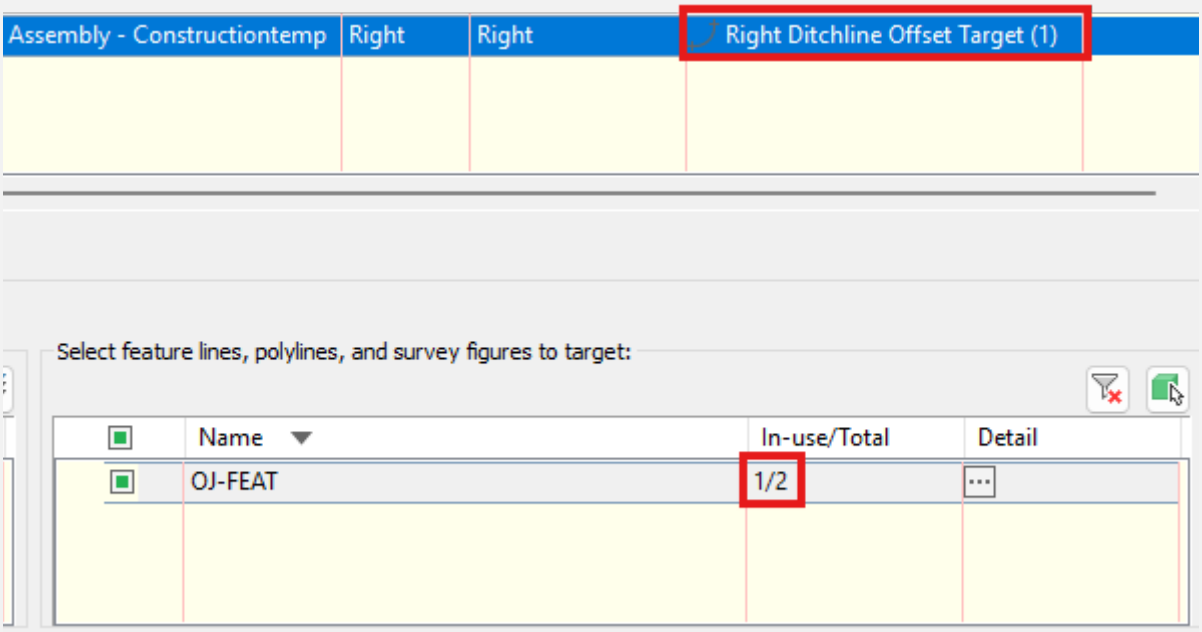


1. Inside the target mapping menu select the appropriate offset target to map to the feature line based on subassembly and stationing.
2. To select the target object(s) click on the select from drawing button. Follow the prompts in the command line.

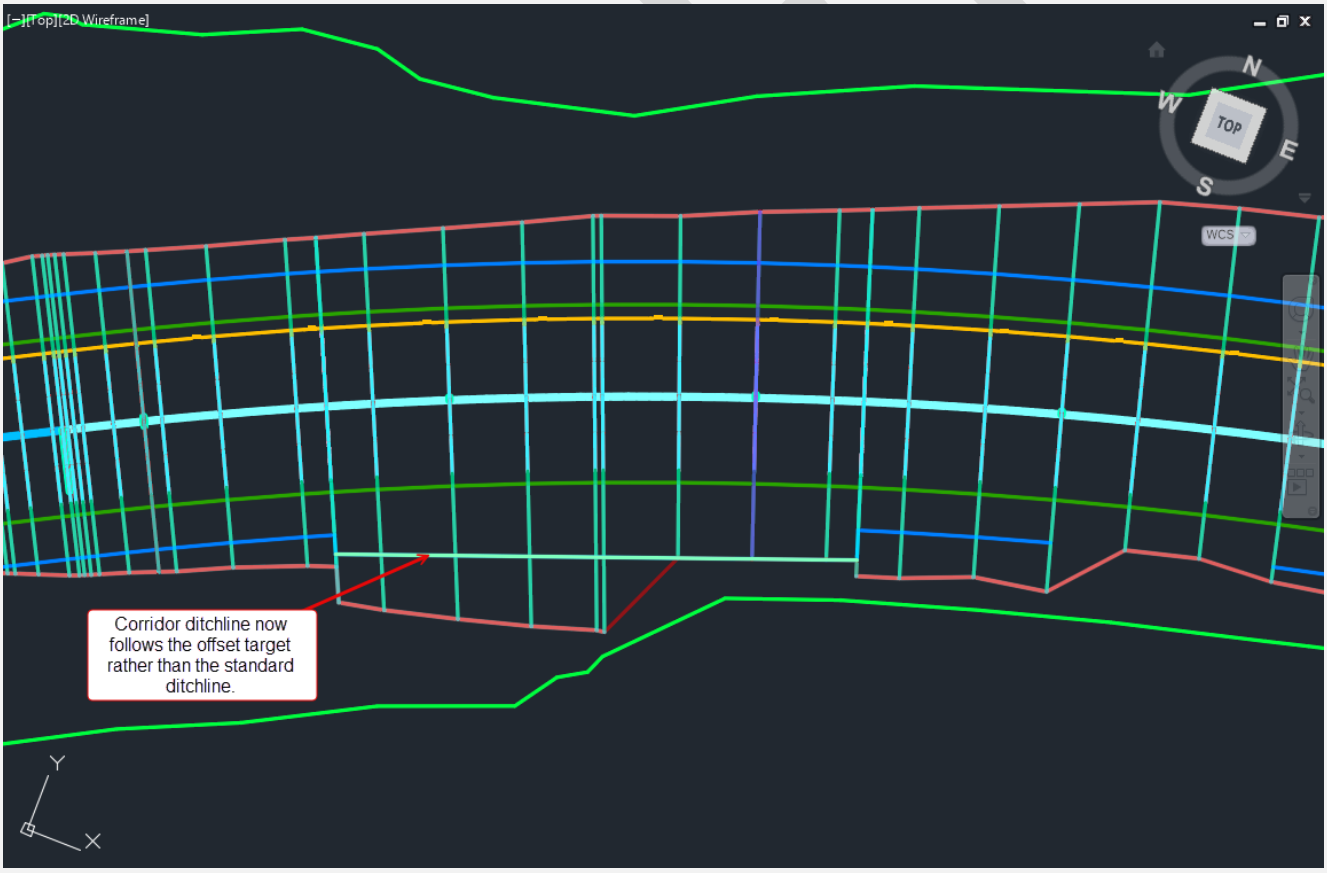
EDITCORRIDORPROPERTIES Select objects:



The target mapping menu will update with the object(s) name and show that there are one or more objects in use.

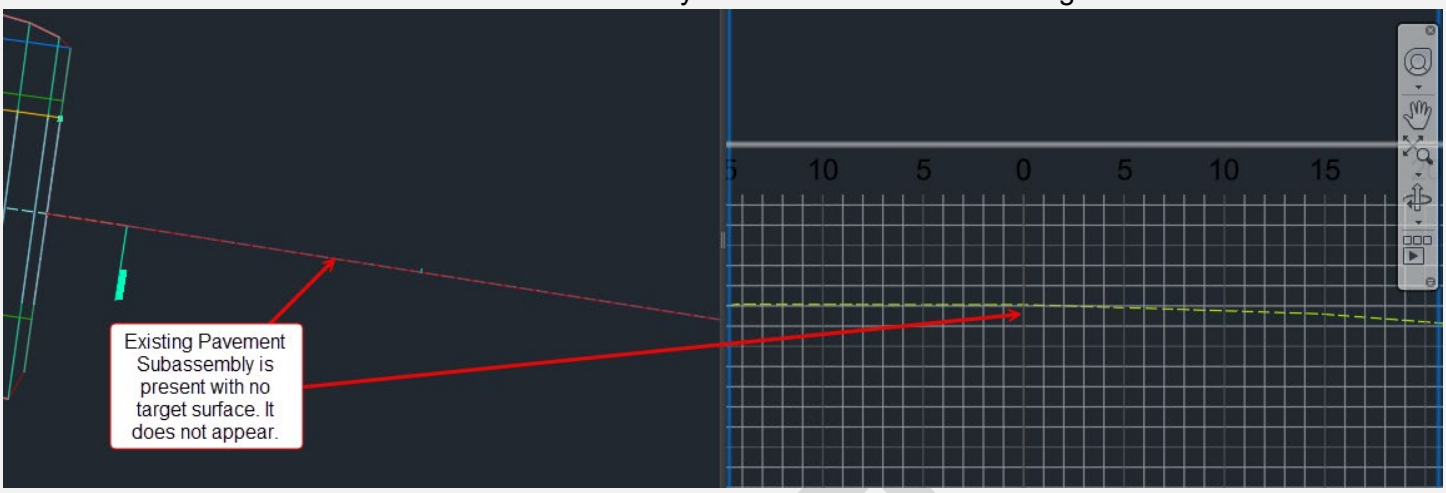


Select OK, then Rebuild Corridor to see the updates.

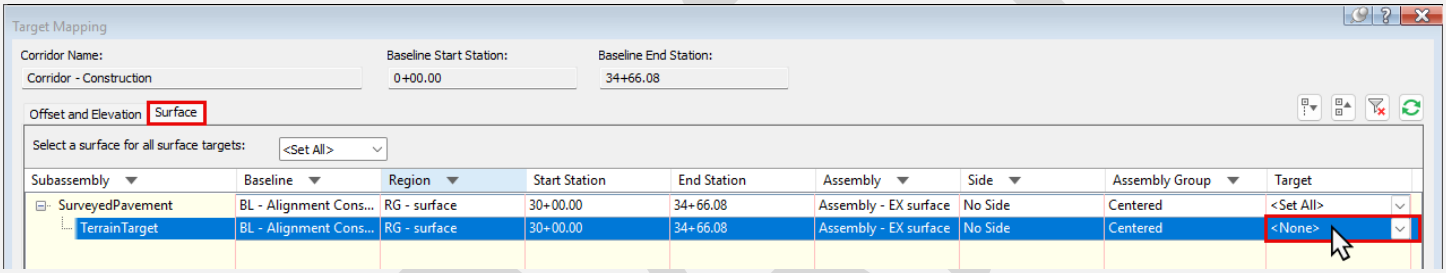


Example: Defining Surface Target

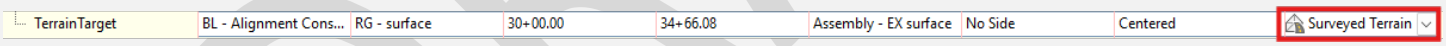
What the corridor looks like with the assembly attached and no surface target.



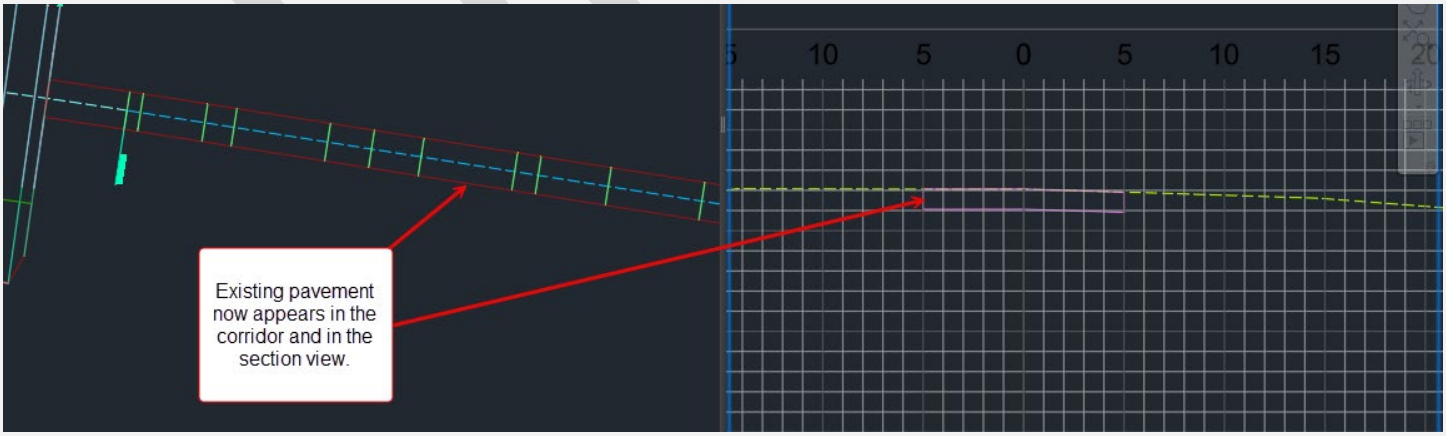
In the target mapping menu on the surface tab select the appropriate surface target from the drop down to map to the existing surface for the project.



The target will update to the selection.

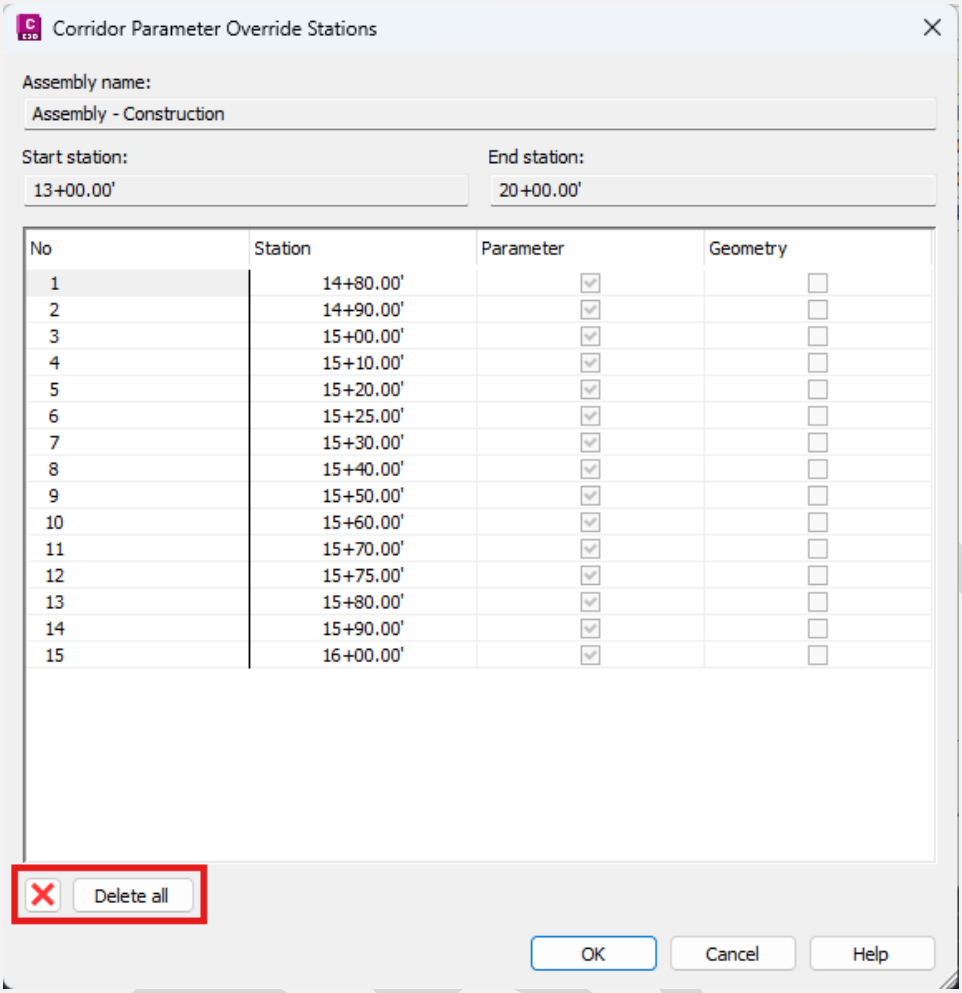


Select OK, then Rebuild Corridor to see the updates.



5. Overrrides: Overrides adjust subassembly input parameters at specific stations or station ranges. In this menu they can be viewed and deleted only. Overrides can be applied through the Corridor Section Editor.

