

Structures plan production - beginner

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Civil 3D interface

Interface introduction

Last updated: 2021-11-09

Total video time: 21:24

Welcome screen

[c3d-intrfc-intro-01.mp4](#) 9:41

What you will find on the Welcome screen are:

1. Short video tutorials, such as: user interface, surfaces, alignments, profiles, corridors, intersections and pipe networks.
2. Exercise tutorials, show step-by-step processes on broader topics.
3. What's New, explores new features in Civil 3D for the current year.



Info: Most of these are web-based and will need internet connection.



Tip: To turn-off the start screen, in the command line type **Startmode**, press Enter, type **0**, press Enter.



Tip: To turn-on start screen, select Help button (? button in upper right), option listed in drop-down.

Application menu browser

[c3d-intrfc-intro-02.mp4](#) 3:15

1. Large C icon in upper left corner.
2. When selected once, it allows access to the general production menu. When selected twice, Civil 3D will close.
3. Menu includes
 - A. New - new drawing or sheet set
 - B. Open - opens a drawing, not a template
 - C. Save
 - D. Save As - has different formats
 - E. Export - has different formats
 - F. Publish - one example, eTransmit packages all the files attached to your project, including Xrefs and data shortcuts.
 - G. Print - Plot, batch plot, plot preview, page setup, etc.
 - H. Drawing utilities - Set drawing properties, drawing settings, units, audit, purge, recover, etc.
 - I. Close - To close all drawings or current drawing.
4. Options button - Opens a dialog box with options.
5. Search bar at the top, to find commands within the ribbon.
6. Application menu also lists currently open and recently used files. Pin a drawing here to find it quickly.
7. Exit button for exiting Civil 3D.

Quick Access toolbar

[c3d-intrfc-intro-03.mp4](#) 1:04

1. Found to the right of the Application menu browser button at the top of the screen.
2. Allows access to general commands; new, open, save, plot, undo/redo, and others.
3. To add your own choice of command to the Quick Access menu
 - A. Select dropdown > More Commands...
 - B. Customize User Interface dialog box
 - I. Select command name you want to add > OK
4. To show the menu bar
 - A. Select dropdown > Show Menu Bar
 - B. Menu bar will appear above the tabs of the ribbon

Ribbon

1. The ribbon is a user interface tool that allows all of the icon selection in Civil 3D to be centralized in a space sufficient area.
2. The ribbon is organized into tabs that manage the different tools available.
3. Each tab is subdivided into panels that contain the icons for the tools. If there are more tools than shown, a panel pulldown (arrow in lower right corner of panel) will display.



Tip: To keep the panel expanded while using a tool repeatedly, select the thumbtack (icon found in lower left corner of expanded panel).

Toolbars

[c3d-intrfc-intro-04.mp4](#) 1:25

1. Toolbars are the command structures for base AutoCAD, prior to the ribbon. Transparent commands is the only toolbar open by default. All other toolbars have been added to the ribbon.
2. Selecting the dash line (found at the top or left side of the bar) you can move the bar. Right-click in the gray space of the toolbar to access a list of old toolbars.

Command Line

[c3d-intrfc-intro-05.mp4](#) 2:16

1. The command line can be found at the bottom of the screen. It is used for the typed version of commands.
2. The command line is in a tool palette and can be moved. Like other toolbars, select the dash line (found on the left side) and drag to new location, even another screen.
3. The command line is not in use when it displays "Type a command". Once you have typed a command, it will prompt you through to command.

Status bar

[c3d-intrfc-intro-06.mp4](#) 2:13

1. The status bar can be found below the command line. It is a series of icons that will allow for settings for certain functions within AutoCAD and Civil 3D.
2. The status bar displays the cursor location, drawing tools, and tools that affect your drawing environment.

3. The status bar provides quick access to some of the most commonly used drawing tools. There are function key alternatives for most of these icons, but not all.
4. Some of the tools include; Snap mode, Ortho mode, Polar Tracking, Object Snap (OSnap), Annotation scale, and Workspace.

Drawing Scale

[c3d-intrfc-intro-07.mp4](#) 1:27

1. The drawing scale is a representation of the drawing area the you have and is 1" = 1".
2. The annotation scale is found at the bottom in the status bar. Use the arrow to activate a flyout menu and change the scale of your drawing.
3. The drawing scale controls the size of text; text in labels, text in dimension labels, and text in multileaders, and space between section views in an array.

Ribbon and tabs

Last updated: 2021-10-22

Total video time: 8:14

Ribbon interface

[c3d-intrfc-rbn-01.mp4](#) 4:21

The ribbon is a management style of keeping commands at the top of the screen. The ribbon management area includes tabs, panels, and icons.

1. Tabs contain a grouping of command panels.
2. Panels are a grouping of similar command icons.
3. Icons start the commands directly.

Tabs

[c3d-intrfc-rbn-02.mp4](#) 3:53

The tabs are found on top of the ribbon directly below the Quick Access toolbar. Some of the tabs included are: Home, Insert, Annotate, Modify, Analyze, View, Output, Manage, and so on. The tabs also include WisDOT Design and WisDOT Sheets.

Panels

Panels are labeled on the bottom of the ribbon. Each panel contains tool/commands that are related to that panel. If the panel's name has an arrow next to it, select to see additional tools/commands. This is called a fly-out menu and once a tool/command is selected it will minimize.

Icons

Icons are tools/commands. If there is an arrow next to the icon, select it for a dropdown menu of additional related commands.

Minimize ribbon

To minimize the ribbon to have more drafting room, select the last icon within the row of tabs. This button has 4 options, and must be clicked each time to activate.

1. First click, Minimize to Panel Buttons
2. Second click, Minimize to Panel Titles
3. Third click, Minimize to Tabs
4. Forth click, Show full ribbon

Command shortcuts and hotkeys

Last updated: 2021-11-09

Total video time: 5:53

Exercise files: [c3d-intrfc-data-c3d20.zip](#)

ProjectID\SheetsPlan\STH25-XS.dwg

[c3d-intrfc-cmnd-shrtct-hky-01.mp4](#) 9:27

All commands have a typed alternative

Some typed commands are quicker than switching ribbon tabs



Tip: This is not a comprehensive list - just some helpful ones

[AutoCAD Keyboard Shortcuts](#) is an Autodesk webpage with a more complete listing of AutoCAD-specific keyboard shortcuts.

Hotkeys

- **Esc** = Exit a command
- **Spacebar** = Enter
- **F1** = Opens Help to topic you are working with
- **F2** = Expands command line to a window
- **F3** = OSNAPS toggle
- **Shift + Right-Click** - Temporary OSNAP Overrides
- **Shift + Spacebar** = selection cycling
- **Ctrl + Left-click** select for some labels
- **Ctrl + 9** = toggles Command Line palette
- **Ctrl + 3** = toggles tool palettes

Command line commands

- **z, enter e enter** = Zoom Extent ("Fit View")
- **z, enter enter** = "real-time" zoom
- **P, enter** = Pan
- **delete** = Erase

- **E** = Erase
- **PL** for polyline
- **PE** for polyline edit
- **DI** -for Distance command (slightly different than ribbon version)
- **FILEDIA**, setting should = 1
- **CMDDIA**, setting, should =1
- **GEOMARKERVISIBLITY** = 0
- **OSNAPZ** = if 1 then snaps to 3D objects (x/y/z), if 0 then snaps to X/Y but ignores elevation z
- **OPTIONS** = opens OPTIONS dialog box
- **XREF** = opens Xreference manager dialog box
- **OOPS** = Brings back last deleted selection
- **REA** = Regenerates graphics

Basic mouse operations

Last updated: 2021-11-09

Total video time: 9:19

Exercise files: [c3d-intrfc-data-c3d20.zip](#)

ProjectID\SheetsPlan\STH25-XS.dwg

[c3d-intrfc-basc-mous-01.mp4](#) 12:24

Exercise file: **STH25-XS.dwg**

Three-button wheel mouse

Click = select

Right-click = context menus

Wheel operation

- Roll forward/backward = zoom in/out
- Click wheel = pan
- Double-click wheel = zoom extents

Keyboard & mouse clicks

Shift + **Right-click** = Temporary OSNAPS menu

Shift + **wheel-button** = Orbit

Ctrl + **Click** for some objects allows individual label editing

Shift + **Click** = remove from selection set

MBUTTONPAN

= 1, pan

= 0, Temporary OSNAP menu

Options > User Preference tab > Right-click Customization button = Right-click customization

Status bar

Context sensitive

Repeat Last command

Status bar

Last updated: 2021-11-09

Total video time: 6:16

Exercise files: [c3d-intrfc-data-c3d20.zip](#)

ProjectID\SheetsPlan\STH25-XS.dwg

[c3d-intrfc-status-bar-01.mp4](#) 6:16

Status bar

- Icons...
- Function Key Alternatives
- Right-Click Settings

Status bar keys

- Constraints **Ctrl+Shift+I**
- Snap/Grid **F9/F7**
- Ortho Snap **F8**
- Polar Track **F10**
- OSNAP **F3**
- 3D OSNAP **F4**
- Object Snap Tracking **F11**
- Dynamic UCS **F6**
- Dynamic Input **F12**
- Lineweight
- Transparency
- Quick Properties **Ctrl+Shift+P**
- Selection Cycling **Ctrl+W**
- Annotation objects

File open, save, and new

Last updated: 2023-02-22

Total video time: 4:40

[c3d-intrfc-fil-opn-sav-new-01.mp4](#) 4:40

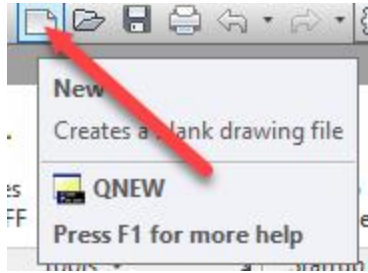
Overview

Opening a file

1. There are multiple ways to open a file
 - A. **App menu > Open**
 - B. **Quick Access toolbar > Open (file folder icon)**
 - C. **Right-click File tab > right-click menu > Open...**

Opening a new template

1. There are multiple ways to open a new file
 - A. **App menu > New**
 - B. **Quick Access toolbar > QNew**



- C. **Right-click File tab > right-click menu > New...**
 - D. Plus sign next to File tab
2. All new files start with a template (.dwt). The template brings in the settings for the new drawing; specific object and layout styles.
3. When opening a new template, WisDOT has template files already setup.
 - A. **App menu > New**
 - B. Select Template dialog box
 - I. Look in should be set to the Begin-dwg folder and contain starting templates; drawing, plat and survey.
 - II. Select design template and Open

Saving a new file

1. To save a new file
 - A. **Right-click File tab > right-click menu > Save...**
 - I. Save Drawing As dialog box
 - a. Save in, browse to project folder
 - b. Rename file name (.dwg)
 - c. **Save**
2. Once saved, there will be no drawing in the model space, but the styles are populated in the settings
 - A. **Toolspace > Settings tab > expand Surface**

File, model, and layout overview

Last updated: 2021-11-09

Total video time: 5:50

[c3d-intrfc-fil-mdl-lyout-01.mp4](#) 5:50

File tabs

1. File tabs display the current open files. They are located directly above the Toolspace palette and model space.
2. To turn off display tabs
 - A. **Right-click in the model space > right-click menu > Options...**
 - B. Options dialog box
 - I. **Display tab > Window elements > uncheck box Display File Tabs**




Tip: Keep the box checked to keep the tabs displayed.

Adding a folder link to a Civil 3D dialog

- C. **OK** to save changes, **Apply** to see changes, or **Cancel** to exit
3. Hover over tab to see open layouts. Each layout has the option to layout or plot.
4. If the file name, in the tab, has an asterisk (*) at the end, it has not been saved yet. Select **Save** in the Quick Access toolbar to have to disappear.
5. Right-click on a tab to get right-click menu dropdown. Commands include: New, Open, Save, Save As, Save All, Close, Close All, and Close All Other Drawings. On the active drawing you get two additional commands: Copy Full File Path and Open File Location.
6. Plus symbol, next to the tabs, will open a new file using your default template.

Model and layout tabs

1. Model and layout tabs can be found on the lower left.
 - A. Model tab is modelspace, displaying the drawing at 1:1 ratio.
 - B. Layout tab is paperspace, used for plotting at scale. Paperspace includes the printable area, title block information, and a viewport to display portions of Modelspace.
 2. To turn off tabs
 - A. In paperspace, **right-click on the drawing > right-click menu > Options...**
 - B. Options dialog box
 - I. **Display tab > Layout elements > uncheck box Display Layout and Model Tabs**
-  **Tip:** Keep the box checked to keep the tabs displayed.
3. In paperspace, the squares/rectangles are called viewports. Viewports are like picture frames into modelspace, the area selected to be viewed. When a viewport is selected, the scale appears in the bottom status bar.
 4. The ribbon displays commands based on the tab selected.
 5. Plus symbol, next to the tabs, will open a new layout.


Adding a folder link to a Civil 3D dialog

Last updated: 2023-02-22

Total video time: 3:47

[c3d-intrfc-add-flldr-lnk-to-c3d-dlg-01.mp4](#) 3:47

Creating a shortcut folder

 **Tip:** These folders are for quick access to your project(s) and are temporary and can be deleted after you are done with your project.

1. **Quick Access bar > select Open (open folder icon)**
 - A. Select File dialog box
 - I. Look in: browse to **Local Drive:\WisDOT\Design\C3D**
 - II. Select **Up one level** icon



 **Tip:** Set the shortcut folder one level higher than project folders for quick access to your projects.

- III. Left-click **C3D** folder and drag to Places list (blue bar, left side of dialog box)

- IV. Select the C3D shortcut folder to see all project folders
- V. Left-click **86753090** folder and drag it into the Places list

Removing a shortcut folder

1. **Quick Access bar > select Open (open folder icon)**
 - A. Select File dialog box
 - I. In Places list, right-click on **86753090 folder > Remove**
 - II. **Prompt**: Are you sure you want to remove '...C3D\86753090' from Places? **Yes**
 - III. Select **Cancel**
 - IV. **Prompt**: Would you like to save changes you made to the Places list? **Yes**

AutoCAD fundamentals

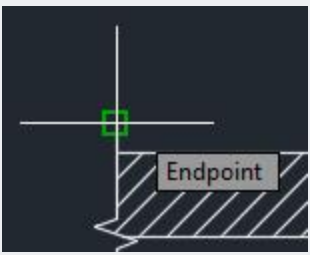
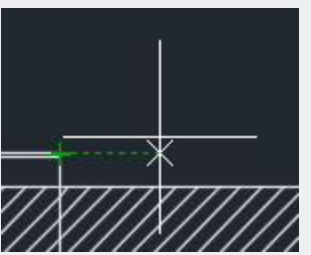
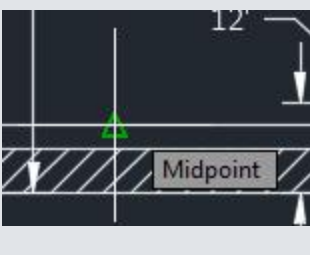
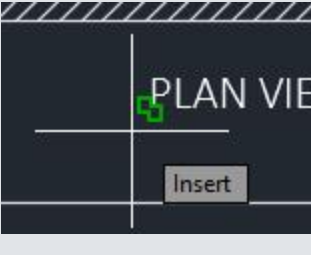

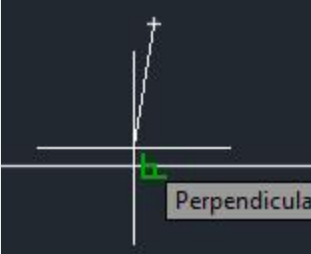
Object snaps

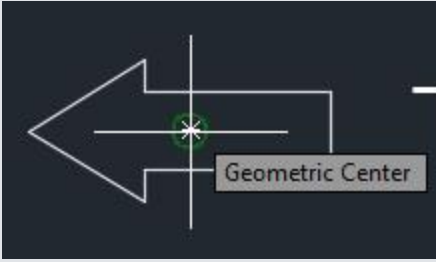
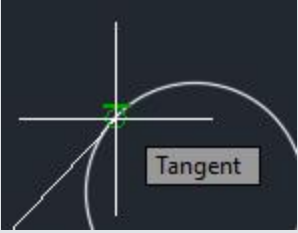
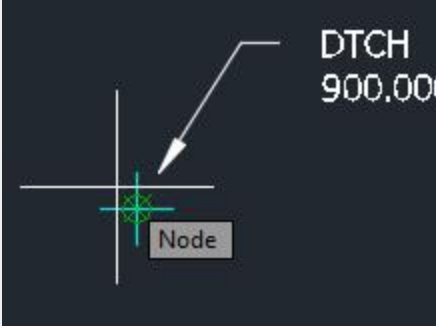
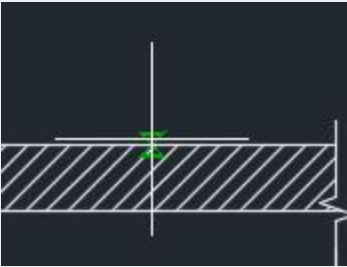

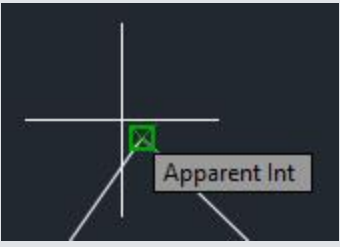
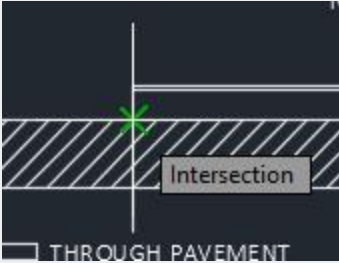

Last updated: 2023-01-04

Total video time: 18:14

Object Snaps are tools built into Civil 3D that help ensure precision when laying out geometry with both basic objects (i.e. Line, Polyline) and smart Civil 3D objects. The idea is that when specifying location during a command, a given Object Snap will force the location to be at the exact specified object point when the command is active and your cursor is within the Object Snap buffer distance. When an Object Snap is ready to take effect, a glyph will appear indicating the type of Object Snap and location of the snap point.

Object snap glyphs

Object Snap	Glyph Image	Object Snap	Glyph Image
Endpoint		Extension	
Midpoint		Insertion	
Center		Perpendicular	

Object Snap	Glyph Image	Object Snap	Glyph Image
Geometric Center		Tangent	
Node		Nearest	
Quadrant		Apparent Intersection	
Inter-section		Parallel	

Introduction & settings

Exercise files: [acad-data-c3d20.zip](#)

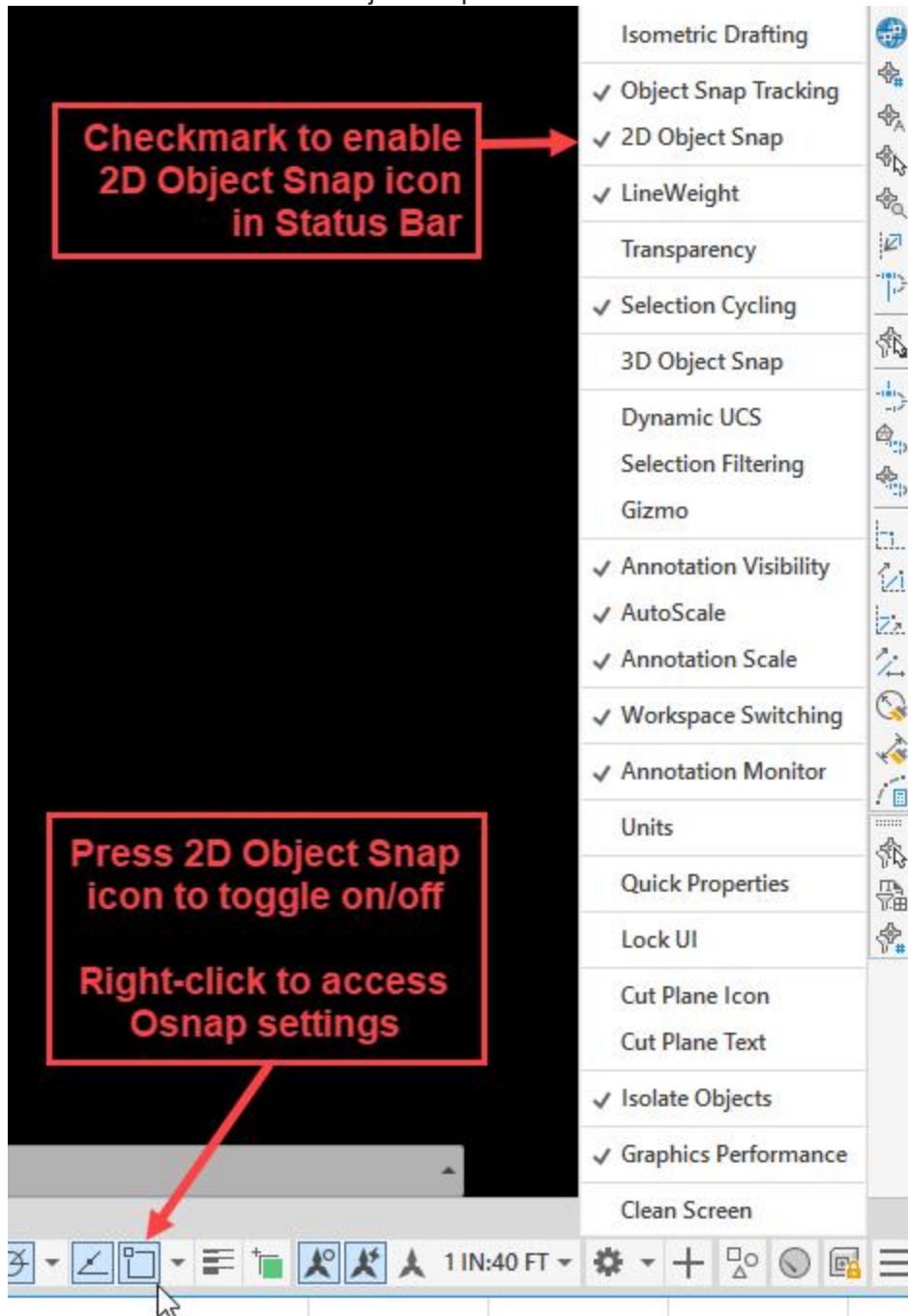
Start with [acad-object-snp-begin.dwg](#)