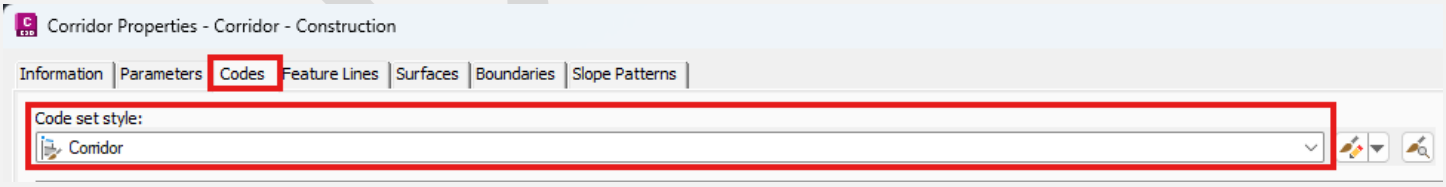
** Overrides should primarily be used for minor edits, while they can be applied over a station range, the values are locked to the specific frequency stations present at that time. If the frequency is later changed additional stations will not have the override value attached.*



Codes

Autodesk Codes Tab

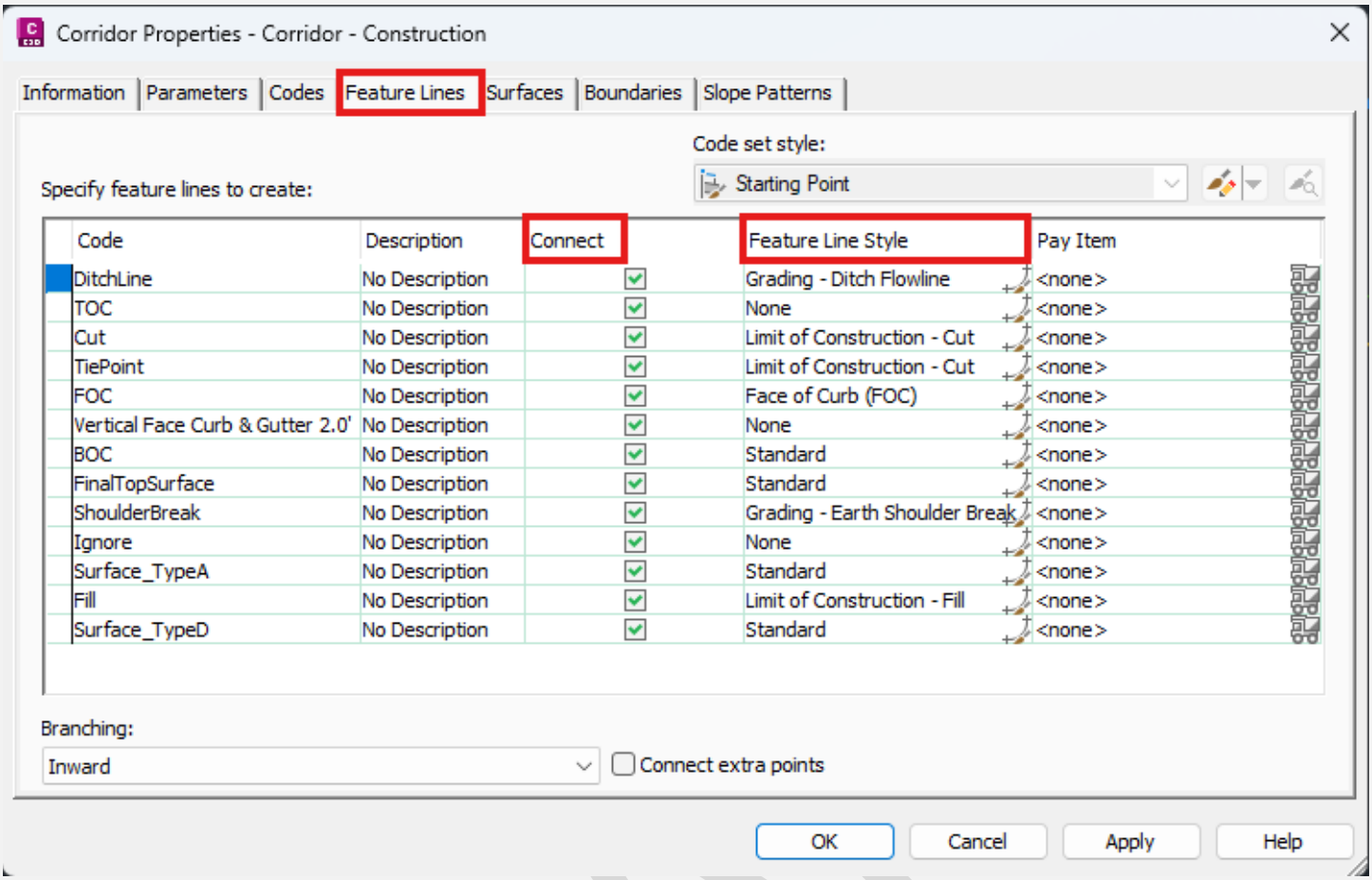
This tab controls the display styles of the corridor based on the codes provided with the subassembly. Select the appropriate code set style at the top. See code set styles if edits need to be made.

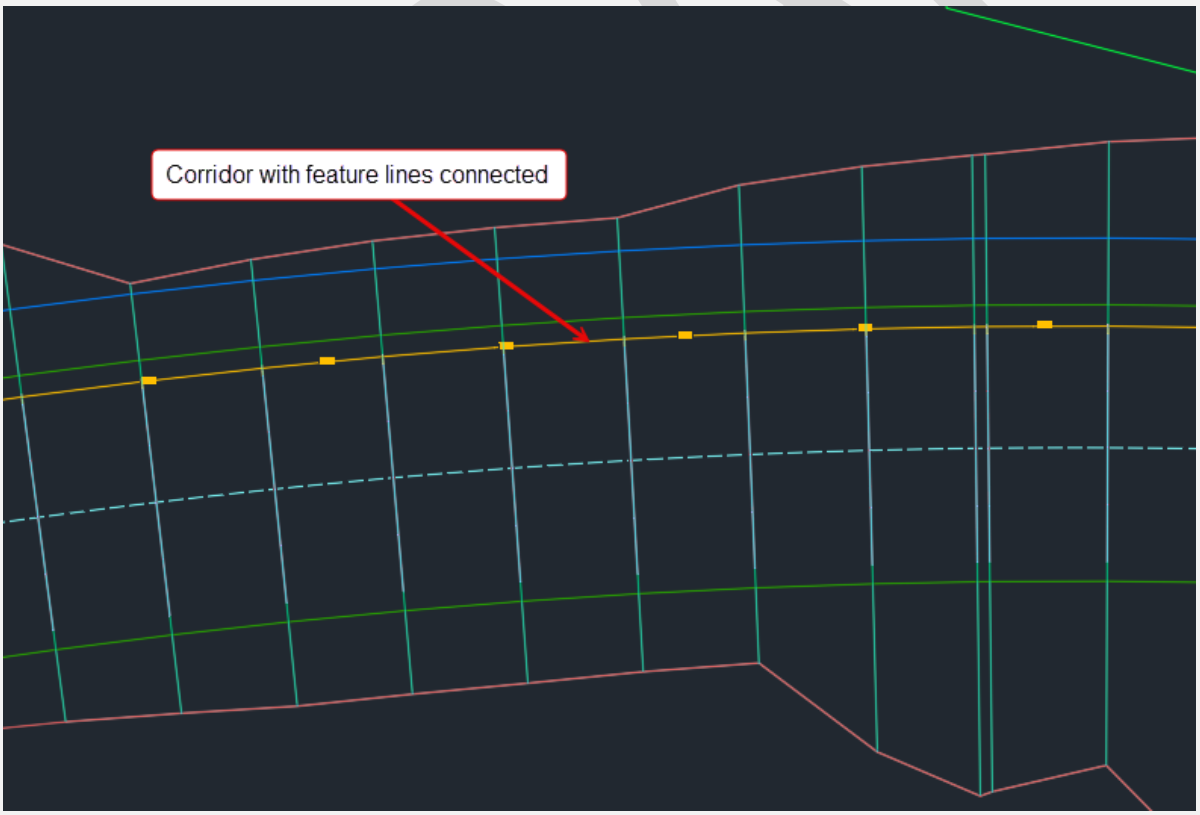


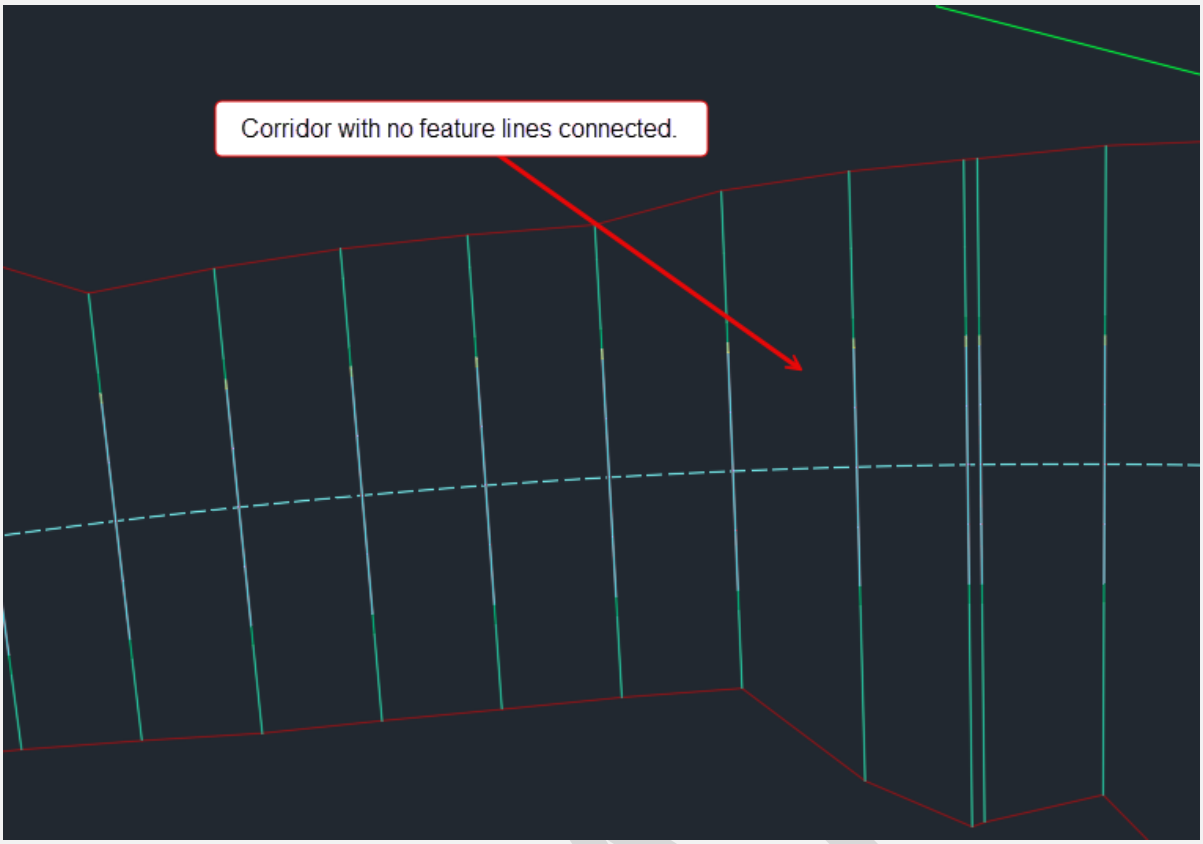
Feature Lines

Autodesk Feature Lines Tab

This tab controls whether feature lines are created from subassembly point codes. The default feature line styles are setup in the code set styles, but they can be adjusted here if needed. If the check box for connect is selected the feature lines will be drawn, if left blank no feature line will be drawn for that code.


Corridor Properties - Corridor - Construction
Information
Parameters
Codes
Feature Lines
Surfaces
Boundaries
Slope Patterns
Code set style:
Starting Point
Specify feature lines to create:
Code
Description
Connect
Feature Line Style
Pay Item
DitchLine
No Description
Grading - Ditch Flowline
<none>
TOC
No Description
None
<none>
Cut
No Description
Limit of Construction - Cut
<none>
TiePoint
No Description
Limit of Construction - Cut
<none>
FOC
No Description
Face of Curb (FOC)
<none>
Vertical Face Curb & Gutter 2.0'
No Description
None
<none>
BOC
No Description
Standard
<none>
FinalTopSurface
No Description
Standard
<none>
ShoulderBreak
No Description
Grading - Earth Shoulder Break
<none>
Ignore
No Description
None
<none>
Surface_TypeA
No Description
Standard
<none>
Fill
No Description
Limit of Construction - Fill
<none>
Surface_TypeD
No Description
Standard
<none>
Branching:
Inward
Connect extra points
OK
Cancel
Apply
Help

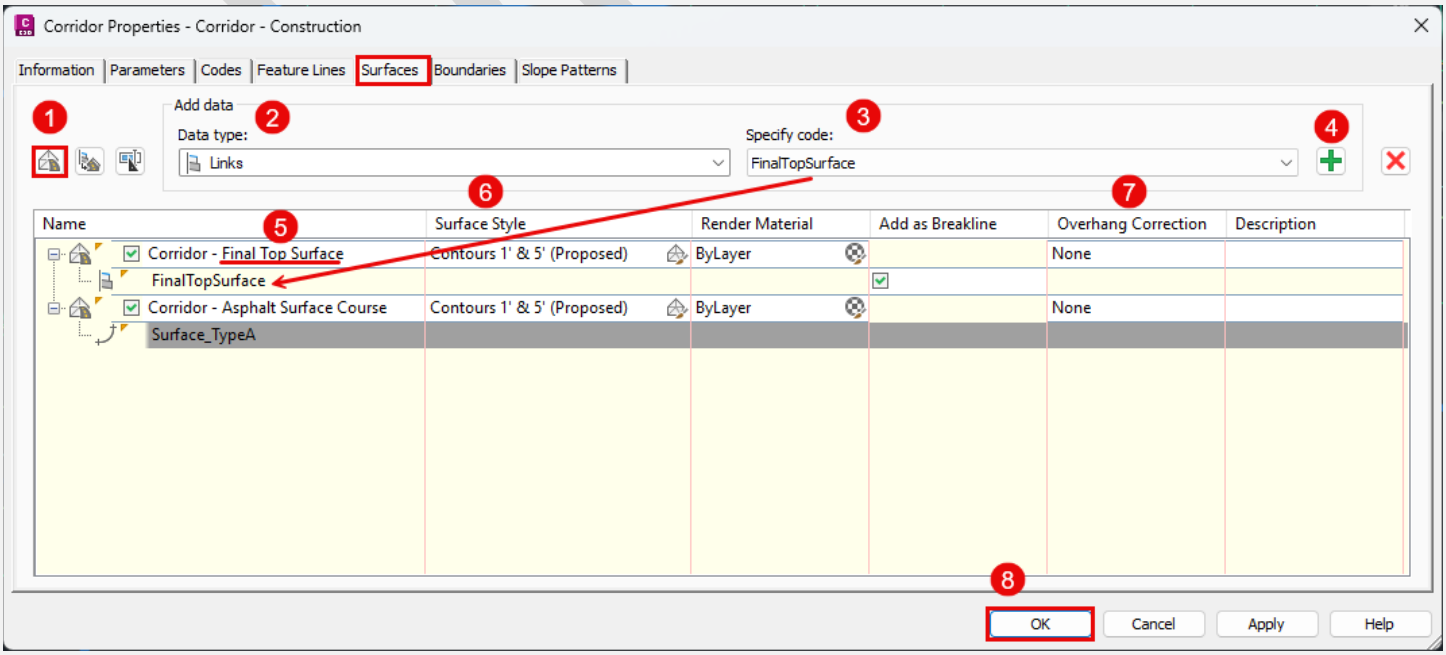

Corridor with feature lines connected



Surfaces

Autodesk Surfaces Tab

This tab controls the creation of surfaces from corridor objects. The surface can be created from any point or link codes that were specified when the subassembly code parameters were set.



1. Select “Create a Corridor Surface”
2. Select the appropriate data type “Links” or “Feature Lines”
3. Select a code to be added as part of the surface.

** Only feature lines selected as connect on the previous tab are available here for inclusion in a surface.*

4. Click the add button to add a single code to a surface. Multiple codes can be added as needed.
5. Provide a descriptive name for the surface
6. Select a surface style that is appropriate for the surface created.
7. See this link to the Autodesk help website for a description of Overhang Correction and whether it may be needed.
8. Select OK and rebuild the corridor to see the surface created.

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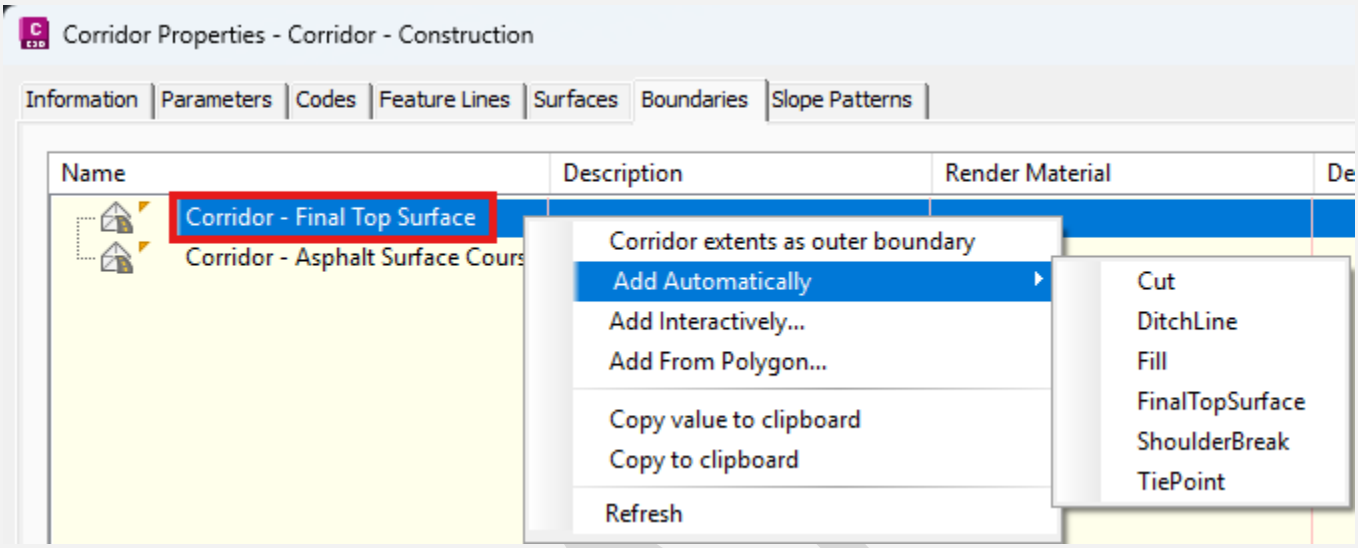
Boundaries

Autodesk Boundaries Tab

This tab is an extension of the last tab as it allows an option to add a boundary to the surfaces previously created.

Right click on a surface for the different boundary options. “Corridor extents as outer boundary” is a quick way to control the surface especially for a Final Top Surface but may not be appropriate for every situation.



** Typical boundaries created through the surface definitions can still be used as well if that is easier.*

Slope Patterns

Autodesk Slope Patterns Tab

Slope patterns can be added between two feature lines to add visual displays for slopes. See the link to the Autodesk website if this is desired.