[acad-object-snp-01.mp4](#) 4:17

Access to settings

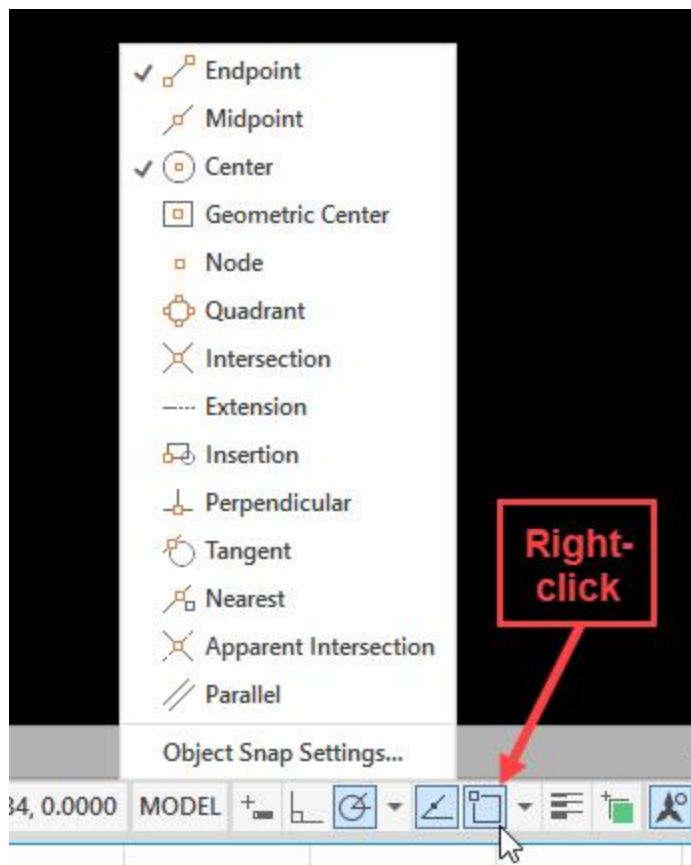
There are a few different ways to access Object Snap settings.

1. Open `acad-object-snp-begin.dwg`
2. **Status Bar > Customization**
 - A. 2D Object Snaps = checked
 - B. Press icon to Turn on Object Snaps




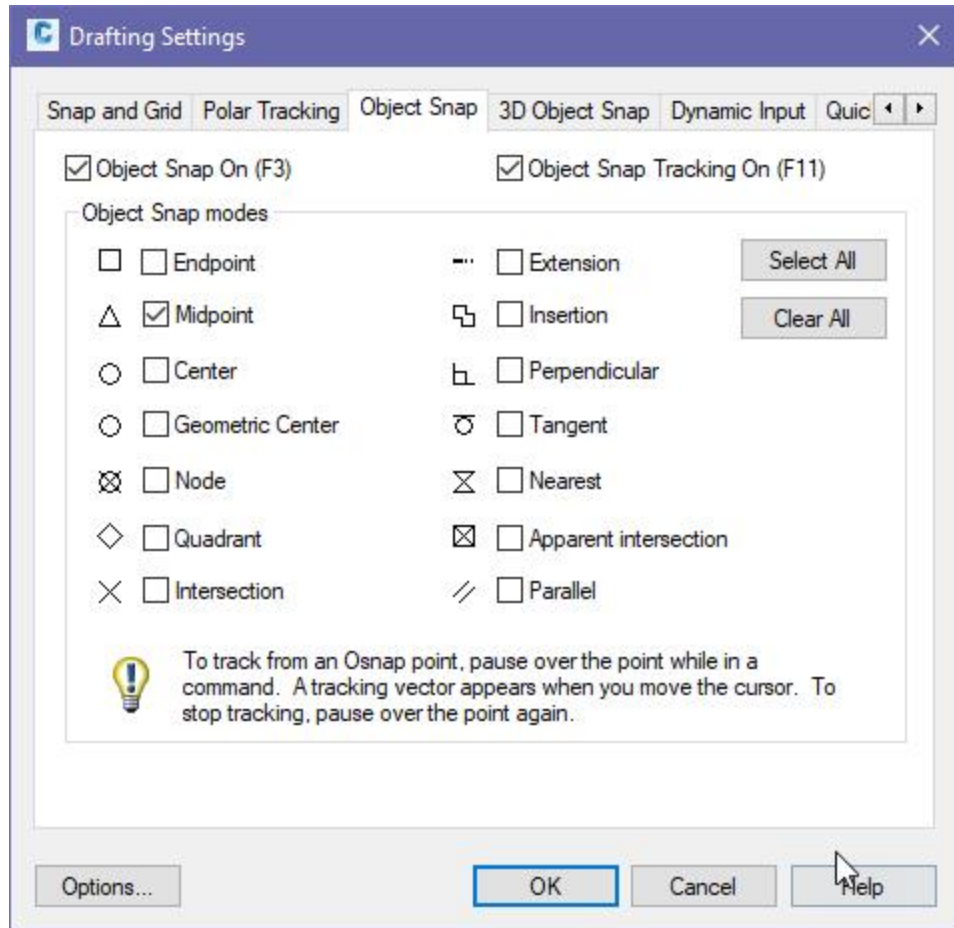
3. **Status Bar > Object Snap icon**
 - A. Right-click on 2D Object Snap icon
 - B. Place checkmark to turn on individual Object Snaps

Object snaps



4. Status Bar > Object Snap icon

- A. Left-click flyout triangle 
- B. Observe access to running Object Snaps list
 - I. Object Snap Settings...
 - a. Drafting Settings dialog box, Object Snap tab



- a. Object Snap On = checked
 - b. **Select All**
 - c. **Clear All**
 - d. Midpoint = checked
 - e. **OK**
- C. **Ribbon > Home tab > Draw panel > Polyline button**
- I. Turn on Midpoint Object Snap
 - II. Move cursor over objects
 - a. Observe Midpoint glyph appear
 - b. **esc** to deselect
5. **Model space**
- A. **Shift+right-click**
 - I. **Osnap Settings...**
 - B. Observe access to Drafting Settings dialog, Object Snap tab

Introduction to Object Snap use

In this example you will use the Midpoint Snap to move Mtext to the correct location on a title block.

1. Continue working in **acad-intrfc-begin.dwg**
2. **Status Bar > Object Snap icon**
 - A. Right-click
 - I. Midpoint = checked

Object snaps

3. Select "MAINTENANCE CROSSOVER FOR FREEWAYS" Mtext object
 - A. Select insertion point grip
 - I. Move cursor near middle of red construction line
 - II. Observe Midpoint glyph appear
 - III. Left-click



- B. Select red construction line
 - I. `delete`

Workflow efficiency

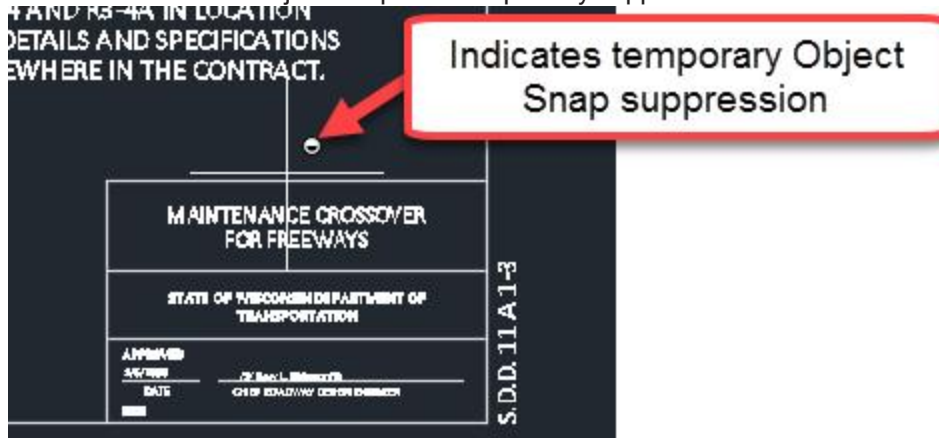
Start with [acad-objct-snp-begin.dwg](#)

[acad-objct-snp-02.mp4](#) 3:37

F3 hotkey

A "alias" is essentially a single keystroke shortcut designed to streamline execution of a task or string of tasks. Many hotkeys are programmed and ready for use in Civil 3D. The "F3" key is one powerful hotkey relevant to Object Snap use. You might incorporate this into your typical Object Snap workflow to improve efficiency.

1. Continue working in [acad-objct-snp-begin.dwg](#)
2. Toggle Object Snaps off: `F3`
3. Toggle Object Snaps on: `F3`
4. **Ribbon > Home tab > Draw panel > Polyline button**
 - A. Hold `F3`
 - B. Hover over a Line object
 - C. Observe that Object Snaps are temporarily suppressed



Object snap cycling

Pressing the tab key allows you to cycle through Object Snaps relevant to a given object as long as those Object Snaps are turned on.

1. Continue working in **acad-object-snp-begin.dwg**
2. **Status Bar > Object Snap icon**
 - A. Right-click
 - I. Endpoint = checked
 - II. Midpoint = checked
 - B. Verify Object Snaps turned on
3. **Ribbon > Home tab > Draw panel > Polyline button**
 - A. Hover cursor over middle of EDGE OF PAVED MEDIAN SHOULDER Line
 - I. Observe Midpoint glyph appear
 - II. **tab**
 - III. **tab**
 - IV. **tab**

System variable: ignore elevation

By default, Civil 3D will apply existing geometry elevation when using Object Snaps and existing geometry to specify location. You can change this behavior so elevation properties are ignored and only location in the X,Y plane are used when "snapping". This is done by resetting the **OSNAPZ** System Variable. When this is done, the elevation Z=0 will be used for new location specification.

1. Continue working in **acad-object-snp-begin.dwg**
2. **Ribbon > Home tab > Draw panel > Polyline button**
 - A. Draw a single Polyline
 - I. Select Polyline drawn
 - II. Properties Palette > Geometry
 - a. Set Elevation = 100
 - b. **esc**
3. **Ribbon > Home tab > Draw panel > Polyline button**
 - A. Use Endpoint Snap to specify location on end of Polyline drawn in 2.A
 - I. Select Polyline drawn
 - II. Properties Palette > Geometry
 - a. Observe Elevation = 100
4. **Command line: OSNAPZ**
 - A. **enter**
 - B. **1**
 - C. **enter**
5. **Ribbon > Home tab > Draw panel > Polyline button**
 - A. Use Endpoint Snap to specify location on end of Polyline drawn in 2.A
 - I. Select Polyline drawn
 - II. Properties Palette > Geometry
 - a. Observe Elevation = 0
6. Select previous three Polylines drawn
 - A. **delete**

Temporary overrides

Calling up temporary Object Snap overrides either through the command line or right-click menu allows a "one-time use" override to current Object Snap settings. For example, you could have Endpoint Object Snaps currently on, then use a temporary Midpoint Object Snap override to ignore all Endpoint Snaps and use Midpoint Snaps for the next location specification. Alternatively you might have all running Object

Object snaps

Snaps off, then use any temporary Object Snap overrides as you need them for the next location specification. This temporary override workflow avoids the need to open a running Object Snap interface and thus can improve efficiency.

After a command requiring location input is activated, hold Shift key and right-click to open the temporary Object Snap override menu. Choose a one-time use temporary Object Snap override from this list. Continue location specification.

1. Continue working in **acad-object-snp-begin.dwg**
2. Turn on running Endpoint Object Snap using your method of choice
3. **Ribbon > Home tab > Draw panel > Polyline button**
 - A. **Shift+Right-click**
 - I. **Midpoint**
 - B. Left-click first endpoint and then second endpoint of line you want to midpoint snap to.

Example 1

Start with **acad-object-snp-begin.dwg**

[acad-object-snp-03.mp4](#) 4:48

Geometric Center

This Object Snap analyzes any closed area object and snaps to the centroid of that area. The object can be irregularly shaped, but must show as "closed" in the properties palette for the Geometric Center snap to work.

1. Continue working in **acad-object-snp-begin.dwg**
2. Turn on running **Geometric Center** Object Snap using your method of choice
3. Select "6" Mtext at right of drawing extents
 - A. Select middle-center Mtext insertion point
 - I. Move cursor to hover over adjacent rectangular closed Polyline
 - II. Observe Geometric Center glyph appear
 - III. Left-click

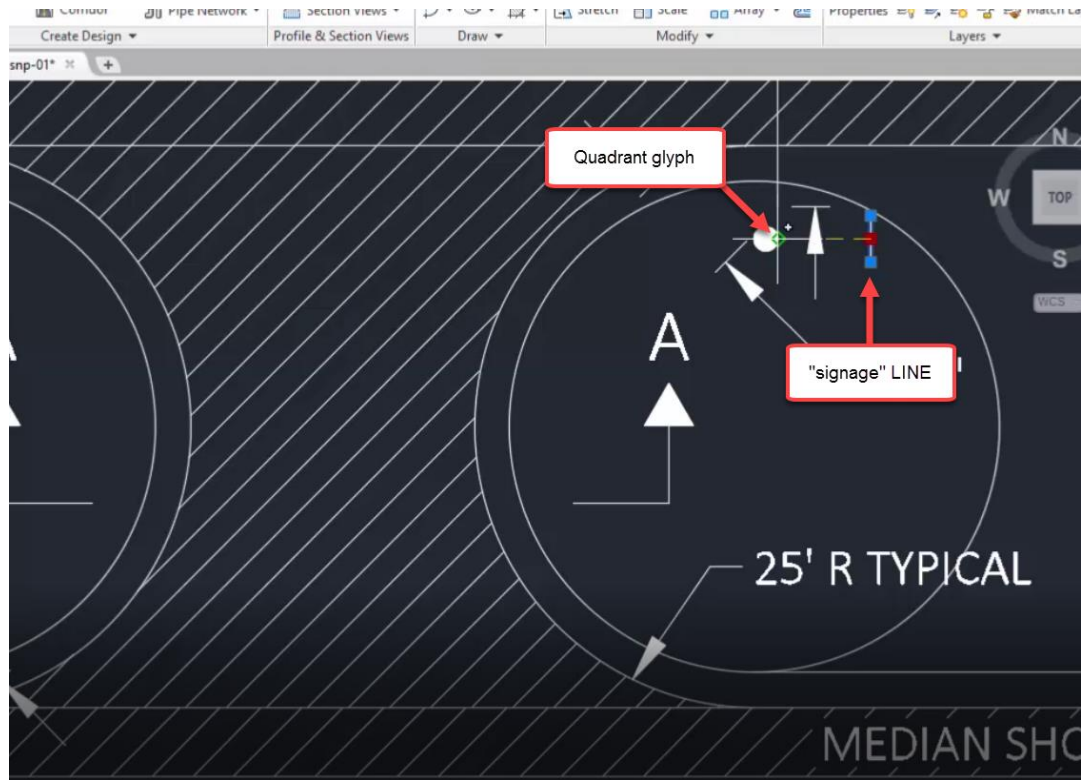


Quadrant

This Object Snap grabs the location on a Circle, Ellipse or Arc object intersecting with any of the four 2D quadrant lines (i.e. along X or Y axis).

1. Continue working in **acad-object-snp-begin.dwg**
2. Turn on running **Node** Object Snap using your method of choice.
 - A. Observe the behavior of the **Node** Object Snap glyph as you hover over different objects.
3. Turn on running **Quadrant** Object Snap using your method of choice.
4. Select Line representing signage in the PLAN VIEW area of drawing extents
 - A. **Enter**
 - I. **Shift+Right-click**
 - a. **Midpoint**
 - B. Move cursor near Circle representing sign post in PLAN VIEW area of drawing extents
 - I. Observe Quadrant glyph along positive X-axis appear
 - II. Left-click

Object snaps



5. Turn on running **Intersection** Object Snap using your method of choice.
 - A. Observe glyph behavior as you hover over any area of intersecting geometry.

Examples 2

Start with [acad-objct-snp-01.dwg](#)

[acad-objct-snp-04.mp4](#) 5:32

Extension

The Extension Object Snap will find a point on a projected extension of a drawing object.

1. Open **acad-objct-snp-01.dwg**
2. Turn on running **Extension** Object Snaps using your method of choice.
3. **Ribbon > Home tab > Draw panel > Polyline button**
 - A. Move cursor near any arc in PLAN VIEW area of drawing extents
 - I. Observe Extension Object Snap glyph appear and that it shows a continuing green extension of the arc as you move outside of the arc.
 - II. Left-click
 - B. Move cursor near a line and extend along the path of the line past its endpoint and notice the same green extension appear.
 - C. **esc**

Insertion

The Insertion Object Snap will snap to the insertion point of objects such as blocks or text.

1. Open **acad-object-snp-01.dwg**
2. Turn on running **Insertion** Object Snaps using your method of choice
3. **Ribbon > Home tab > Draw panel > Polyline button**
 - A. Move cursor near any block or text in the drawing.
 - I. Observe Insertion Object Snap glyph appear at the insertion point of the object.
 - B. **esc**

Perpendicular

The Perpendicular Object Snap will snap perpendicular to any object such as a line or polyline in relation to the object being drawn.

1. Open **acad-object-snp-01.dwg**
2. Turn on running **Perpendicular** Object Snaps using your method of choice.
3. **Ribbon > Home tab > Draw panel > Polyline button**
 - A. Click any point in the drawing.
 - B. Hover near any line or other object in the drawing for your second point.
 - I. Observe Perpendicular Object Snap glyph appear at the perpendicular point of the other object.
 - C. **esc**

Tangent

The Tangent Object Snap finds the point of tangency on a Circle, Arc, or Ellipse object coming in from any Line or Polyline object.

1. Open **acad-object-snp-01.dwg**
2. Turn on running **Tangent** Object Snaps using your method of choice.
3. **Ribbon > Home tab > Draw panel > Create Line**
 - A. Move cursor near PLAN VIEW area of drawing extents.
 - I. Left-click anywhere to place first point.
 - B. Move cursor near Circle representing median back of curb in PLAN VIEW area of drawing extents
 - I. Observe Tangent Object Snap glyph appear
 - II. Left-click to create line tangent to the circle.

Nearest

The Nearest Object Snap will anywhere on an object nearest to where the user clicks.

1. Open **acad-object-snp-01.dwg**
2. Turn on running **Nearest** Object Snaps using your method of choice
3. **Ribbon > Home tab > Draw panel > Polyline button**
 - A. Click any point in the drawing.
 - B. Hover near any line or other object in the drawing and observe the Nearest Object Snap glyph appear.
 - C. **esc**

Parallel and Apparent Intersection

Use the Parallel Object Snap to lay out new linear objects while referencing existing linear objects for directional orientation. You will first start the new linear object command (i.e. Line), then hover over the desired linear reference object. This will activate the Parallel Object Snap and you will see a dashed extension line as a preview of your new linear object draw parallel to that existing. Apparent Intersection Object Snap allows a user to snap to where two objects would intersect even if they do not actually connect. This

object snap will extrapolate the linework to find the point at which the objects would intersect if they were extended far enough to intersect.

1. Continue working in **acad-object-snp-01.dwg**
2. Turn on running Endpoint, Apparent Intersection and Parallel Object Snaps using your method of choice
3. **Ribbon > Home tab > Draw panel > Line flyout > Polyline button**
 - A. Move cursor near upper right of SECTION A-A, CRUSHED AGGREGATE BASE COURSE border Line
 - I. Observe Endpoint Object Snap glyph appear
 - II. Left-click
 - B. Move cursor to hover over adjacent TOPSOIL Line
 - I. Observe Parallel Object Snap glyph appear
 - C. Move cursor along path from the new Line starting vertex parallel to TOPSOIL Line
 - I. Observe Parallel preview line appear
 - D. Move cursor to point of intersection of parallel preview line and existing BOTTOM OF MEDIAN Line.
 - I. Observe Apparent Intersection Object Snap glyph appear
 - II. Left-click

Polar and osnap tracking

Last updated: 2023-01-04

Total video time: 14:01

Both Polar Tracking and Object Snap (aka Osnap) Tracking are tools designed to streamline the process of specifying location precisely when executing a command. Polar tracking allows "snapping" along vectors based on preset angle increments around an initially specified point. Osnap Tracking allows projection out from existing Osnap locations to specify the next command location. These projection vectors can come from multiple Osnap locations and can use current Polar Tracking angles to form the projections. Once you become familiar with the tools, both Polar Tracking and Object Tracking can greatly improve efficiency when specifying command location.