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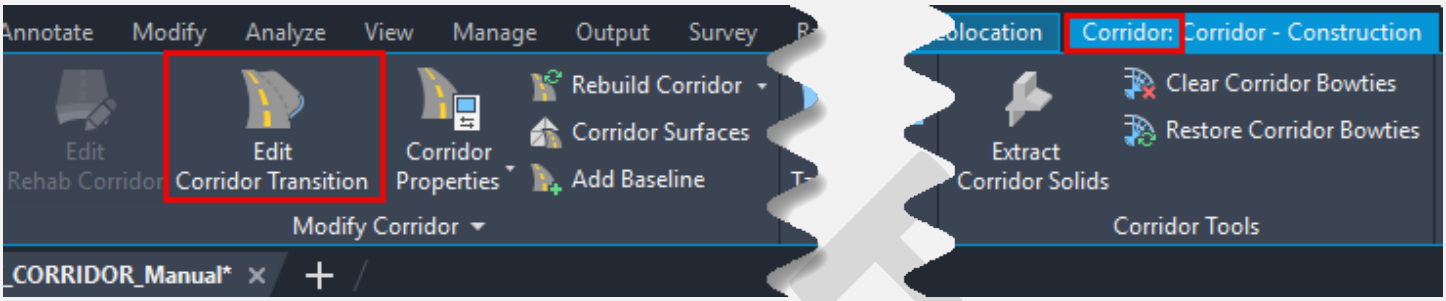
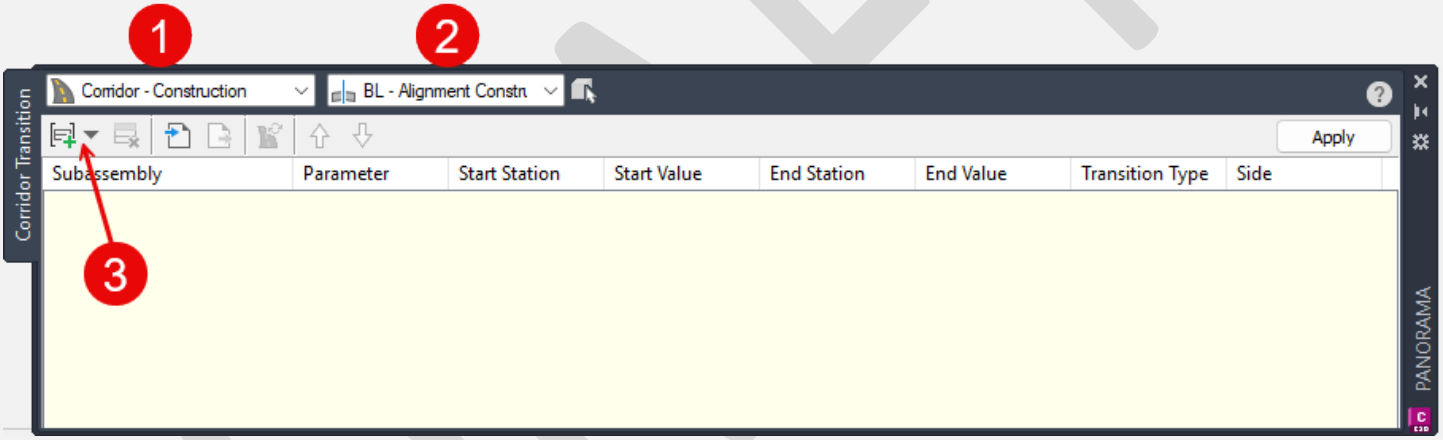
Edit Corridor Transition

Within a corridor, subassembly parameters can be adjusted to create transitions (ex: lane width, side slopes, shoulder widths, etc.). Additionally these transitions can be exported and imported which allows the opportunity to rebuild a corridor quickly for situations such as having multiple project alternatives or a file become corrupt.

To create corridor transitions in Civil 3D, select the corridor, then on the contextual tab, within the "Modify Corridor" panel, select "Edit Corridor Transition" to open the corridor transition menu in the Panorama window.



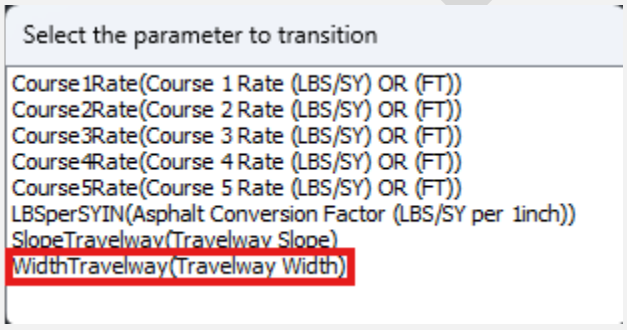
1. Select the appropriate corridor.
2. Select the appropriate baseline.
3. Click on “Create a new transition set”.



Follow the prompts in the command line to select the appropriate subassembly.

```
Select a subassembly by subassembly name or [Class name]:
```

Once a subassembly has been selected a pop up will appear with the available parameters for that subassembly. Select the parameter that a transition will be applied to.

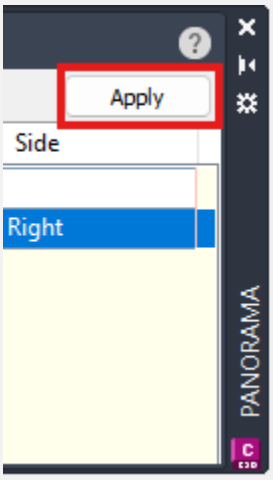


Continue to follow the prompts in the command line

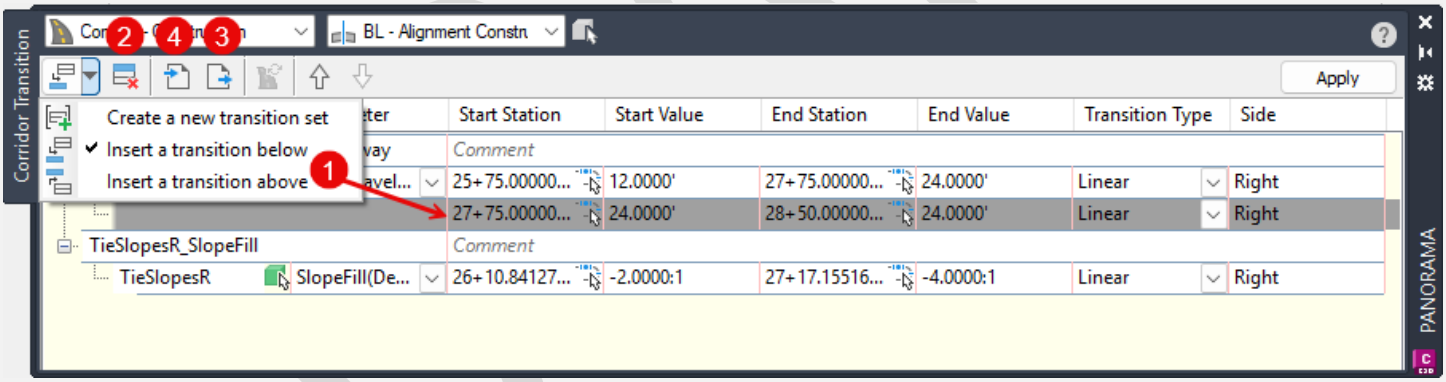
```
Select the start station of the transition for the WidthTravelway:
```

```
Enter the parameter value at station 25+75.0000' <12.0000'>:

Select the end station of the transition for the WidthTravelway:

Enter the parameter value at station 27+75.0000' <12.0000'>:

Enter the transition type : [Linear Bay taper Cubic in cUbic out Parabolic in pArabolic
out Reverse parabolic] <Linear>:
```

Select Apply in the Panorama window. The corridor will rebuild and the transition can be seen.



Additional options for editing corridor transitions:



1. Transitions can be added to the same subassembly either above or below the currently selected transition.
2. Deletes the selected line: A single transition or all the transitions for a subassembly can be deleted.
3. Export Transitions: The corridor transitions can be exported to a .csv file and saved as a backup in case they need to be used in the future to recreate a corridor with all the appropriate transitions.
4. Import Transitions: The corridor transitions can be added to a corridor by import rather than manually as well. If there are any existing transitions they will be overwritten (see image below). If there is a case where some current transitions need to be maintained and some need to be imported, the best action would be to export the current transitions and merge them with the new transitions in excel, then import the combined .csv file.

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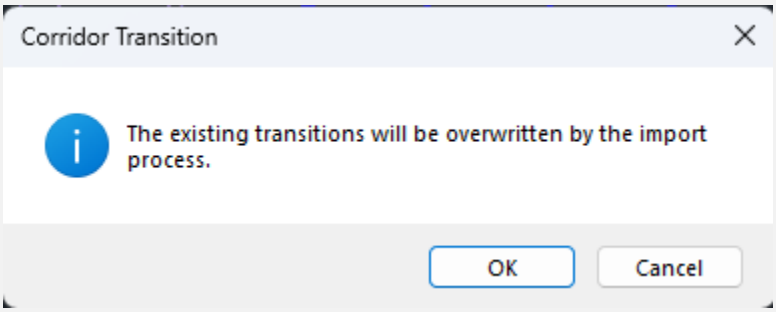
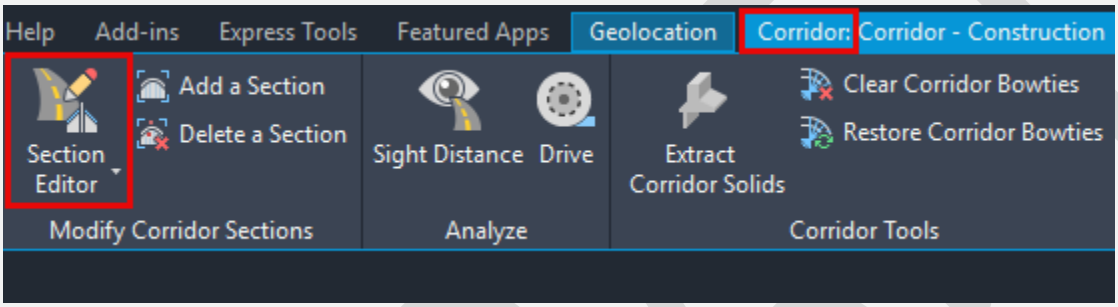


Corridor Section Editor

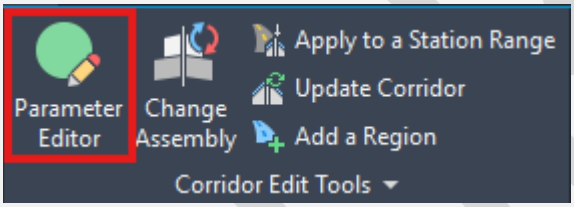
The corridor section editor is a tool for visually inspecting and manually modifying corridor cross-sections at specific stations, allowing the ability to override default subassembly parameters.

For direction on how to navigate the corridor section editor see the Autodesk link [To View Corridor Sections]

To open the corridor section editor in Civil 3D, select the corridor, then on the contextual tab, within the "Modify Corridor Sections" panel, select "Section Editor" to open the corridor section editor.

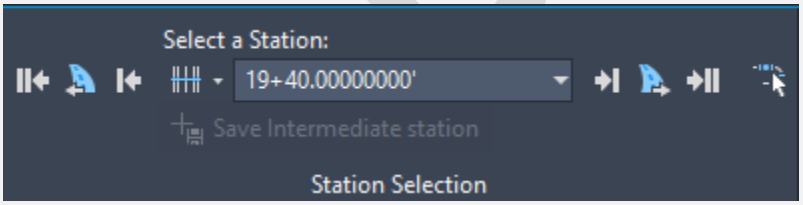


Within the “Corridor Edit Tools” panel select the “Parameter Editor” tool.



Within the Parameter Editor overrides can be added for specific stations or station ranges.

Use the Station Selection panel to find a station that needs to be edited.



Change any parameters that need to be adjusted at that station or a range of stations.

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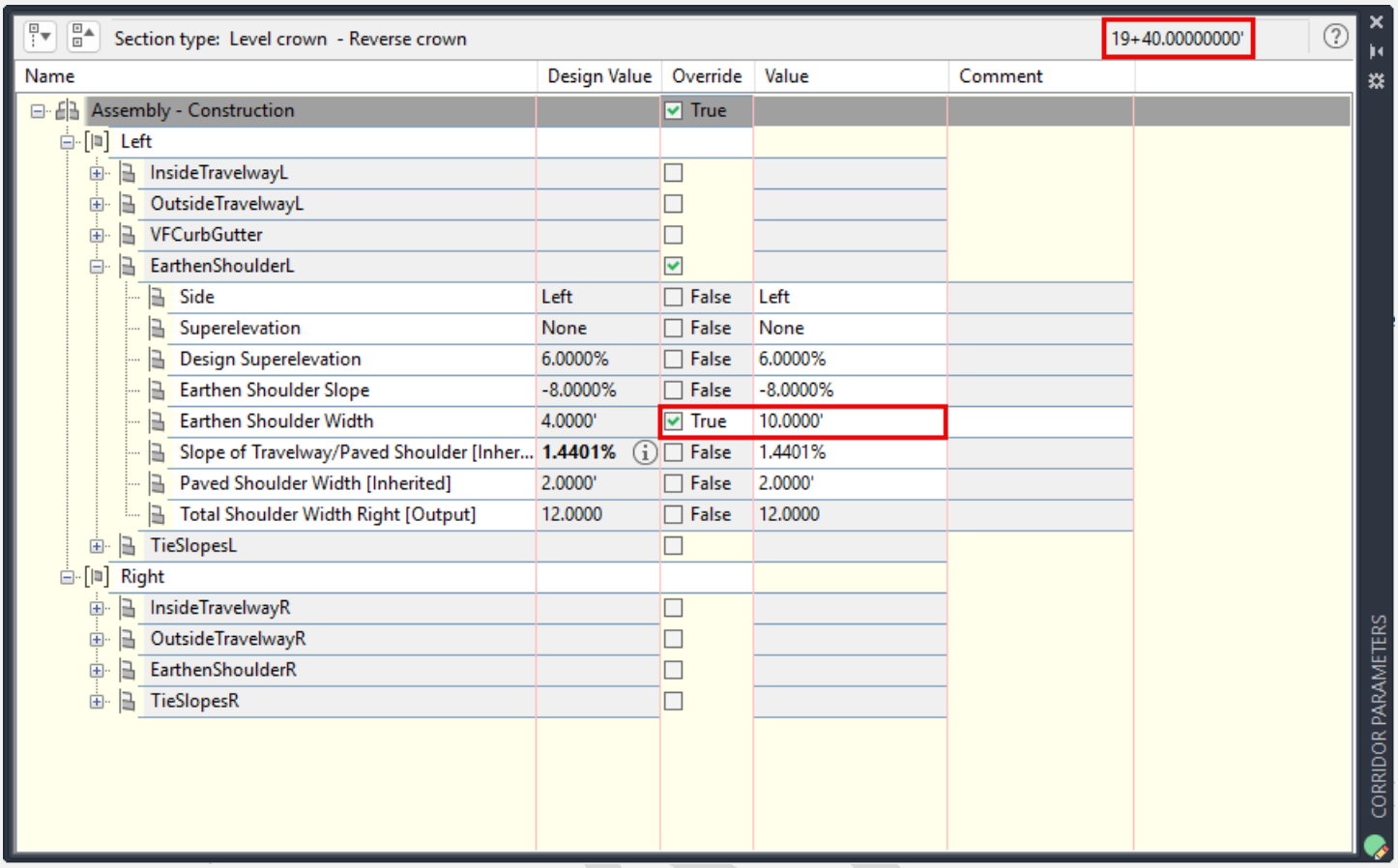
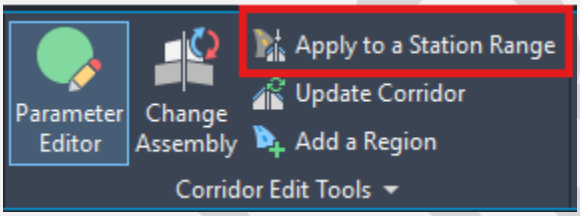
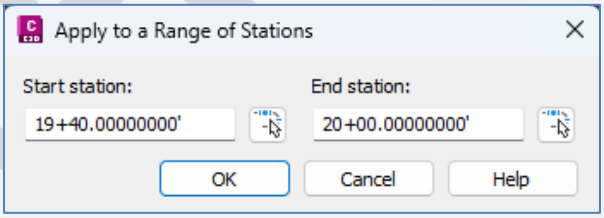
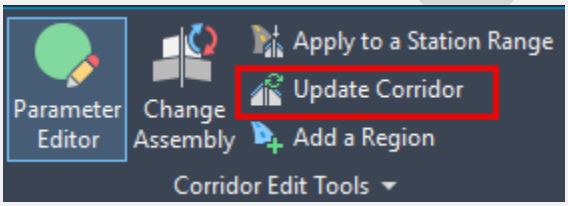


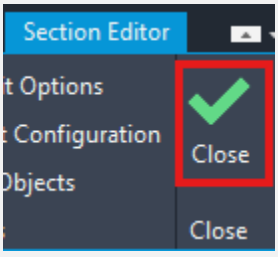
To apply a change to a range of stations select Apply to Station Range on the Corridor Edit Tools panel then specify the station limits.

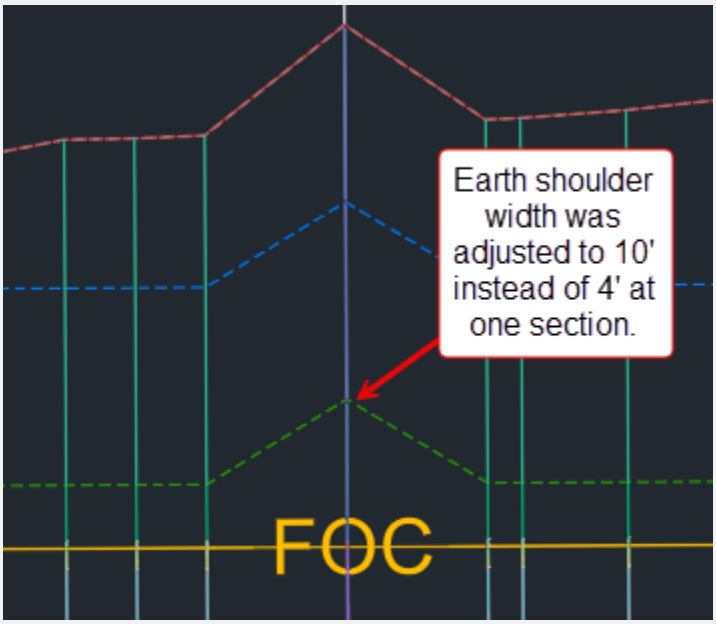




Once the parameters have been changed and set to a range if necessary select Update Corridor in the Corridor Edit Tools panel to have the corridor reflect the changes. Select close to exit the Corridor Section Editor.