Polar Tracking

Exercise files: [acad-data-c3d20.zip](#)

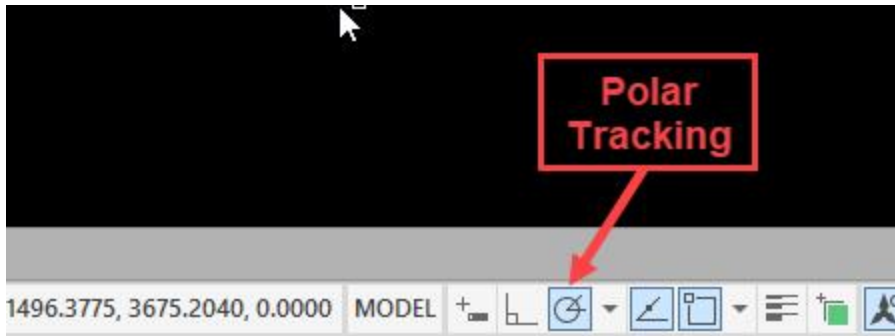
Start with **acad-polr-osnp-trak-begin.dwg**

[acad-polr-osnp-trak-01.mp4](#) 4:33

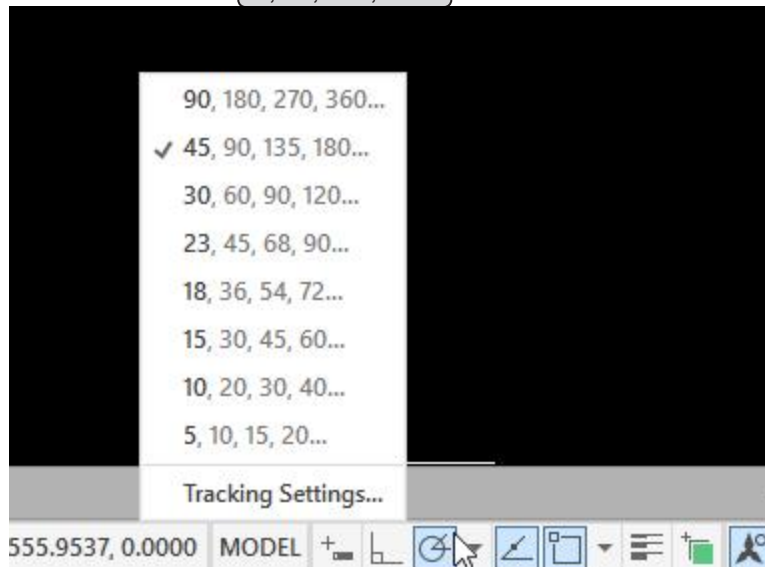
Basics

This section will get you started using Polar Tracking with an example exercise laying out title block Lines.

1. Open **acad-polr-osnp-trak-begin.dwg**
2. **Status Bar > Customization flyout**
 - A. Polar Tracking = checked
3. **Status Bar**
 - A. Polar Tracking on



4. **Ribbon > Home tab > Draw panel > Polyline button**
 - A. Left-click anywhere in Model space to specify first points
 - B. Rotate cursor around first point location
 - C. Observe Polar Tracking vector "snapping"
5. **Status Bar > Polar Tracking icon**
 - A. Right-click
 - I. Increment = 45, 90, 135, 180...



6. **Status Bar**
 - A. Dynamic Input off
 - B. Polar Tracking off
 - C. Center Object Snap on
7. Zoom to lower right of drawing extents
8. **Ribbon > Home tab > Draw panel > Polyline button**
 - A. Snap to bottom red guiding Circle for first point
 - I. @26<180 Enter
 - II. Enter
 - B. Enter
 - C. **Status Bar**
 - I. Dynamic Input on
 - D. Snap to middle red guiding Circle for first point
 - I. 26
 - II. tab
 - III. 180
 - a. Enter

Polar and osnap tracking

9. **Status Bar**
 - A. Dynamic Input off
 - B. Polar Tracking on
 - I. Increment =
10. **Ribbon > Home tab > Draw panel > Polyline button**
 - A. Snap to top red guiding Circle for first point
 - I. Move cursor until 180 deg Polar Tracking vector appears
 - a. **26**
 - i.
 - II. Move cursor until 270 deg Polar Tracking vector appears
 - a. **16.5**
 - i.

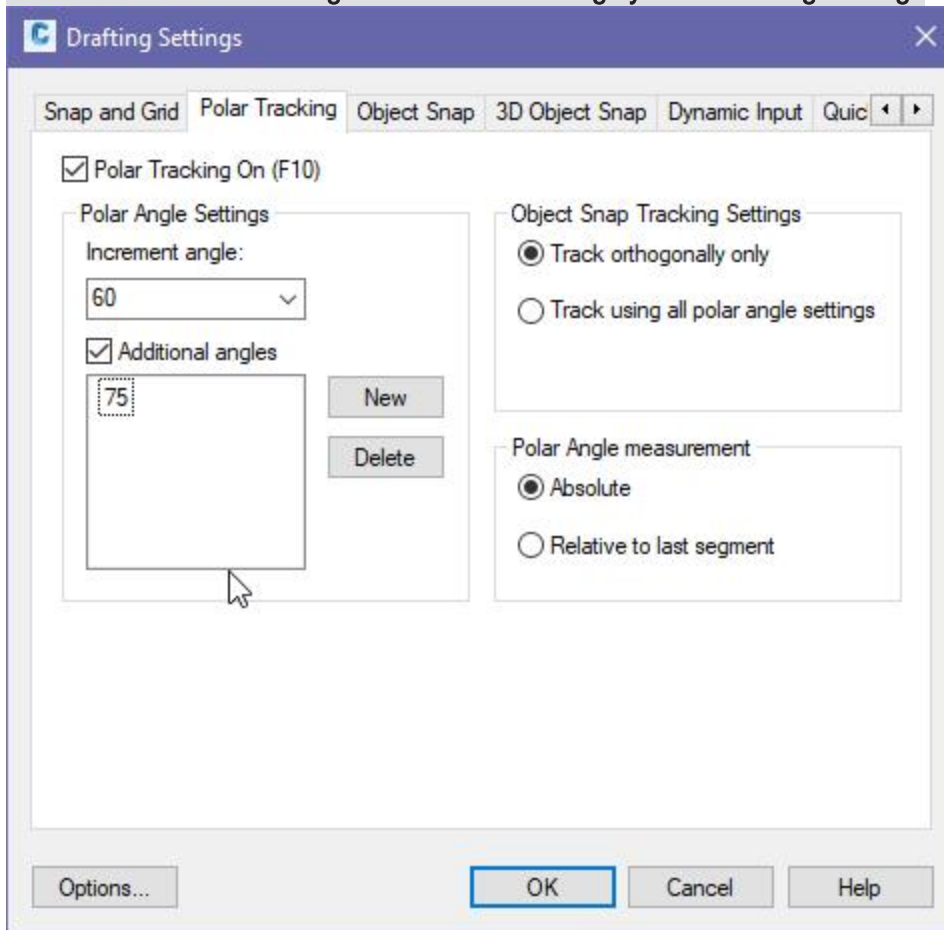
Access to settings

Start with **acad-polr-osnp-trak-01.dwg**

[acad-polr-osnp-trak-02.mp4](#) 3:46

You can customize the way Polar Tracking works based on your preferences and/or workflow needs. Here you will be able to add increment angles, additional angles (single angle relative to 0 deg), set display preferences, set Osnap Tracking interaction preferences, and toggle between relative (direction of last drawn line segment is assumed as 0 deg) and absolute angle measurement. This section will walk you through these settings and their effect on Polar Tracking function.

1. Open **acad-polr-osnp-trak-begin.dwg**
2. **Status Bar > Polar Tracking icon > Polar Tracking flyout > Tracking Settings**



- A. Polar Tracking On = checked
- B. Polar Angle Settings
 - I. Increment angle = 60
- C. **OK**
3. **Ribbon > Home tab > Draw panel > Polyline button**
 - A. Left-click in anywhere in Model space to specify first point
 - I. Rotate cursor around first point
 - II. Observe 60 deg Polar Tracking angle increments
 - B. **esc**
4. **Status Bar > Polar Tracking icon > Polar Tracking flyout > Tracking Settings**
 - A. Polar Angle Settings
 - I. Additional angles = checked
 - II. **New**
 - III. **75**
 - B. **OK**
5. **Ribbon > Home tab > Draw panel > Polyline button**
 - A. Left-click in anywhere in Model space to specify first point
 - I. Rotate cursor around first point
 - II. Observe 75 deg Polar Tracking additional angle
 - B. **esc**
6. **Status Bar > Polar Tracking icon > Polar Tracking flyout > Tracking Settings**

Info: Clicking on the **Options** button inside of the **Tracking Settings** dialog box brings up the **Options** dialog box. Located in the upper-right corner are the on-screen visual options for AutoTrack which can be toggled ON/OFF.

Object Snap Tracking

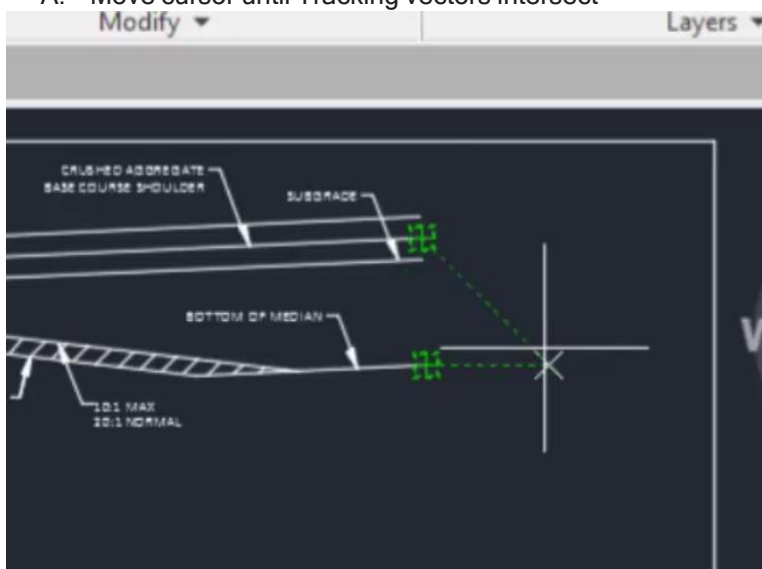
Start with **acad-polr-osnp-trak-02.dwg**

[acad-polr-osnp-trak-03.mp4](#) 5:42

In this section you will be introduced to the Object Snap (aka Osnap) Tracking tool including functionality when combined with Polar Tracking and Dynamic Input. Keep in mind that for Object Snap Tracking to take effect, you will first need to have at least one Osnap turned on.