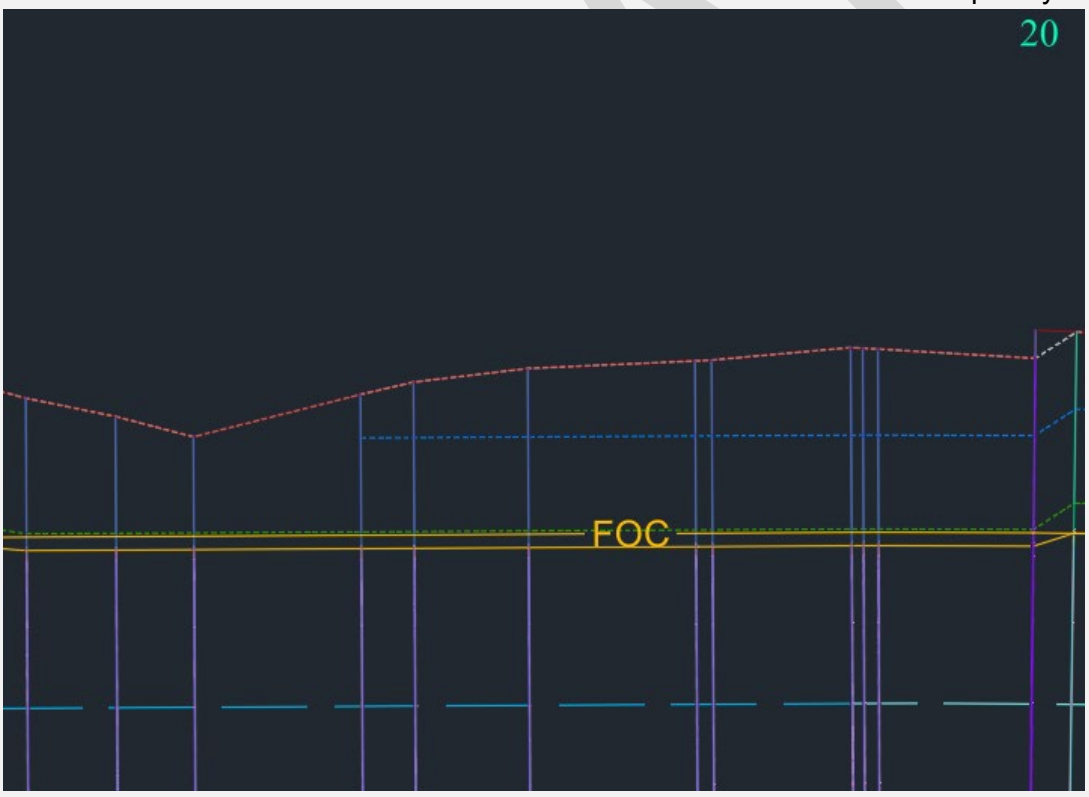




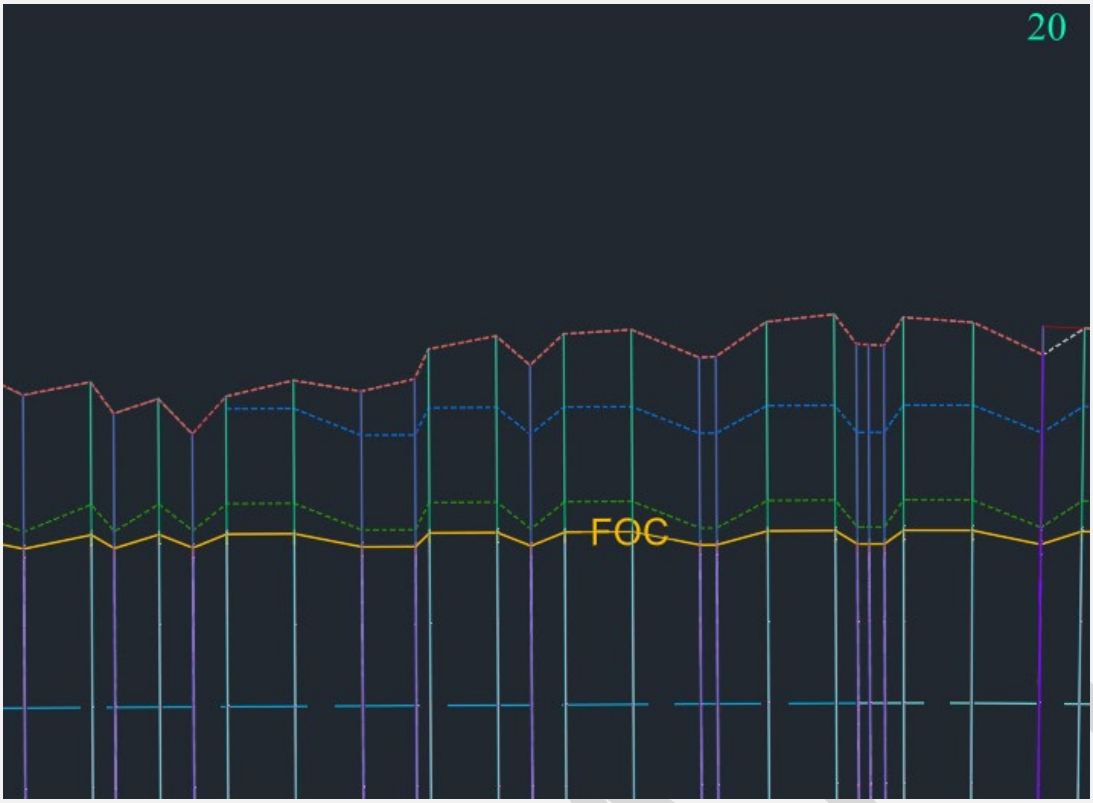


** Overrides should primarily be used for minor edits, while they can be applied over a station range, the values are locked to the specific frequency stations present at that time. If the frequency is later changed additional stations will not have the override value attached. In the images below the only change was a decreased frequency distance.*

Corridor with lane width and earth shoulder width overrides set and 25’ frequency.



Corridor with frequency adjusted to 10’. Original overrides hold but do not apply to additional new sections.



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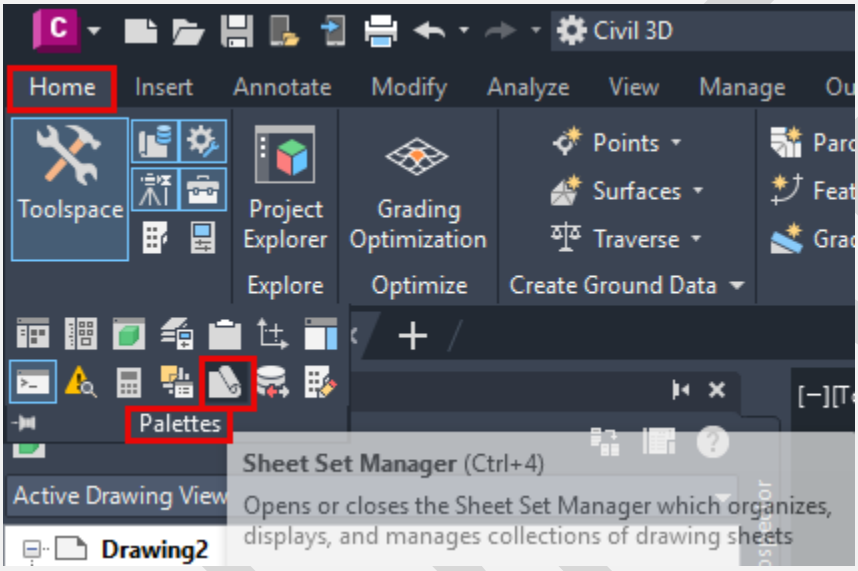
Plan Production

Sheet Set Manager

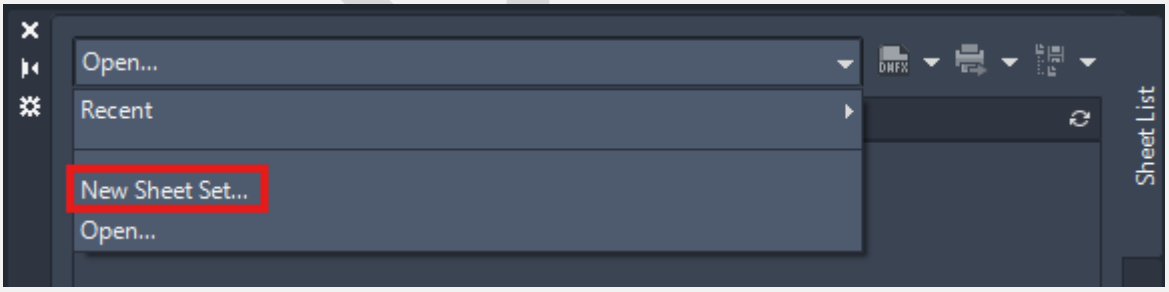
In Civil 3D the Sheet Set Manager is a powerful tool that organizes, manages, and plots layout tabs from multiple drawings as a cohesive project set. It streamlines workflows by enabling automated sheet numbering and real-time updating of title block information using fields. Each project should have a sheet set prepared that is accessible by everyone working on the project. This creates a centralized location for a set of plans to be printed from and provides consistent printing results.

The sheet set manager can be accessed by:
Typing the command SSM in the command line.
OR
Pressing the keyboard shortcut (Ctrl + 4).
OR
To open the Sheet Set Manager in Civil 3D, navigate to the "Home" tab, within the "Palettes" panel, select "Sheet Set Manager".

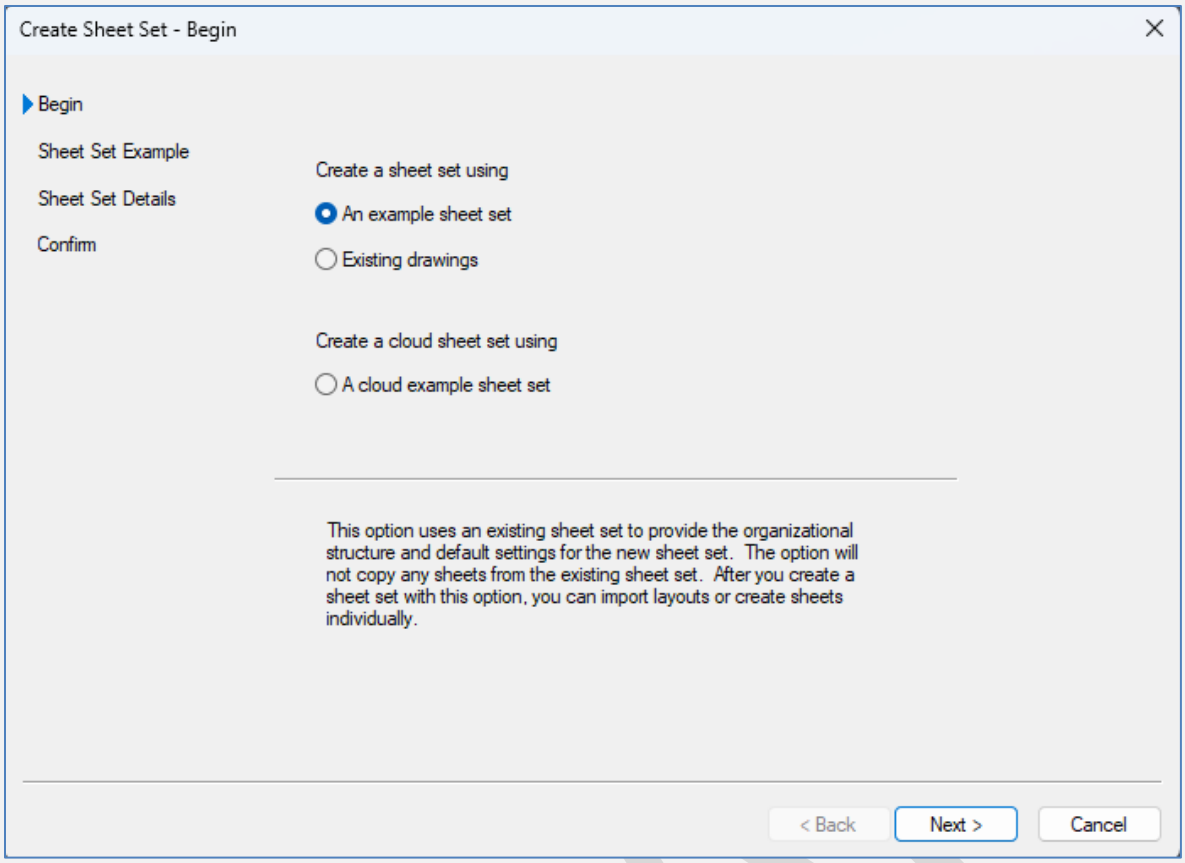


Create New Sheet Set

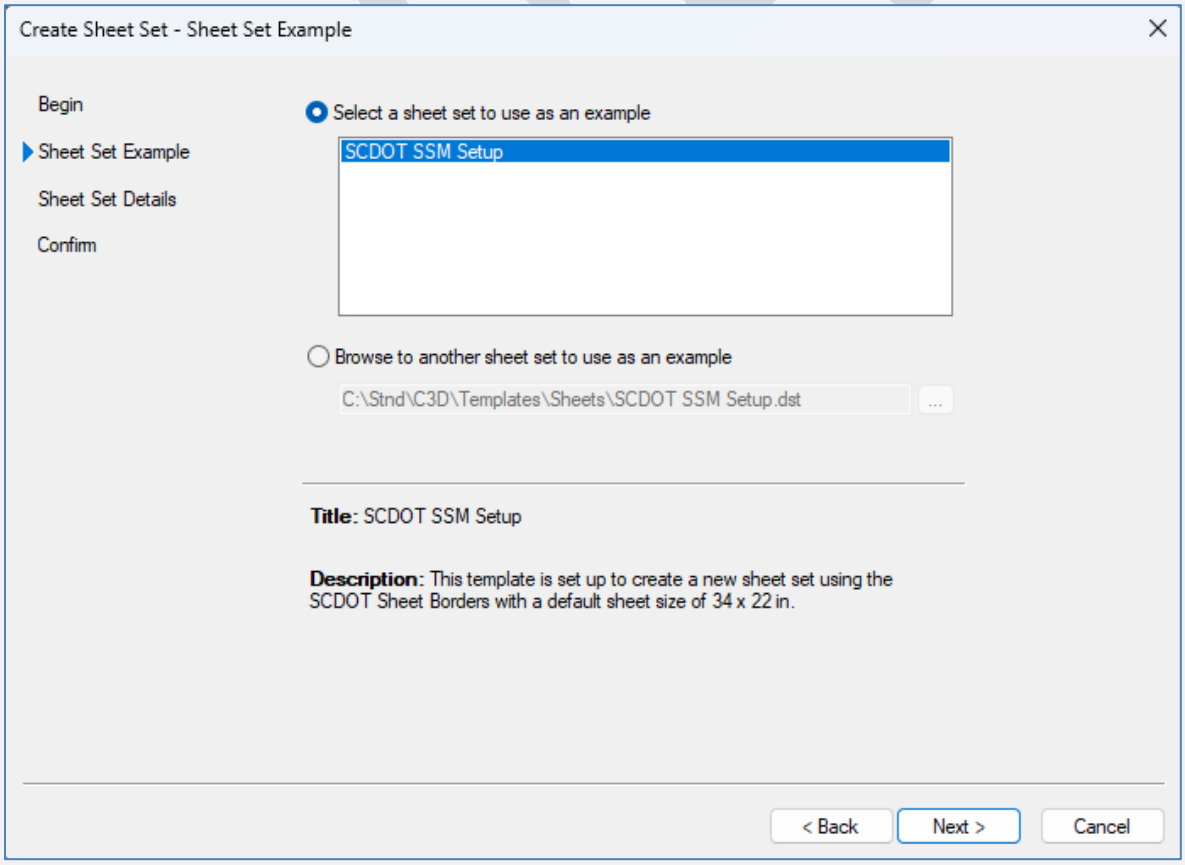
In the Sheet Set Manager select New Sheet Set