Basics

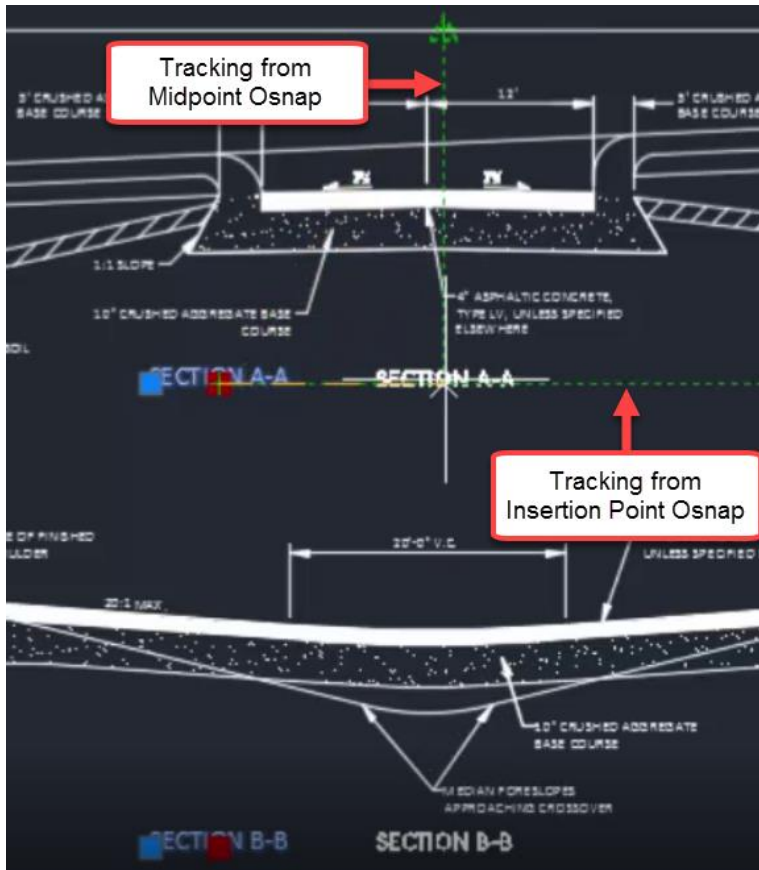
1. Open **acad-polr-osnp-trak-02.dwg**
2. **Status Bar**
 - A. Polar Tracking on
 - B. Object Snap Tracking on
 - C. Object Snap on
3. **Status Bar > Polar Tracking icon > Polar Tracking flyout**
 - A. Increment = (45, 90, 135, 180...)
4. **Status Bar > Object Snap icon > Object Snap flyout**
 - A. Endpoint = checked
5. **Ribbon > Home tab > Draw panel > Polyline button**
6. Move cursor to hover over a Line endpoint
 - A. Observe Object Snap Tracking activate
 - B. Rotate cursor around active Object Snap Tracking location
 - C. Observe Tracking vectors available based on Polar Tracking increments
7. Move cursor to hover over additional endpoint
 - A. Move cursor until Tracking vectors intersect



8. **Status Bar > Polar Tracking icon > Polar Tracking flyout > Tracking Settings...**
 - A. Object Snap Tracking Settings
 - I. Track orthogonally only = checked
 - B. OK
9. **Ribbon > Home tab > Draw panel > Polyline button**
 - A. Move cursor to hover over a Line endpoint
 - B. Observe Object Snap Tracking activate
 - C. Rotate cursor around active Object Snap Tracking location
 - D. Observe Tracking vectors available based on x and y-axes only
10. Move cursor to hover over activated Object Snap Tracking location again to deactivate

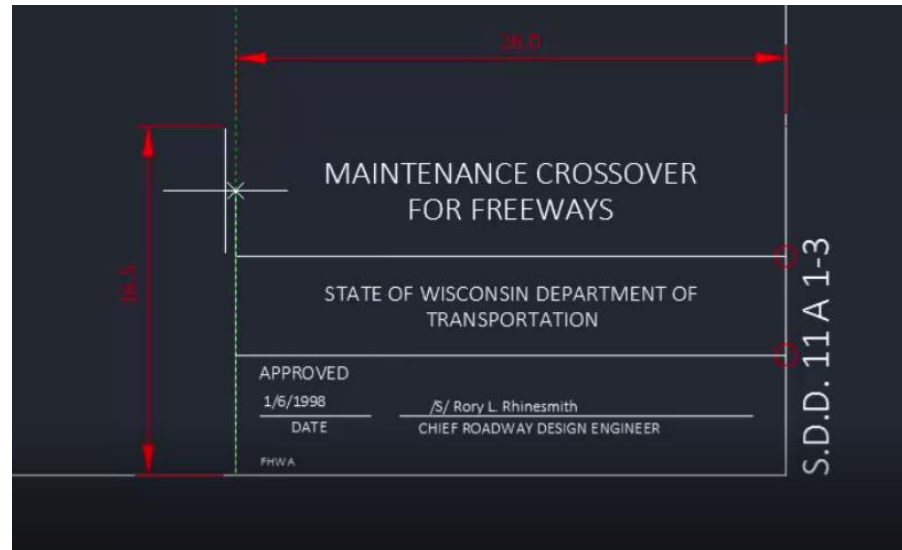
Exercise: align objects

1. Continue working in **acad-polr-osnp-trak-02.dwg**
2. **Status Bar > Object Snap icon > Object Snap flyout**
 - A. Midpoint = checked
 - B. Insertion Point = checked
3. Select both SECTION A-A and SECTION B-B Mtext objects
 - A. Hold Shift
 - I. Select middle insertion point grips on both Mtext objects
 - II. Note grip color change to red
 - A. Release Shift
4. Select one red Mtext grip to begin Move command
 - A. Move cursor to hover over insertion point grip
 - I. Observe insertion point Osnap Tracking activate
 - B. Move cursor to hover over midpoint of top sheet border Line
 - I. Observe midpoint Osnap Tracking activate
 - C. Move cursor to intersection of Osnap Tracking vectors
 - D. Left-click to specify destination location for Move command



Exercise: lay out geometry

1. Continue working in **acad-polr-osnp-trak-02.dwg**
2. **Status Bar > Object Snap icon > Object Snap flyout**
 - A. Endpoint = checked
3. **Status Bar**
 - A. Object Snap Tracking on
 - B. Polar Tracking on
 - C. Dynamic Input on
4. **Ribbon > Home tab > Draw panel > Polyline button**
 - A. Move cursor to hover over lower right sheet border Line endpoint
 - I. Observe Object Snap Tracking activation
 - II. Move cursor left of Endpoint Snap location along 180 deg Object Snap Tracking vector
 - a. **26**
 - b. Move cursor above Line first point along 90 deg Object Snap Tracking vector
 - i. **16.5**
 - c. Move cursor right of Line second point along 0 deg Object Snap Tracking vector
 - i. **26**

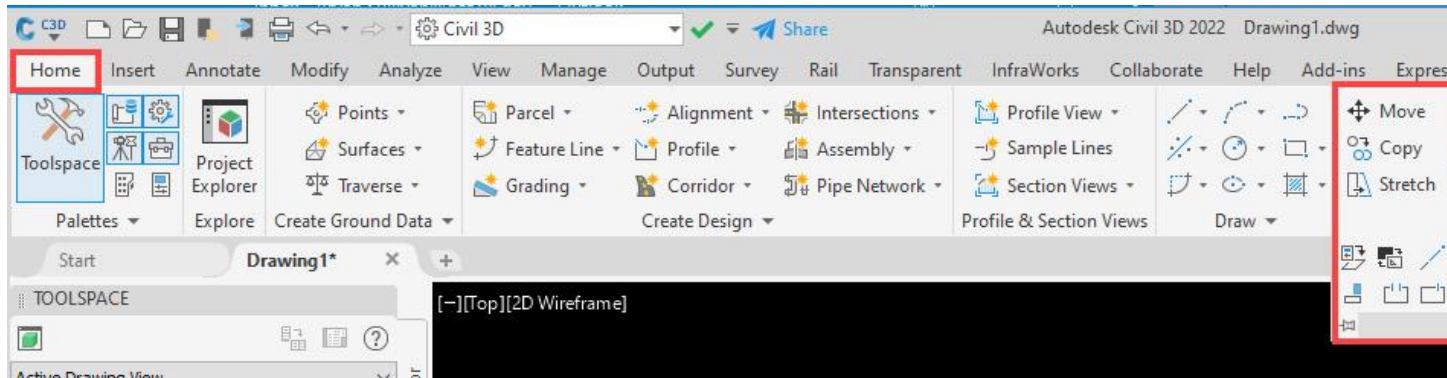


AutoCAD modify

Last updated: 2023-01-04

Total video time: 44:42

Modify commands are used to make changes to objects that have already been drawn. These commands can greatly improve workflow efficiency by eliminating the need to re-create objects, streamlining object creation and location specification, combining multiple commands, and otherwise utilize existing geometry objects.



Move & Copy

Exercise files: [acad-data-c3d20.zip](#)


Start with [acad-modify-begin.dwg](#)

[acad-modify-01.mp4](#) 4:54

Move

The Move command allows you to relocate objects either by keying in X, Y, Z displacement or by cursor-selecting a base point and destination point.

1. Open **acad-modify-begin.dwg**
2. **Ribbon > Home tab > Modify panel > Move**


 **Info:** **m** is a command line "alias" that also invokes the **move** command.

- A. Select objects: **SD.D.11.A 1-3** text in lower right of drawing extents
 - B. **spacebar**
 - C. Specify base point: lower right Endpoint of sheet border Line
 - D. Specify second point: pick anywhere to place new base point location
 - E. **Ctrl+z** to undo previous command.
3. **Ribbon > Home tab > Modify panel > Move**
 - A. Select objects: **SD.D.11.A 1-3** text in lower right of drawing extents
 - B. **Displacement**
 - I. **Enter**
 - C. **50,0,0**
 - I. **enter**
 - D. **Ctrl+z** to undo previous command.

Copy

The Copy command allows you to duplicate an existing object and then paste it to a location either by keying in X, Y, Z displacement or by cursor-selecting a base point and destination point.