Begin: Select “An example sheet set” then press Next

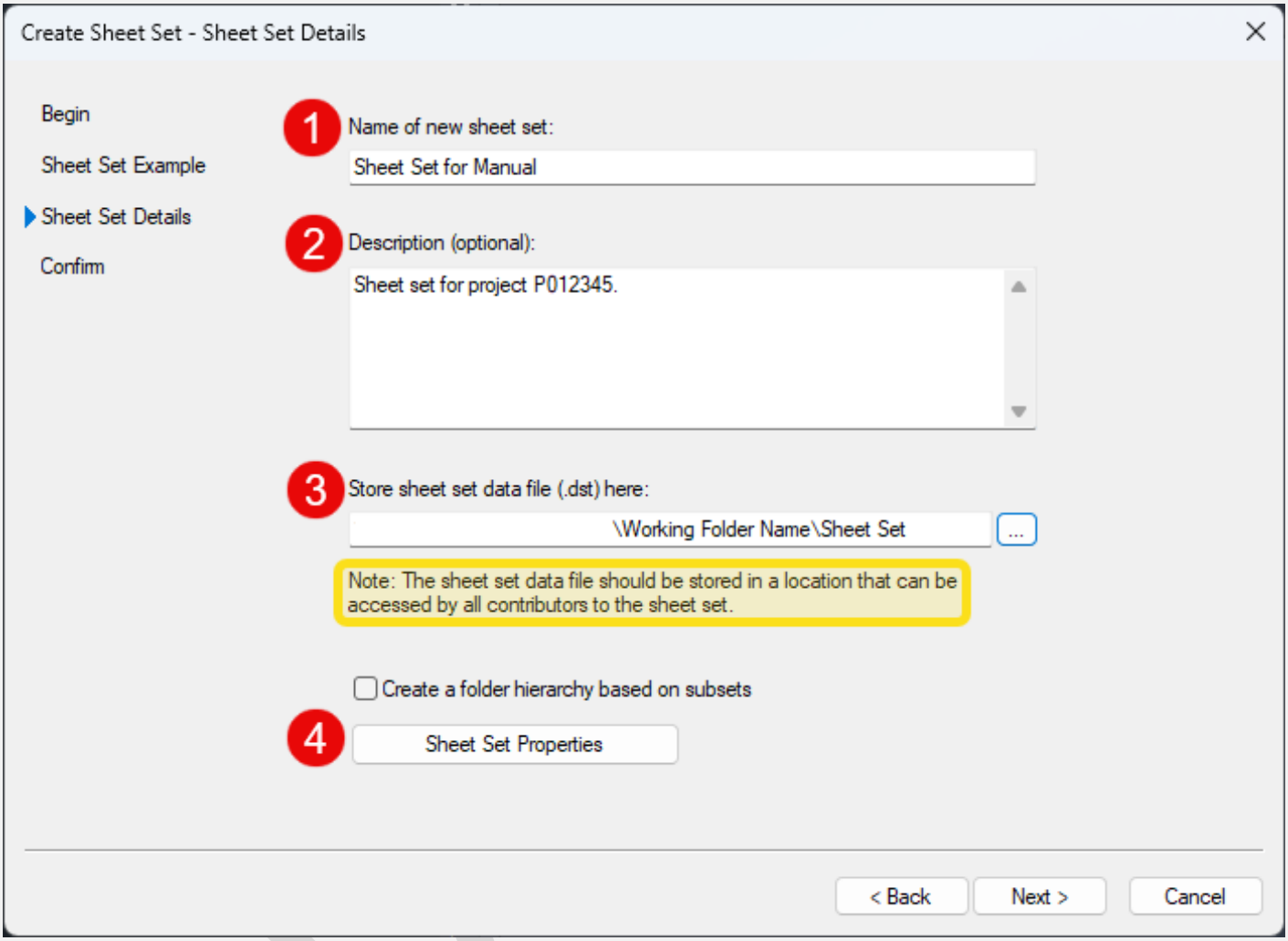


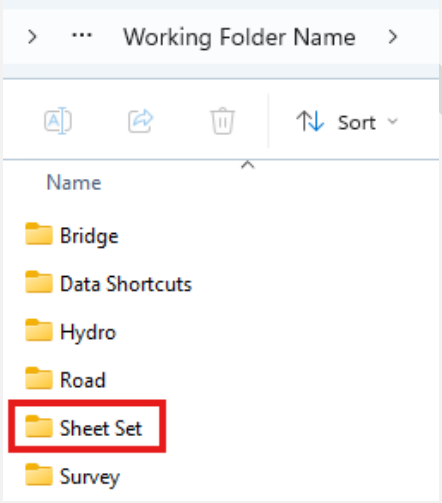
Sheet Set Example: Select the SCDOT SSM Setup then press Next.



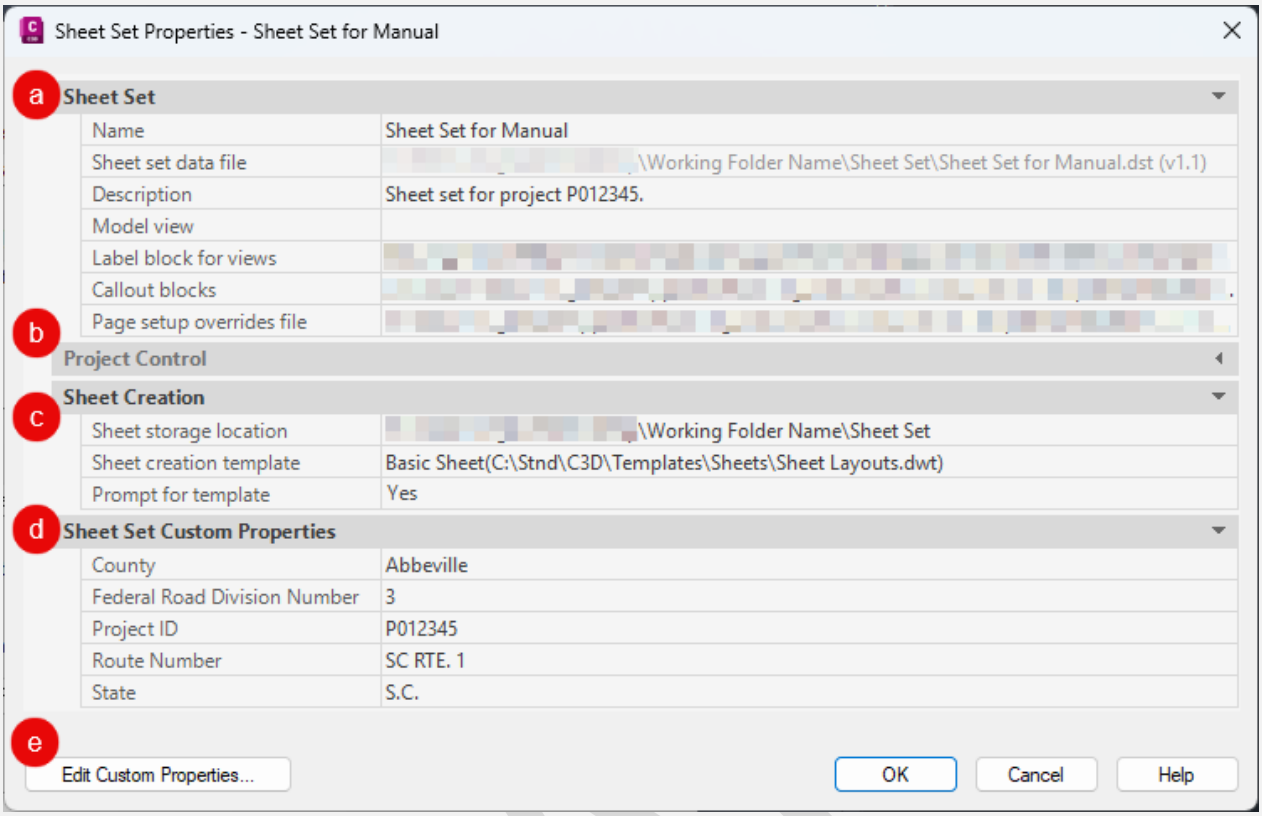
Sheet Set Details:

1. Provide an appropriate name.
2. Provide a description if desired.
3. Select the location for the sheet set file (.dst).
   ** Notice the note below the file path. A suggestion would be to place this in the same location as the Data Shortcuts folder.*





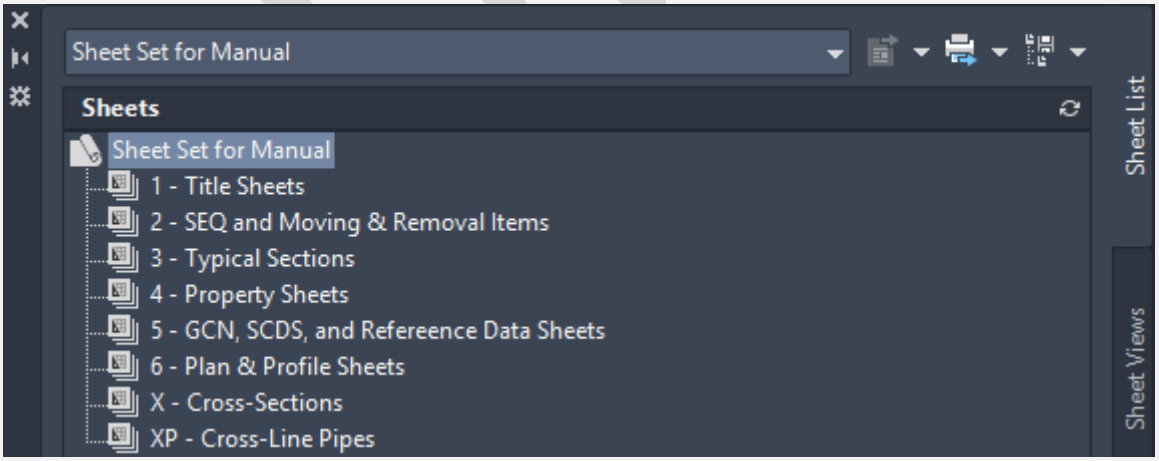
4. The sheet set properties are where selections can be made that will generate throughout all the sheets in a set.



   a. Most of the information in the Sheet Set should have been filled out already.
   b. The Project Control can be left blank.
   c. The Sheet Creation information should populate but can be reviewed or changed here.
   d. The Sheet Set Custom Properties is where project specific information can be input that will be present on all the sheets.
   e. Additional Custom Properties can be added for project specific use if needed.

Confirm: The confirm page allows for review of all the selections made. Select Finish to create the sheet set.

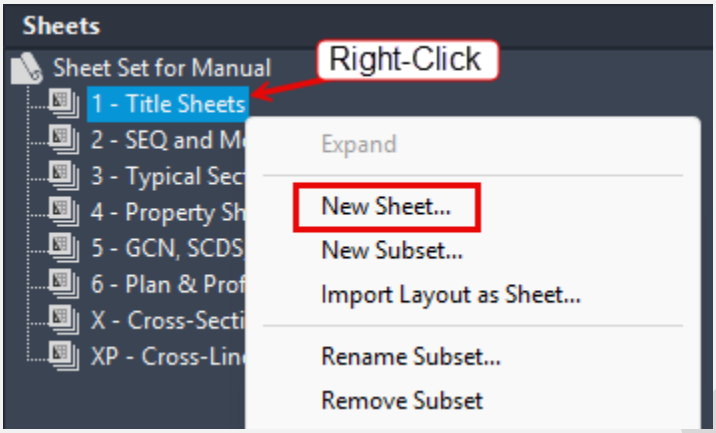
The sheet set will be created with default subsets following the standard SCDOT sheet numbering scheme.



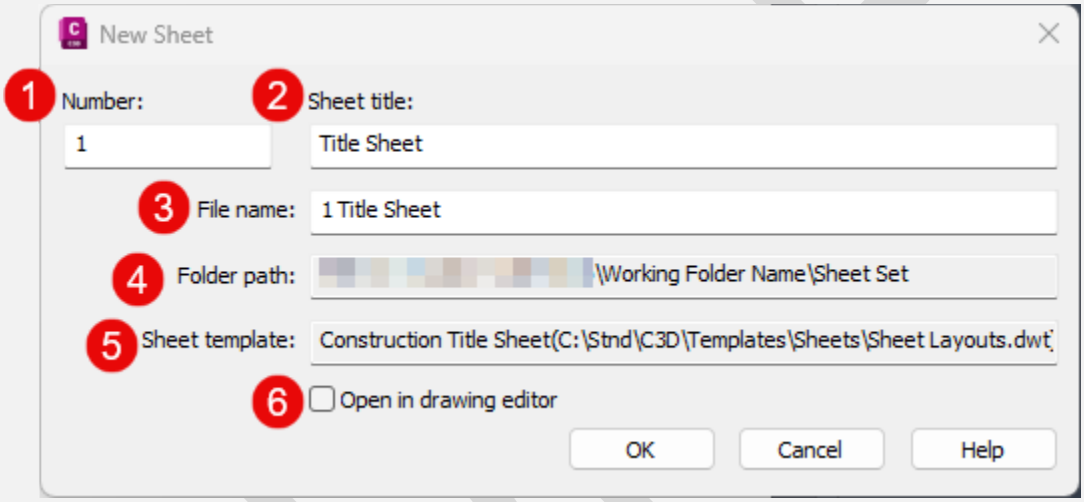
01 Title Sheets

If a sheet set has not been created yet see the Create New Sheet Set section above.

Start by opening the appropriate project sheet set. Then right click on the Title Sheets subset and choose New Sheet…

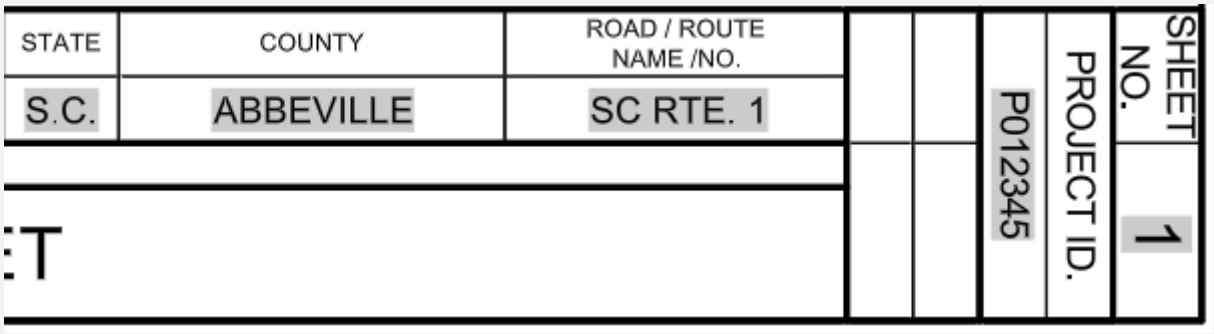


In the new sheet dialog:



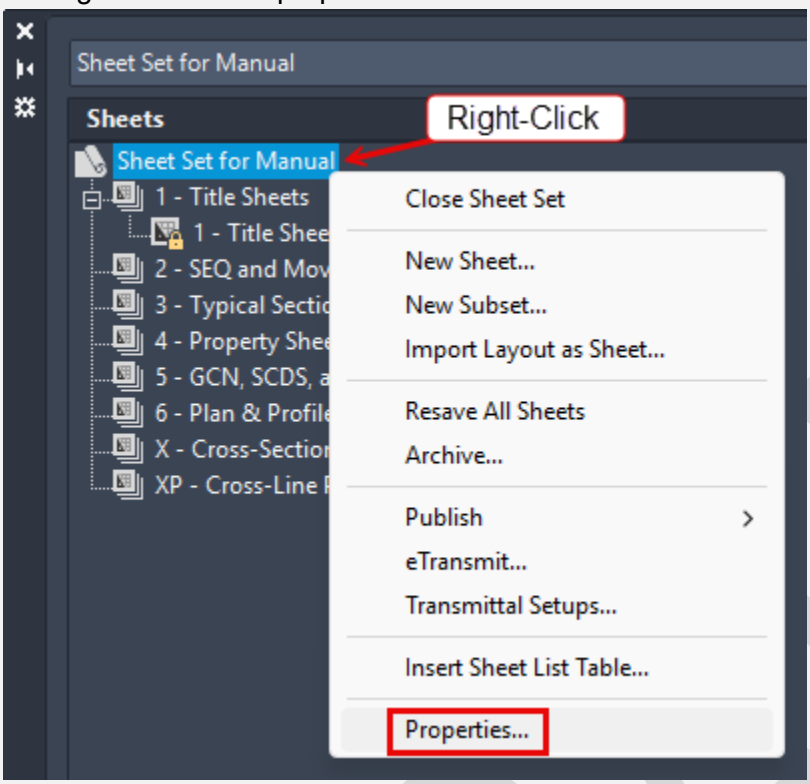
1. Add a Sheet Number
2. Add a Sheet Title
3. The filename will default to a combination of the sheet number and filename but can be edited.
4. The folder path will default to the location setup when the sheet set was created but can be edited.
5. The sheet template should be maintained to setup a Title Sheet.
6. If this is checked the sheet will open automatically in Civil 3D to allow edits.

The sheet will be created as a layout in a new file in the folder specified in item 4 above.



** Notice that the text fields in gray match the information that was provided in the custom properties when the sheet set was created.*

If any custom properties need to be adjusted for a project, right-click on the sheet set name in the sheet set manager then select properties.

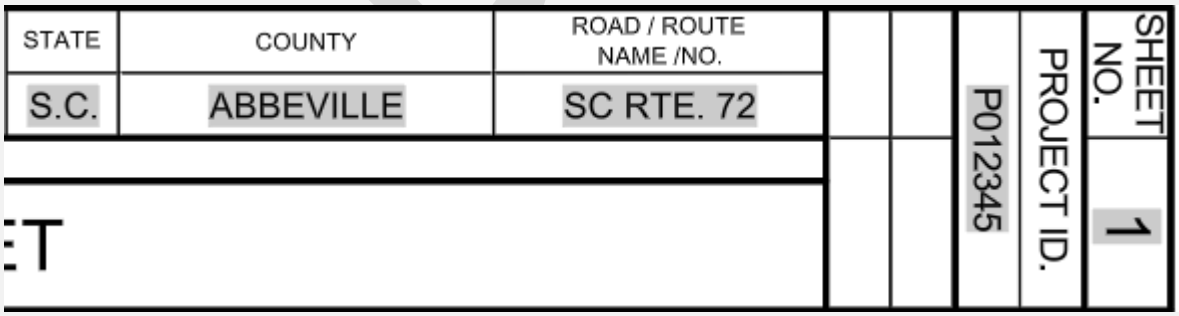


Any of the custom properties can be edited.

Sheet Set Custom Properties

County	Abbeville
Federal Road Division Number	3
Project ID	P012345
Route Number	SC RTE. 72
State	S.C.

Type RE for Regen into the command line and the text field will be updated on the sheet.