1. Continue working in **acad-modify-begin.dwg**
2. **Ribbon > Home tab > Modify panel > Copy**

 **Info:** **co** is a command line "alias" that also invokes the **copy** command.

- A. Select objects: **SD.D.11.A 1-3** text in lower right of drawing extents
 - I. Right-click or **spacebar**
 - B. Specify second point: lower left Endpoint of sheet border Line
 - C. Left-click multiple additional destination points
 - D. Select copies made in above step and **delete**
3. **Ribbon > Home tab > Modify panel > Copy**
 - A. Select objects: **SD.D.11.A 1-3** text in lower right of drawing extents
 - I. Right-click or **spacebar**
 - B. **Displacement**
 - I. **enter**
 - C. **50,0,0**
 - I. **enter**
 - D. **Ctrl+z** to undo previous command.
 4. **Ribbon > Home tab > Modify panel > Copy**
 - A. Select text to copy
 - I. Right-click or **spacebar**
 - B. **Mode**
 - I. **Multiple** (allows multiple copies of selected objects)
 - C. **spacebar** to end command

Rotate & Scale

Continue with **acad-modify-begin.dwg**

[acad-modify-02.mp4](#) 5:27

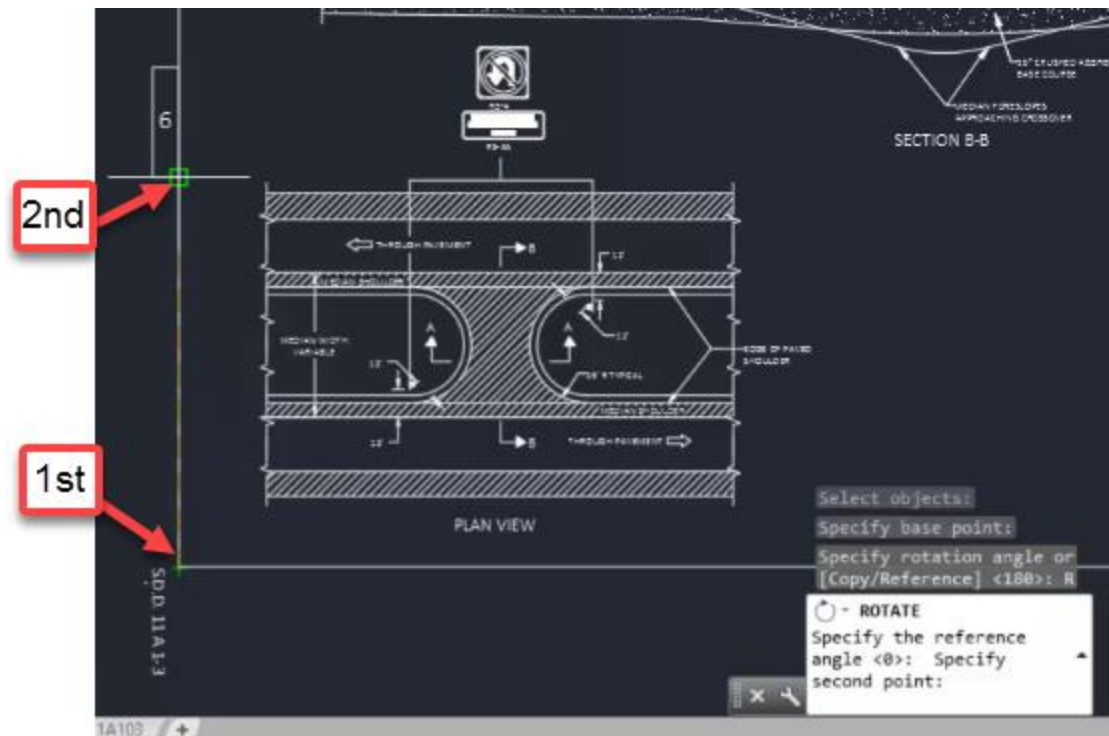
Rotate

The Rotate command allows you to rotate an object in the XY plane about a point either by keying in a rotation angle, selecting a relative rotation point, or picking two points to form a reference "line" and two points to form a destination rotation "line".

1. Continue working in **acad-modify-begin.dwg**
2. Select **SD.D.11.A 1-3** text in lower middle of drawing extents
 - A. Select the square grip on the text
 - B. Place the grip at the lower left corner of the sheet border to move the text
3. **Ribbon > Home tab > Modify panel > Rotate** (**ro**Enter) for command line hotkey option)

Info: **ro** is a command line "alias" that also invokes the **rotate** command.

- A. Specify base point: lower left corner of the sheet border
 - B. Specify rotation angle: **180**
4. **Ribbon > Home tab > Modify panel > Rotate**
 - A. Select **SD.D.11.A 1-3** text
 - I. Right-click or spacebar
 - II. Specify base point: lower left corner of the sheet border
 - III. **Reference**
 - a. Left-click first and second reference angle points




- b. Specify the new angle: **p**
 - i. enter
- c. Left-click first and second new angle points

Scale

The Scale command allows you to resize a selection of objects while holding a specified base point either by keying in a scale factor or referencing existing objects.

1. Continue working in **acad-modify-begin.dwg**
2. Double-click middle mouse wheel to Zoom Extents
3. Window-Select full-sized "PLAN VIEW"
 - A. **(delete)**
4. **Ribbon > Home tab > Modify panel > Scale**

 **Info:** **sc** is a command line "alias" that also invokes the **scale** command.

- A. Select objects: Window-Select half-size objects to left of full-size objects
 - B. Specify base point: lower right of half-size border Line
 - C. Specify scale factor: **2****(enter)**
 - D. **(Ctrl+z)** to undo last command
5. **sc****(enter)**
 - A. Window-Select half-sized objects to left of full-size objects
 - B. Specify base point: lower right of half-size border Line
 - C. **R****(enter)** for Reference
 - D. Specify reference length: Left-click beginning and end of bottom half-size border Line
 - E. Specify new length: **R****(enter)**
 - I. Left-click beginning and end of bottom full-sized border Line
 6. Window Select "PLAN VIEW" objects that were Scaled up
 - A. **m****(enter)**
 - B. Specify base point: lower left of bottom border Line that was Scaled up
 - C. Specify second point: lower left of original full-size bottom border Line
 7. Select redundant border Lines
 - A. **(delete)**
 8. Double-click middle mouse wheel to Zoom Extents

Join & Explode


Start with **acad-modify-01.dwg**

[acad-modify-03.mp4](#) 5:23

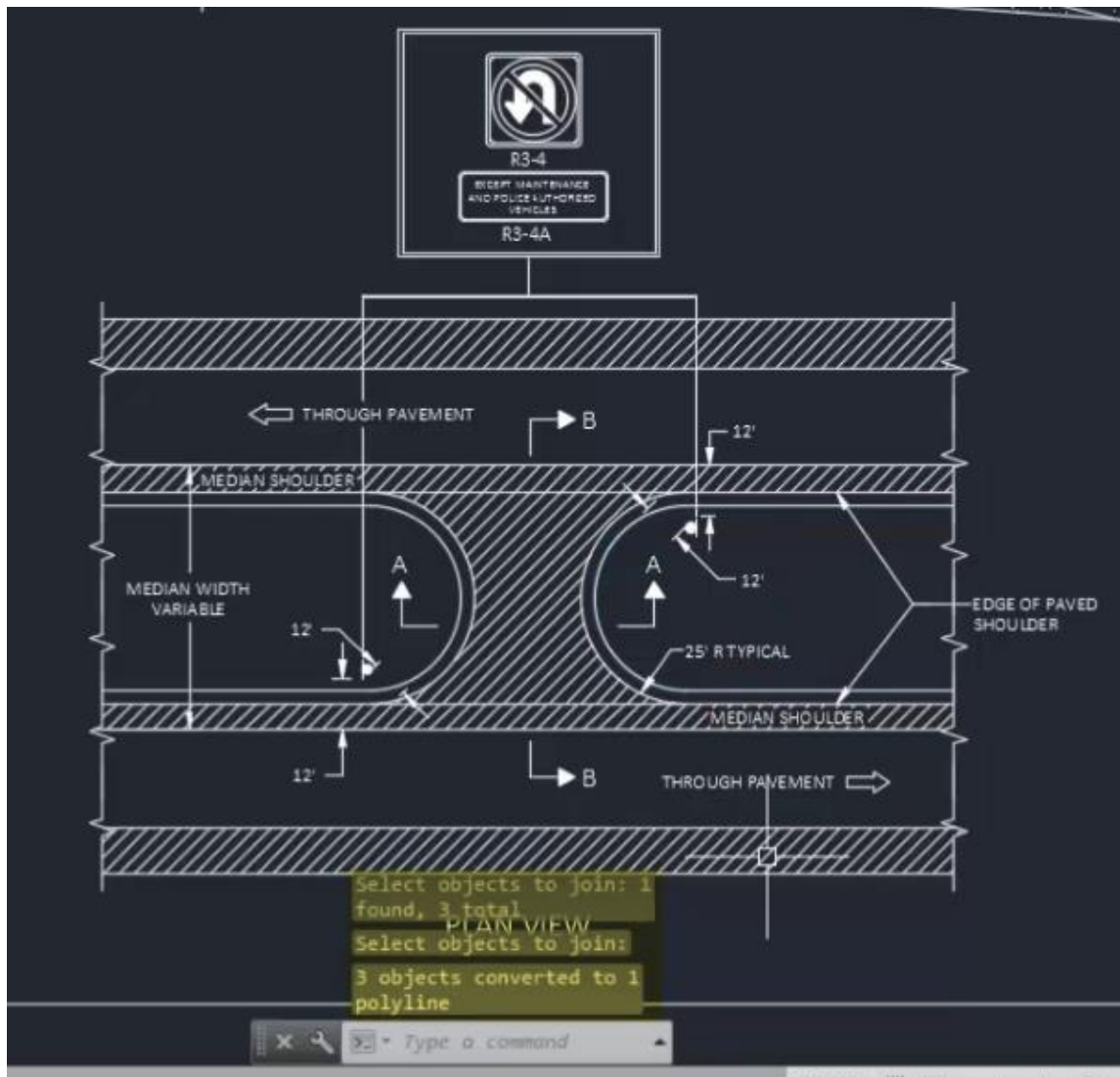
Join

The Join command will take all Line and/or Arcs objects included in a selection set that share common start and end point coordinates (same X,Y,Z) and combine them into a single Polyline.