STATE	COUNTY	ROAD / ROUTE NAME /NO.			P012345	PROJECT ID.	SHEET NO.
S.C.	ABBEVILLE	SC RTE. 72					
							1

Some blocks have been created to provide consistency while filling out the title sheet. By left-clicking the X symbols of the “Environmental Permit Information Section” and left-clicking the blue downwards facing arrow, you can toggle whether the X’s should be “Visible” or “Invisible” for the road plans.

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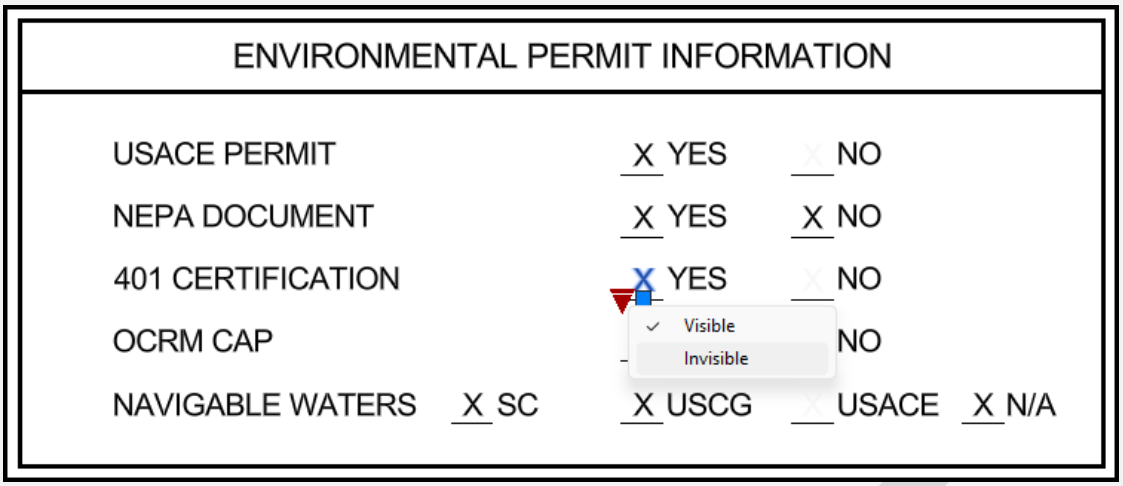
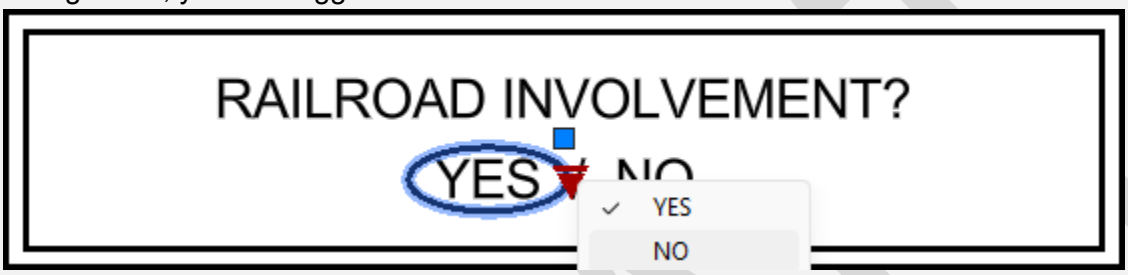


Similarly, by left-clicking the circle in “Railroad Involvement Section” and left-clicking the blue downwards facing arrow, you can toggle whether “YES” or “NO” will be circled.



Fill out and edit any normal text objects as needed to match project information.

Title Sheet Location Map

Current SCDOT county maps can be accessed on the SCDOT website at https://info2.scdot.org/GISMapping/Pages/OrderMaps.aspx or by searching “Maps” at scdot.org

On the county maps page select the appropriate county map for the project.

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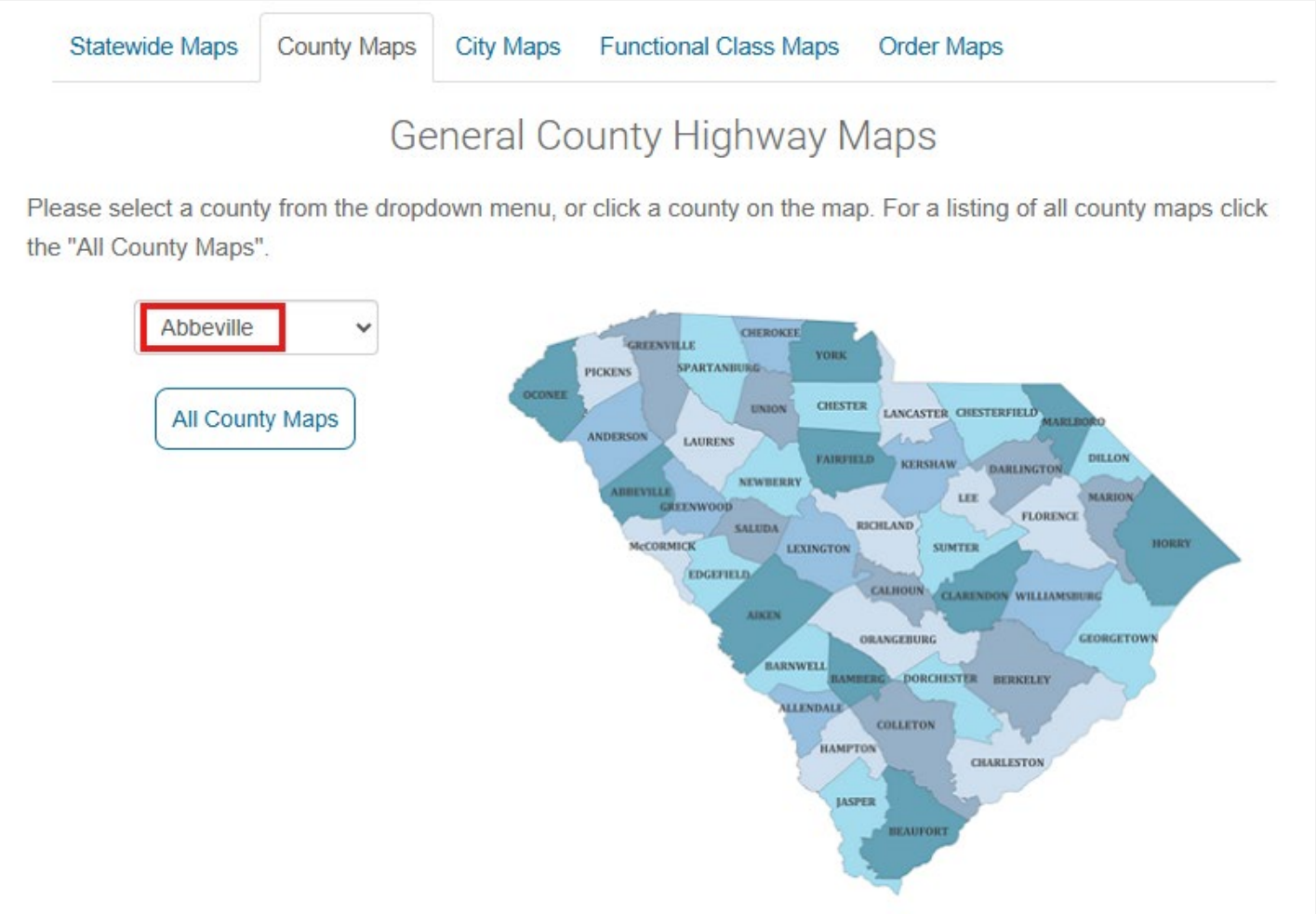
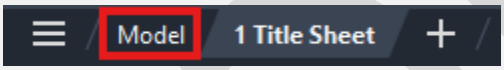
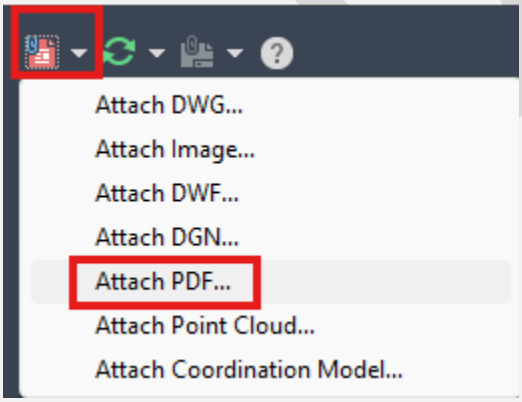


Once the county map is downloaded save it to an accessible location for the project.
** The same folder as the sheet set would be suggested.*

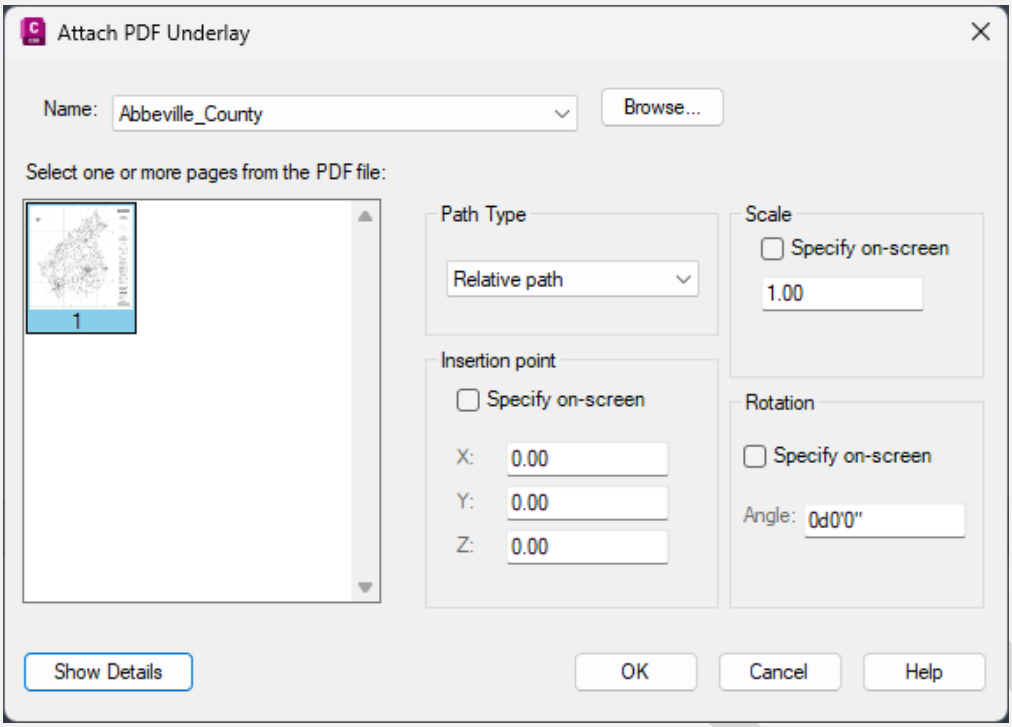
Switch to the model space



The .pdf of the county map will need to be attached as an External Reference



The default values can be used for the location of the map. Select OK to attach the map as an external reference

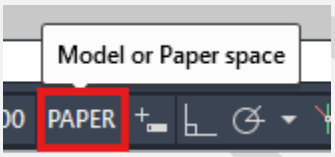


** If it is desired to have the title sheet map to scale, a scale could be set here or the scale of the external reference could be manually adjusted once it is placed to adjust the map size to a 1 to 1 scale.*

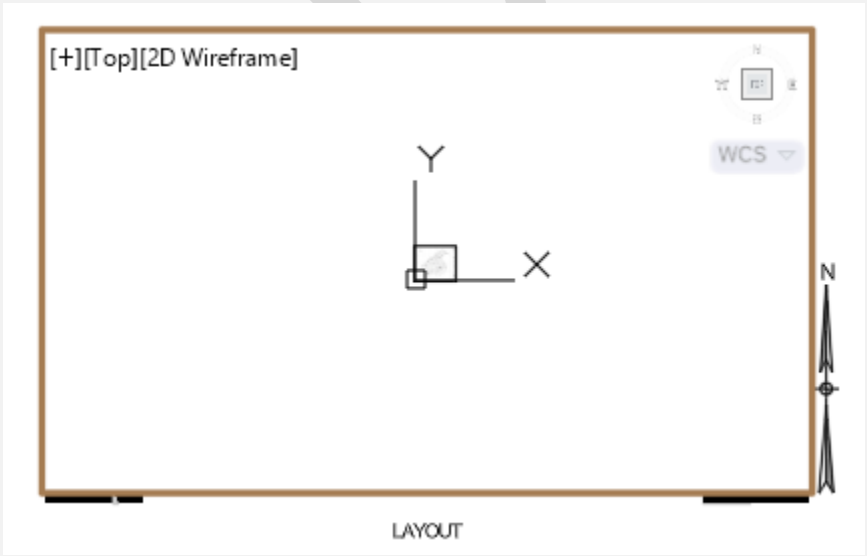
Double center-click on the screen to perform a zoom extents, the drawing view will adjust so that all objects in the drawing are visible on screen. Use this to help verify that the map was attached as intended.

Return to the title sheet layout tab.

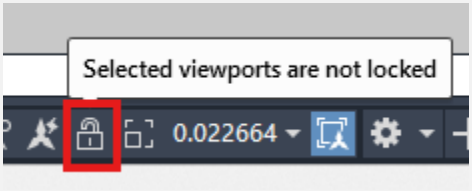
Click on PAPER in the status bar to toggle from Paper space to Model space.



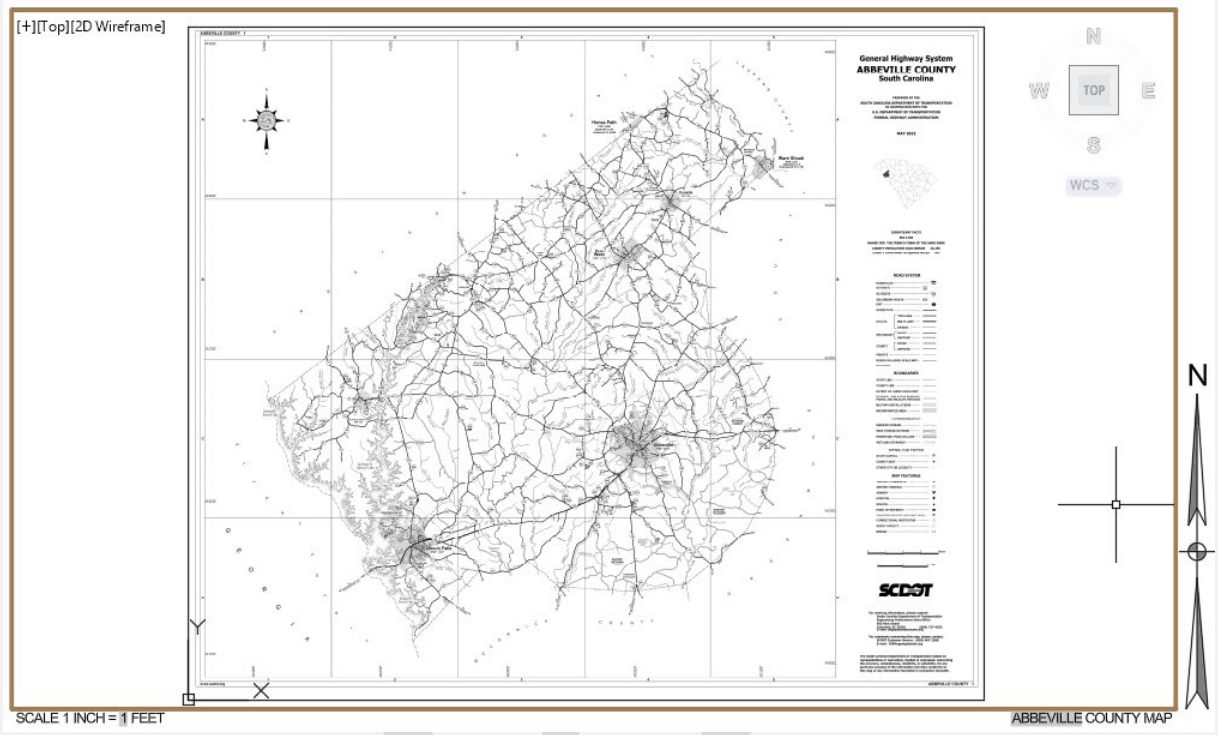
Once in Model space the status bar will say MODEL and the viewport in the center of the sheet will be highlighted and activated in model space.



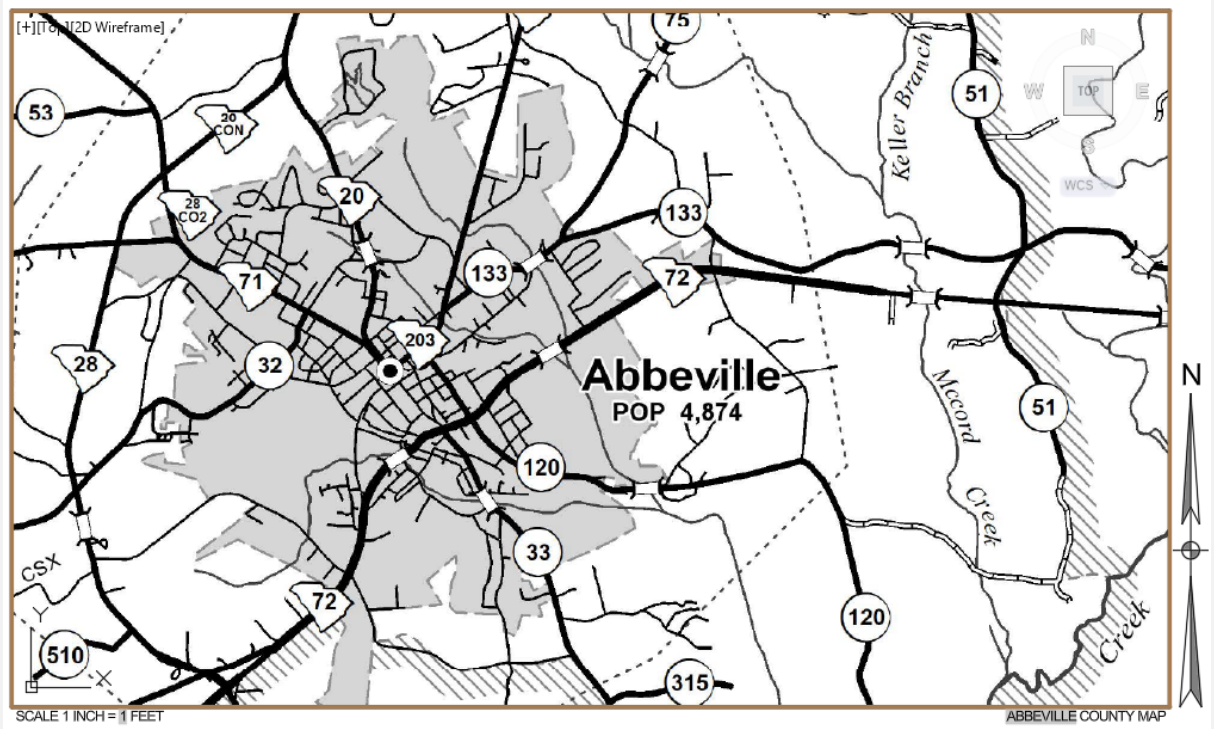
In the status bar verify that the viewport is unlocked.



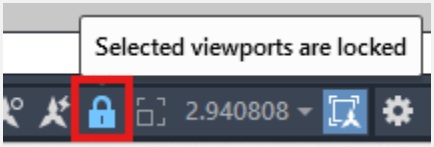
Then double center-click within the viewport to use the zoom extents again and zoom to the map.



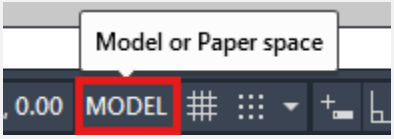
Zoom in and out or pan around to find the project location on the map.



Once the map extents are at the desired location lock the viewport in the status bar to prevent inadvertent changes.



Click on MODEL in the status bar to toggle from Model space to Paper space.



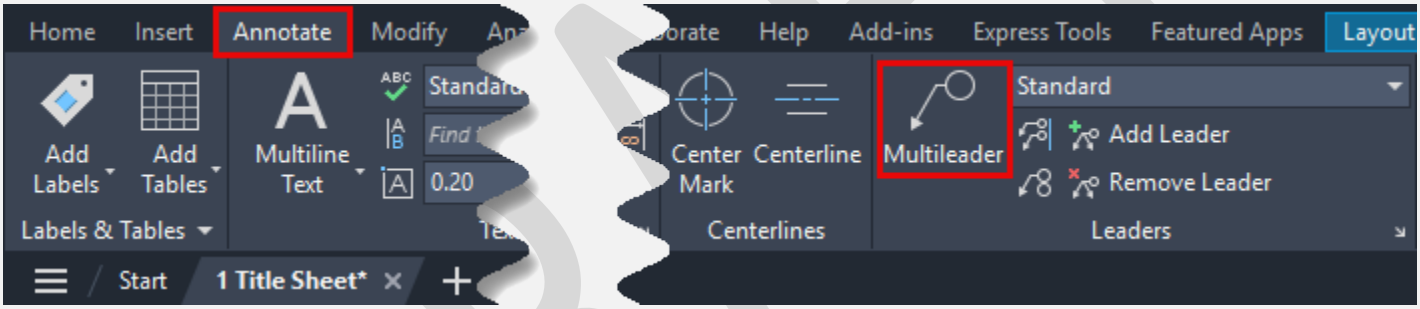
** If the map was scaled appropriately in model space type RE for regen in the command line and the scale should update to be correct. If not, the scale text will need to be adjusted to reflect that the map is not to scale.*

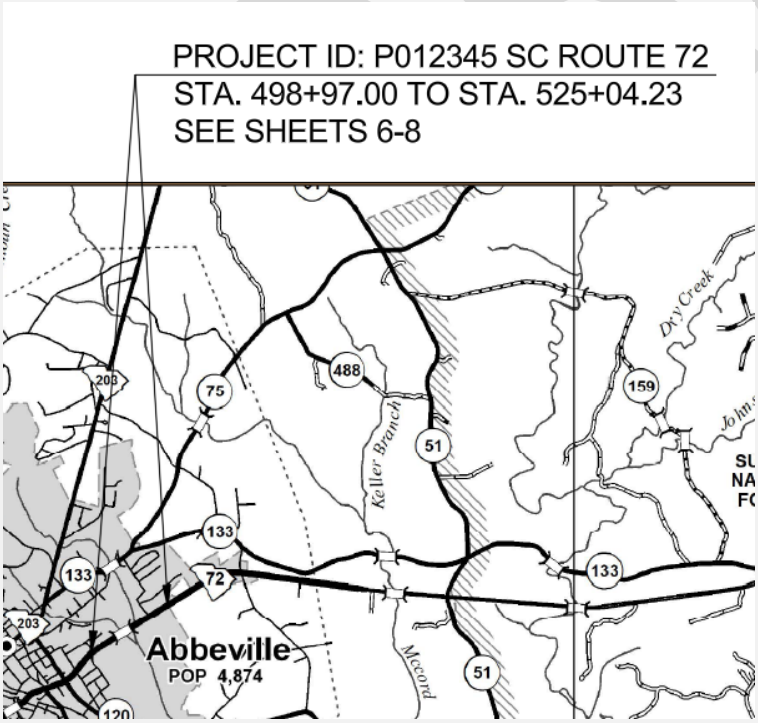
SCALE 1 INCH = 5000 FEET

OR

SCALE = NTS

Under the “Annotate” tab in the “Leaders” panel use the “Multileader” tool to add the appropriate project notes.





02 Summary of Estimated Quantities Sheets
Coming soon

03 Typical Section Sheets
Coming soon

04 Right of Way Data Sheets
Coming soon

05 General Construction Notes Sheets and Reference Data Sheets
Coming soon

06 Plan and Profile Sheets etc.
Coming soon

Labeling Alignments
Coming soon

Labeling Profiles
Coming soon

Create Sample Lines
Coming soon

Create Sections
Coming soon

Create Cross Section Sheets
Coming soon

Plotting
Coming soon

DRAFT

Deliverables

eTransmit

Coming soon

DRAFT

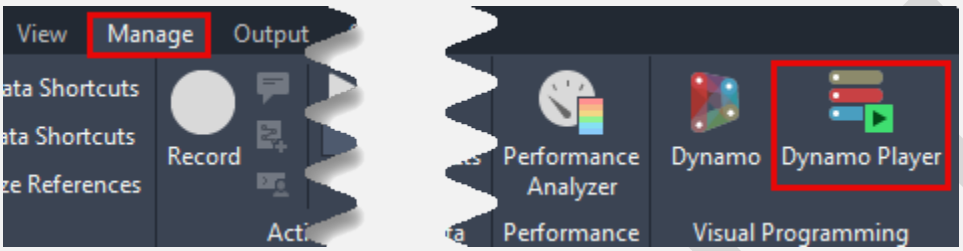
Other

Dynamo Tools

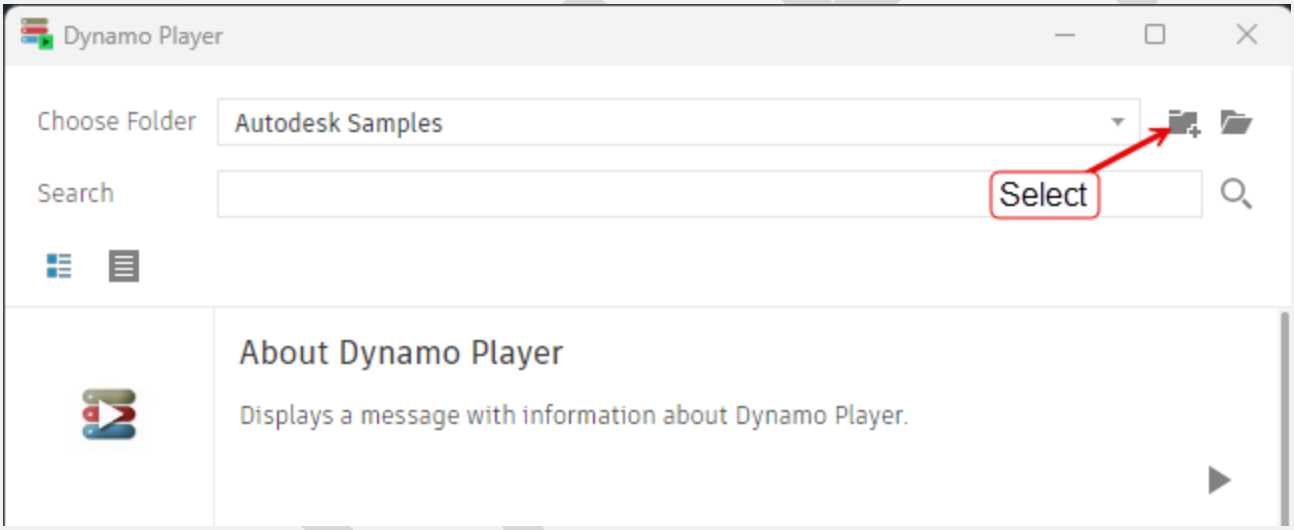
Dynamo is a visual programming application integrated into Civil 3D that enables the automation of repetitive tasks. A select group of tools have been built and included in the state kit. These tools can be accessed and run by using the Dynamo player.

Dynamo Player Setup

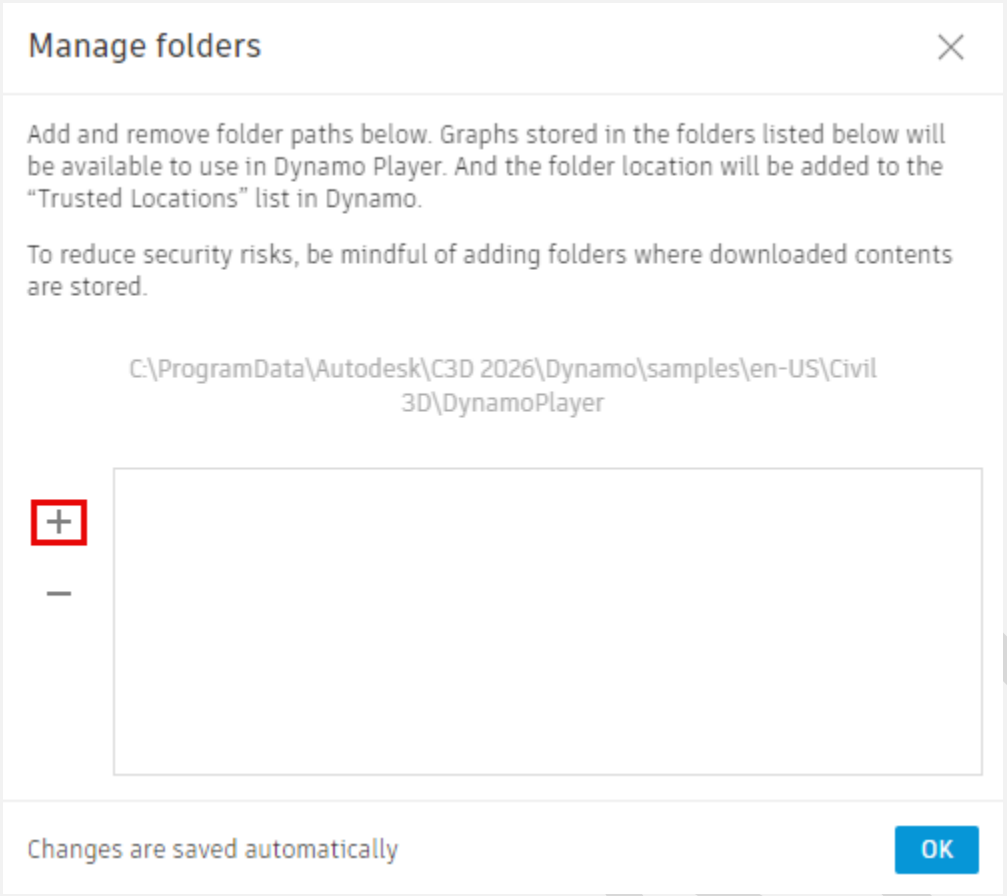
To open the Dynamo Player in Civil 3D, navigate to the "Manage" tab, within the "Visual Programming" panel, select "Dynamo Player".



The player will open and the default folder will be set to Autodesk Samples



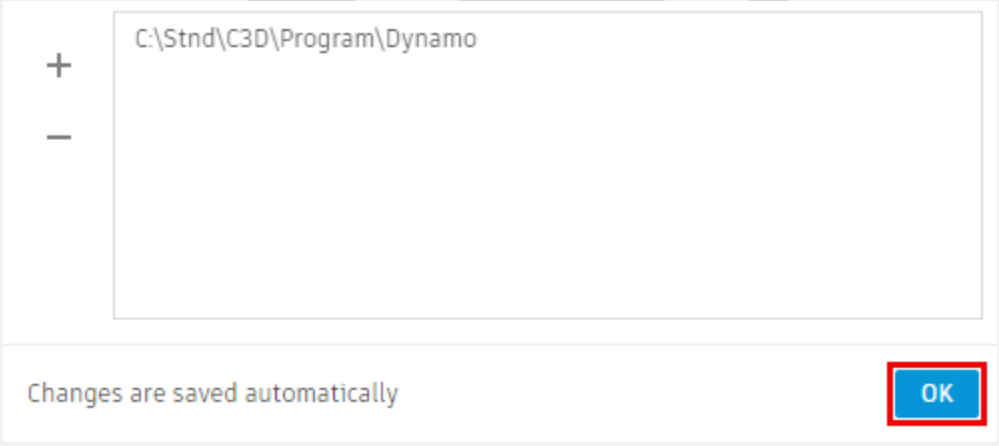
Select the Add Folder icon to add an additional folder location that houses dynamo files.



Select the "+" icon to add a new folder

Navigate to and select the folder below

C:\Stnd\C3D\Program\Dynamo



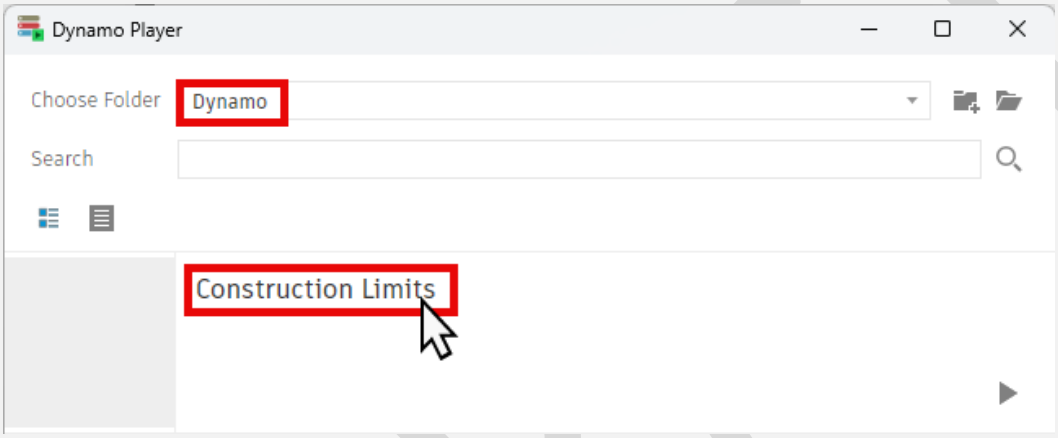
Select "OK"

The Dynamo folder is now available for selection.

Construction Limits

The Construction Limits dynamo adds cut and fill distance text labels at specified intervals along a corridor.

In the Dynamo player select the Construction Limits dynamo script.
** Follow the Dynamo Player Setup instructions if Construction Limits is not available.*

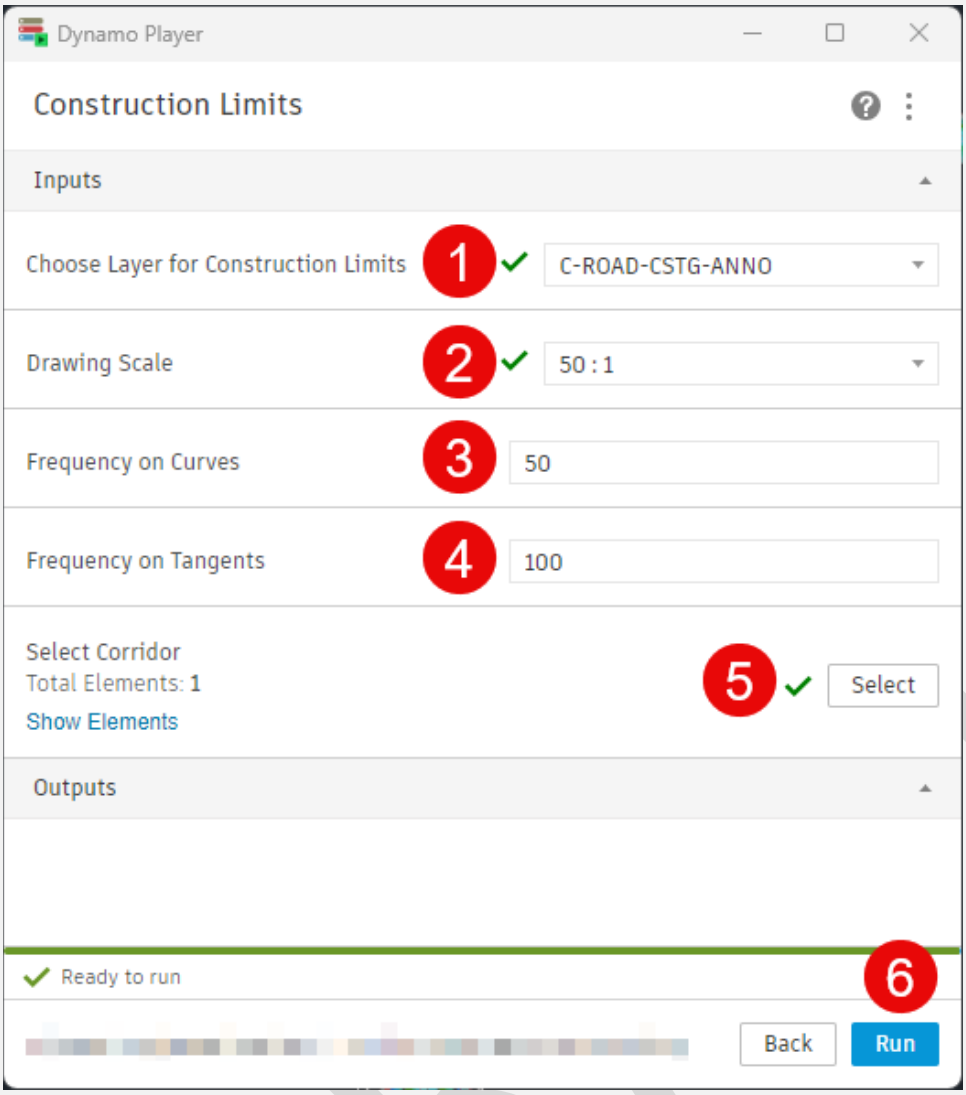


Fill out the five input items for this dynamo script.

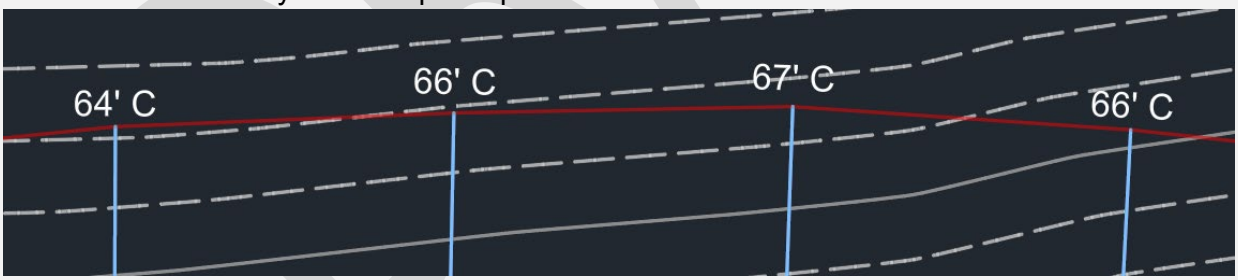
1. Select the appropriate layer from the dropdown list of layers present in the drawing.
2. Select the Drawing annotation scale that the construction limits need to be placed at.
3. Select the frequency that the labels will be placed at along curves.
4. Select the frequency that the labels will be placed at along tangents.

** The corridor frequency must also fall at the specified intervals. (ie if the corridor has a 100' frequency throughout 50' frequencies set here will only produce labels at the corridors 100' locations.)*

5. Select the corridor object from the drawing.



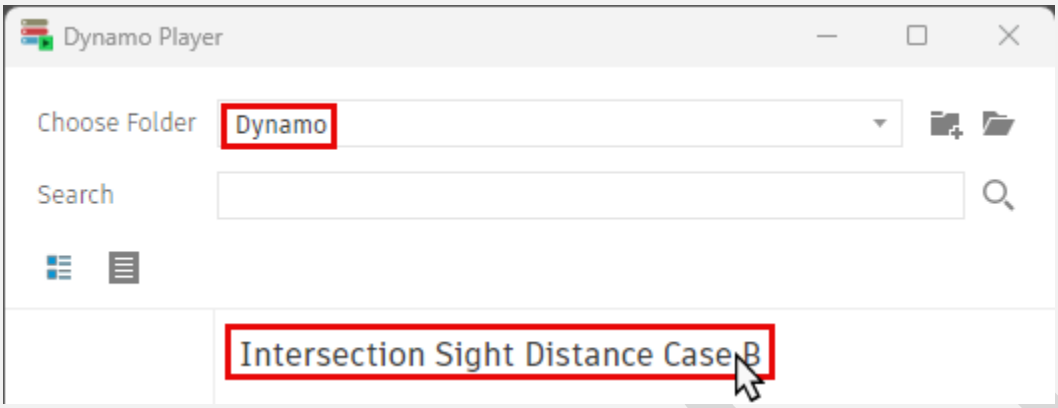
6. Select Run and the dynamo script will process and draw the construction limit labels.



Intersection Sight Distance

The Intersection Sight Distance Case B dynamo plots a 2D ISD triangle for both left and right turns using passenger car, single-unit truck, and tractor/semitrailer design vehicles. It will also draft a 3D sight line and check whether a selected surface intersects that line indicating a sight obstruction.

In the Dynamo player select the Intersection Sight Distance Case B dynamo script.
** Follow the Dynamo Player Setup instructions if Intersection Sight Distance Case B is not available.*



The tool will open with a list of inputs that will need to be filled out before running.

1. **Turn Selector:** Select left, right or both to specify which calculations to run.

a) **Select Major Alignment:** Click the 'Select' button then navigate to the drawing and select the alignment object that corresponds with the major alignment.

b) **Select Minor Alignment:** Click the 'Select' button then navigate to the drawing and select the alignment object that corresponds with the minor alignment.

c) **Select Roadway Elevation Surface:** Click the 'Select' button then navigate to the drawing and select the surface object that contains the roadway elevations that are to be used for the analysis.
** If no 3D analysis is desired a surface will still need to be selected but it does not have to be in the same geographic location as the alignments.*

d) **Select Surface for Conflict Analysis:** Click the 'Select' button then navigate to the drawing and select the surface object that is being reviewed for sight obstructions.
** If no additional surface is needed, select the first surface again. This is an optional input to provide flexibility when performing sight obstruction analysis. If two separate surfaces are chosen the program will check both for obstructions.*

e) **Total Number of Through Lanes on Major:** Enter the total number of through lanes from both directions of the major road.

f) **Major Lane Width (ft):** Enter the standard lane width for the major road.

g) **Total Number of Through Lanes on Minor:** Enter the total number of through lanes from both directions of the minor road.

h) **Minor Lane Width (ft):** Enter the standard lane width for the minor road.

i) **Major Median Width/Additional Width (ft):** Enter the width of the median on the major road.
** It is important to note the calculations assume that the median is centered about the alignment provided. If there is no median, set to 0'.*

j) **Minor Median Width/Additional Width (ft):** Enter the width of the median on the minor road.

** It is important to note the calculations assume that the median is centered about the alignment provided. If there is no median, set to 0'.*

k) **Additional Offset from Edge of Travelway (ft):** Enter any additional offset distance needed from the edge of travelway for items such as crosswalks, skewed intersections etc. If not needed set to 0'.
** The default distance from the edge of travelway is set to 14.5' per the 2021 RDM. Any distance specified here will be added to the 14.5'.*

l) **Major Design Speed (mph):** Enter the Design Speed in miles per hour.

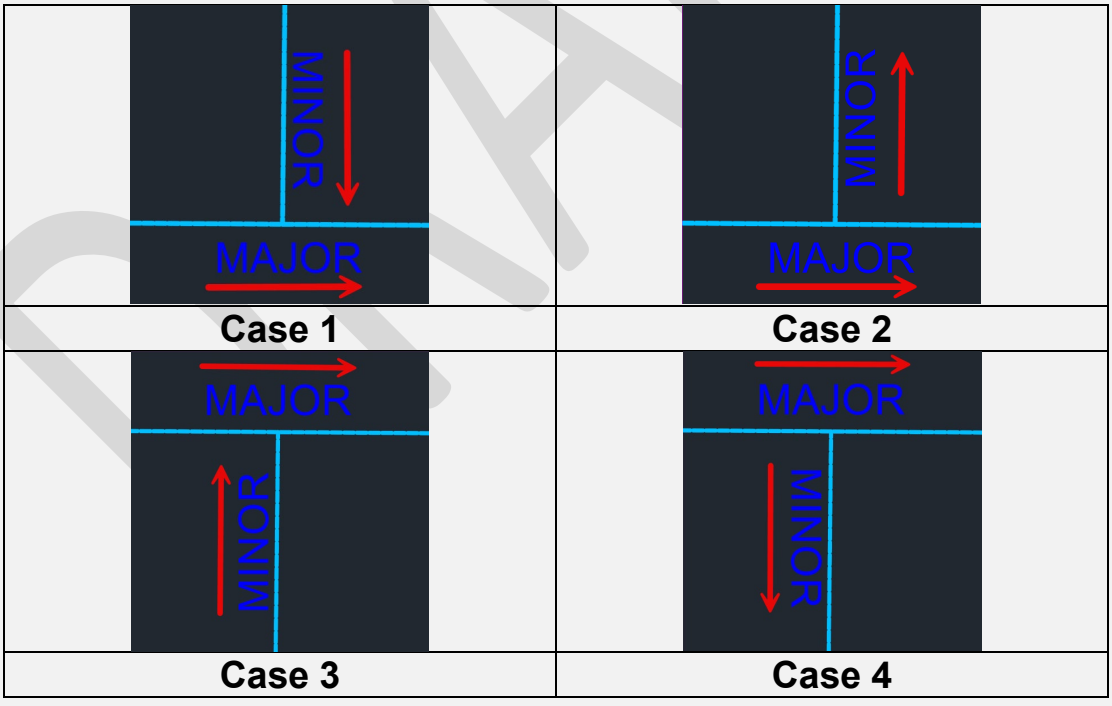
m) **Design Vehicle:** Select the appropriate design vehicle from the drop down. The parameters from the 2021 RDM shown below are used for calculations.

Design Vehicle	Gap Time Right (sec)	Gap Time Left (sec)	Additional Gap Time for Multilane Facilities (per lane)	Driver Eye Height (feet)
Passenger Car	6.5	7.5	0.5	3.5
Single-Unit Truck	8.5	9.5	0.7	7.6
Tractor/Semitrailer	10.5	11.5	0.7	7.6

n) **Additional (tg) Minor Approach Grade, Left Turn (sec):** Add any additional gap time necessary for the minor approach grade associated with the left turn.
** Per the 2021 RDM if the approach upgrade on the minor road exceeds 3 percent, add 0.2 seconds for each percent grade.*

o) **Additional (tg) Minor Approach Grade, Right Turn (sec):** Add any additional gap time necessary for the minor approach grade associated with the right turn.
** Per the 2021 RDM if the approach upgrade on the minor road exceeds 3 percent, add 0.2 seconds for each percent grade.*

p) **Stationing Case Selection:** Select the appropriate case for alignment stationing directions.



q) **Choose Layer:** Select the appropriate layer from the dropdown of available layers in the drawing. The intersection sight distance information will be drawn on this layer.

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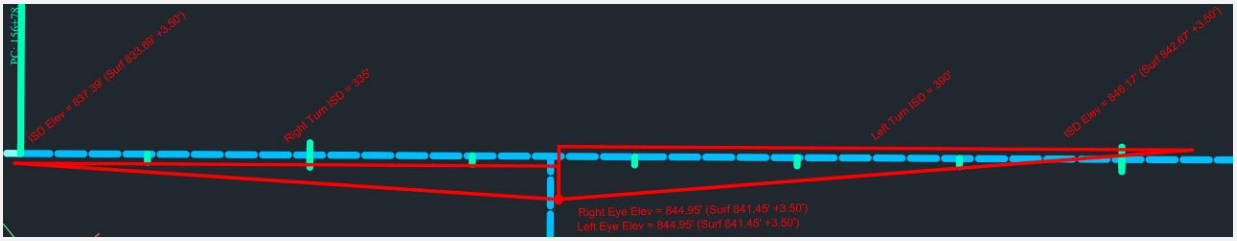
Select run and the script will process and draw the intersection sight distance triangles.



1. The ISD triangles will appear with labels for the Eye and ISD elevation points.
2. If the sight line intersects a surface, an additional label will appear stating there is a sight obstruction. This label will state which surface(s) are intersected.

   SIGHT LINE BLOCKED (Surface(s): Proposed Surface)
3. If no elevation data appears with the Eye and ISD elevation labels, there is no surface information present at those locations.
4. The ISD triangle will be one polyline, and an additional 3D line will be drawn between the Eye and ISD point.
5. The ISD label includes the ISD length rounded up to the nearest 5 ft.

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Appendix A

Objects that utilize base layer and component layers

Alignment
Alignment-Labeling
Alignment Table
Appurtenance
Appurtenance-Labeling
Assembly
Building Site
Cant View
Catchment
Catchment-Labeling
Corridor
Corridor Section
Crossover Group
Feature Line
Fitting
Fitting-Labeling
General Note Label
General Segment Label
Grading
Grading-Labeling
Grid Surface
Grid Surface-Labeling
Interference
Intersection
Intersection-Labeling
Mass Haul Line
Mass Haul View
Match Line
Match Line-Labeling
Material Section
Material Table
Parcel
Parcel-Labeling
Parcel Segment
Parcel Segment-Labeling
Parcel Table
Pipe
Pipe-Labeling
Pipe and Structure Table
Pipe Network Section
Pipe or Structure Profile
Point Table
Pressure Network Section
Pressure Part Profile
Pressure Part Table
Pressure Pipe
Pressure Pipe-Labeling
Profile
Profile-Labeling
Profile View
Profile View-Labeling
Sample Line
Sample Line-Labeling
Section
Section-Labeling
Section View
Section View-Labeling
Section View Quantity Takeoff Table
Sheet
Structure
Structure-Labeling
Subassembly
Superelevation View
Surface Legend Table
Survey Figure
Survey Figure-Labeling
Survey Figure Segment Label
Survey Network
Tin Surface
Tin Surface-Labeling
Turnout
View Frame
View Frame-Labeling

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Appendix B

Tips and Tricks

- **Drafting lines by bearing and distance**

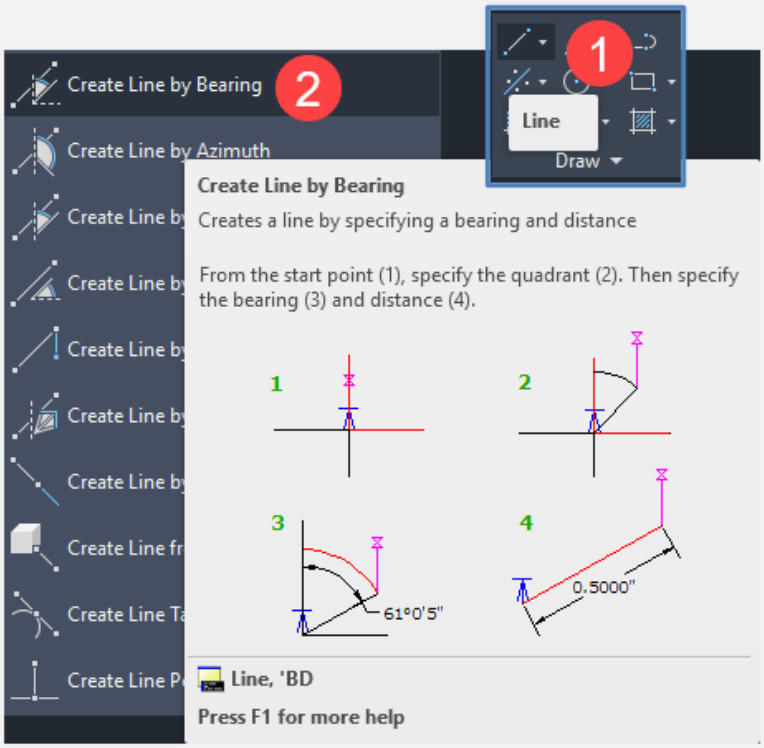
For drafting lines with precise bearing and distance, several techniques can be used. This tip presents two foundational techniques, showing that the most suitable approach is often determined by the volume of lines to be created.

Use this option when only drawing a few lines

1. `Line –` Use this command to get started
2. **`LINE`** `Specify first point:` - Select a location in model space
3. **`LINE`** `Specify next point or [Undo]:` - Instead of selecting another point use the transparent command `'BD` to enter the line as a bearing and distance.

Or

1-3. Select the Line drop down in the Draw Panel of the Home Tab and then select "Create Line by Bearing"



4. **`BD`**`>>Specify quadrant (1-4):` - Select the appropriate quadrant (NE=1, SE=2, SW=3, NW=4)
5. **`BD`**`>>Specify bearing:` - Type the bearing in (45d15'03" format)
6. **`BD`**`>>Specify distance:` - Type the distance needed.

Use this option when more lines need to be drawn or a record needs to be retained of the lines drawn.

1. `Line –` Use this command to get started
2. **`LINE`** `Specify first point:` - Select a location in model space

3. **LINE** Specify next point or [Undo]: - Instead of selecting another point enter the bearing and distance as as @distance<bearing ex: @567.54<N88D43'0"W
4. This method can be expedited further by entering all the bearings and distances in excel and then copying an entire column of line information into the command line at step 3. All the lines will be drawn in order, starting from the top and proceeding down the column.

Distance	Degrees	Minutes	Seconds	Direction	N or S	E or W	Civil3D Command
4937.10	77	3		nw	n	w	@4937.1<n77D3'0"w
2118.20	77	23		nw	n	w	@2118.2<n77D23'0"w
1988.50	77	9		nw	n	w	@1988.5<n77D9'0"w

Civil3D Command
@4937.1<n77D3'0"w
@2118.2<n77D23'0"w
@1988.5<n77D9'0"w
@1704.3<n76D52'0"w
@212.6<n76D52'0"w
@6506.3<n81D7'0"w
@3498<n81D7'0"w
@150.9<n81D7'0"w
@9841.6<n73D35'0"w
@742.7<n73D35'0"w
@214.2<n73D35'0"w
@984.5<n82D8'0"w
@3362.3<n82D8'0"w
@203.4<n82D8'0"w

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