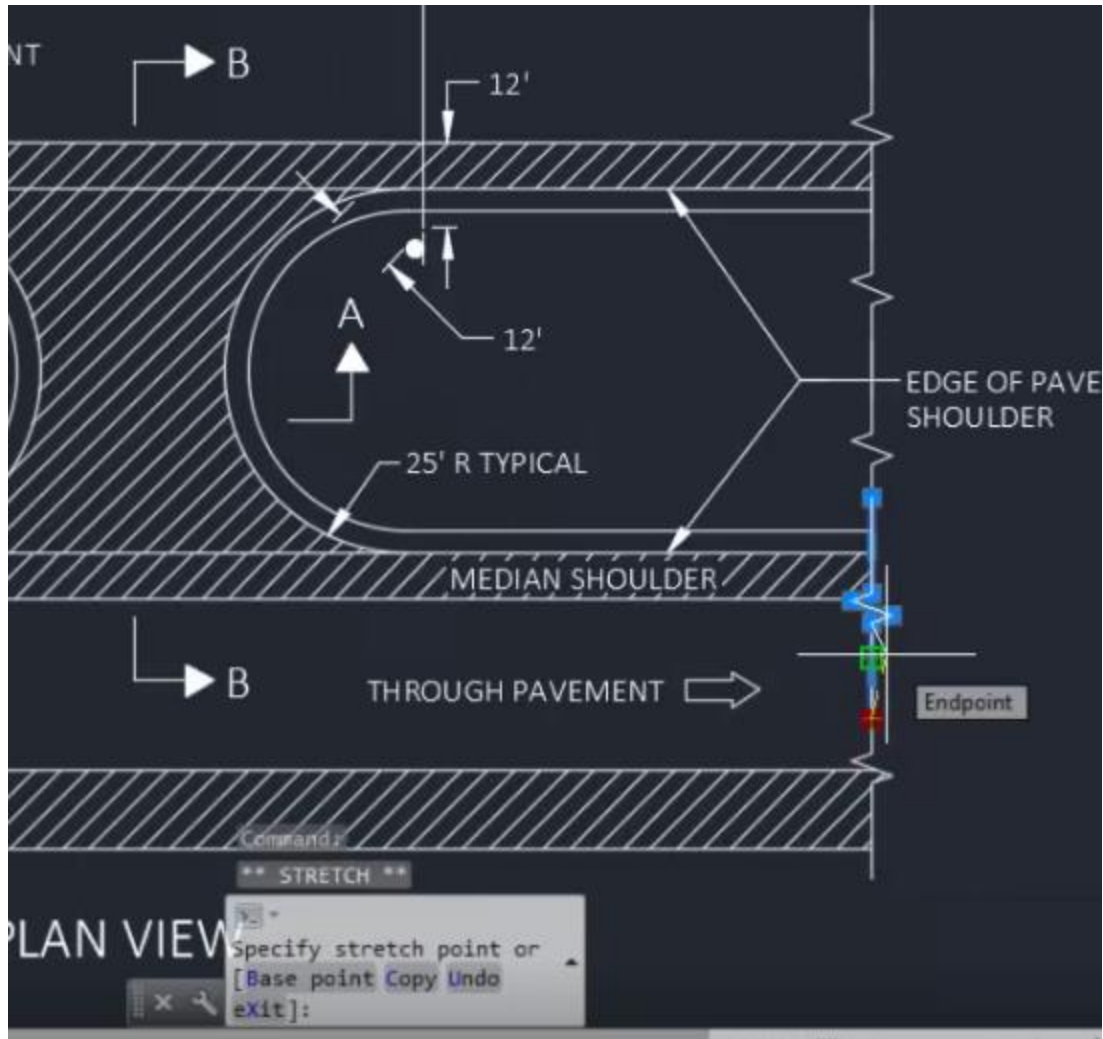
1. Open **acad-modify-01.dwg**
2. Pan and zoom to PLAN VIEW detail
3. **Ribbon > Home tab > Modify panel flyout > Join**

 **Info:** **j** is a command line "alias" that also invokes the **join** command.

4. Select Lines and Arc representing median back of curb
 - A. **(spacebar)**




5. Repeat above step on the other side.
6. **Ribbon > Home tab > Modify panel flyout > Join**
7. Select all "breakline symbol" Polylines along right side of PLAN VIEW detail
 - A.
8. Observe "0 objects joined, 6 objects discarded..." on command line history
9. Select "breakline symbol" Polyline near bottom right of PLAN VIEW detail
 - A. Left-click vertex grip
 - B. Use Endpoint Object Snap to set vertex at same location as adjacent Polyline vertex




10. `[esc]`
 11. **Ribbon > Home tab > Modify panel flyout > Join**
 - A. Select two Polylines whose vertices were aligned in previous step.
 - B. `[enter]`
 - C. Observe "5 segments joined into 1 polyline" on command line history
 12. **Ribbon > Home tab > Modify panel flyout > Join**
 - A. Select all 4 sides of sheet border.
 - B. `[enter]`
 - C. Observe "3 objects converted to 1 polyline, 1 objects discarded..." on command line history
 - I. In the **Properties** palette, observe that the left sheet border line has a different elevation at its vertices than the polyline created with the previous join command.
 - II. Set the Z axis on the left line to 0.
- Info:** All linework must be have the same elevation (Z) value in order for the join command to work.
- D. **Ribbon > Home tab > Modify panel flyout > Join**
 - I. Select all sheet border linework.
 - II. `[enter]`
 - III. Observe that the border is 1 polyline.

Explode

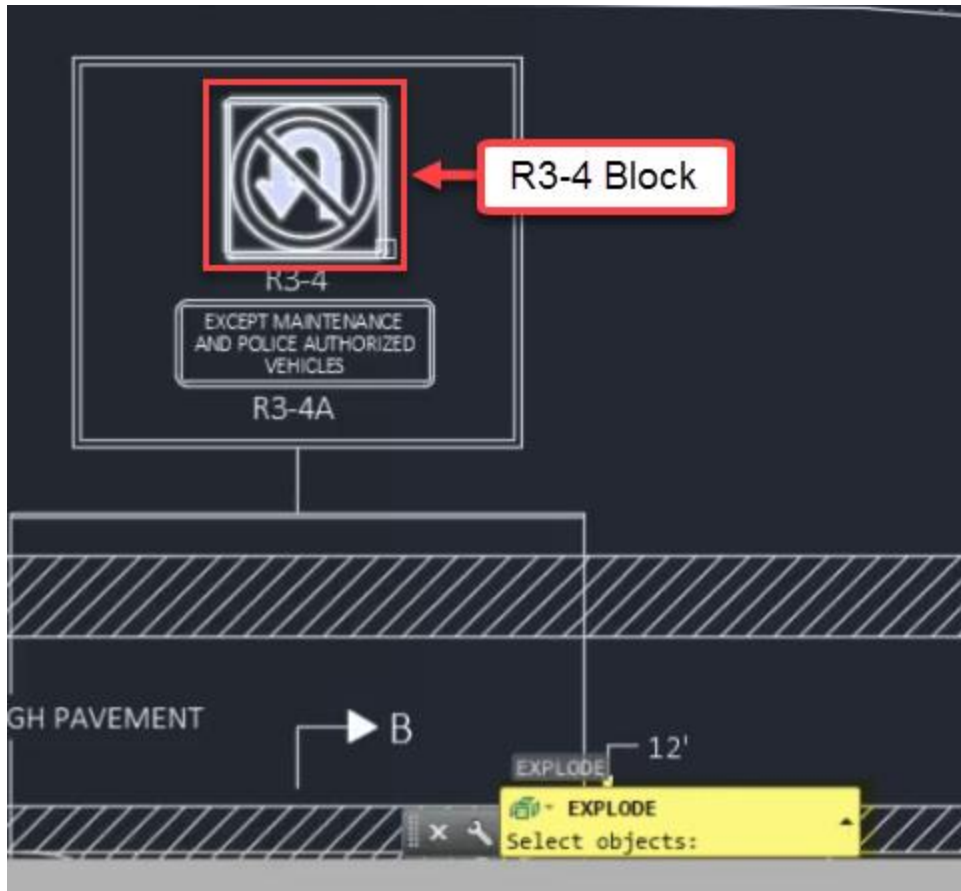
The Explode command will break objects down into foundational pieces. For example, a single Polyline can be Exploded into multiple Lines and/or Arcs that make up the Polyline geometry.

 **Warning: Never Explode a Civil 3D Object** (i.e. Alignment, Surface, Corridor). This will cause you to lose dynamic updating, labeling, data referencing and other powerful object functionality. Thus, the Explode command should be limited to simple AutoCAD objects as demonstrated in this section.

1. Continue working in **acad-modify-01.dwg**
2. **Ribbon > Home tab > Modify panel > Explode**

 **Info:** **x** is a command line "alias" that also invokes the **explode** command.

3. Select PLAN VIEW median Polyline previously Joined
 - A.
4. Zoom and pan to R3-4 signage detail
5. **x**
 - A. Select R3-4 Block
 - B.
6. **x**
 - A. Select outermost Polyline resulting from the Exploded R3-4 Block
 - B.




Erase & Stretch

Continue with [acad-modify-01.dwg](#)


[acad-modify-04.mp4](#) 3:02

Erase

The Erase command allows you to remove a selection set of objects from a drawing. You can either invoke the command and then select objects to remove using your selection method of choice or vice-versa.

 **Tip:** It is a good idea to hit `esc` a couple times before selecting objects to erase. This will ensure that you do not have objects selected that you do not intend to erase. Selected objects are not always visible depending your current Zoom level and Pan location. Your Properties Palette is a good place to check on what is included in the current selection set.

1. Continue working in [acad-modify-01.dwg](#)
2. **Ribbon > Home tab > Modify panel > Erase**

 **Info:** `e` is a command line "alias" that also invokes the **erase** command.

3. Select outermost Lines surrounding the R3-4 and R3-4A details

A. 

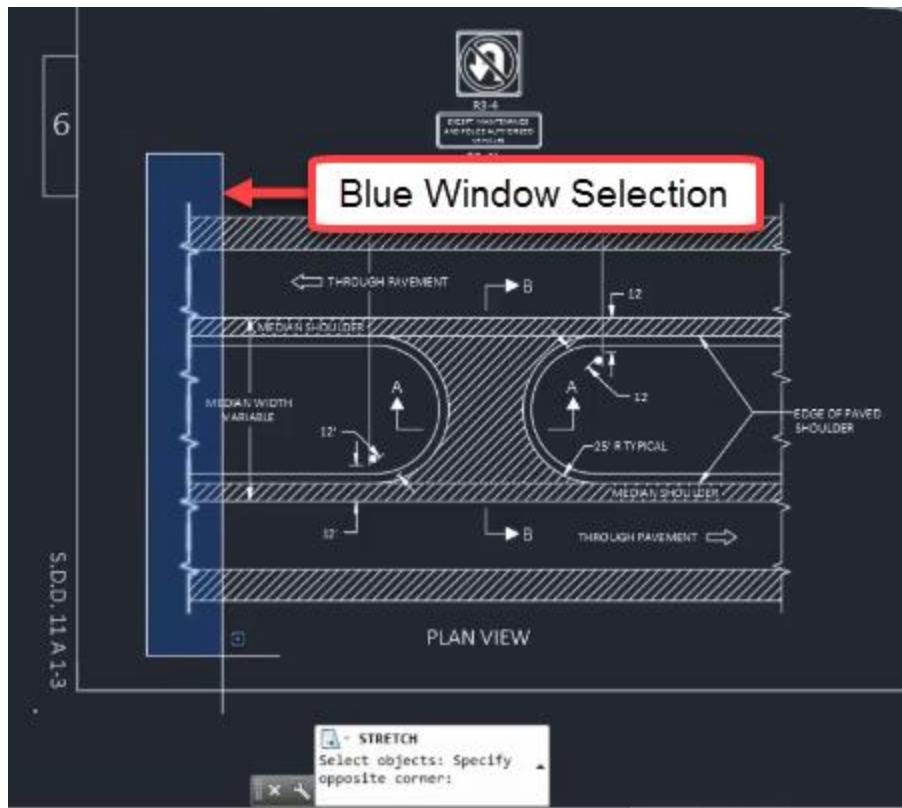
Stretch

The Stretch command allows you to move objects and simultaneously lengthen and reorient adjacent objects while maintaining the original attachment location. After invoking the Stretch command, any objects completely enclosed in a Crossing selection will be moved and any objects partially enclosed in the same Crossing selection will be lengthened and reoriented.

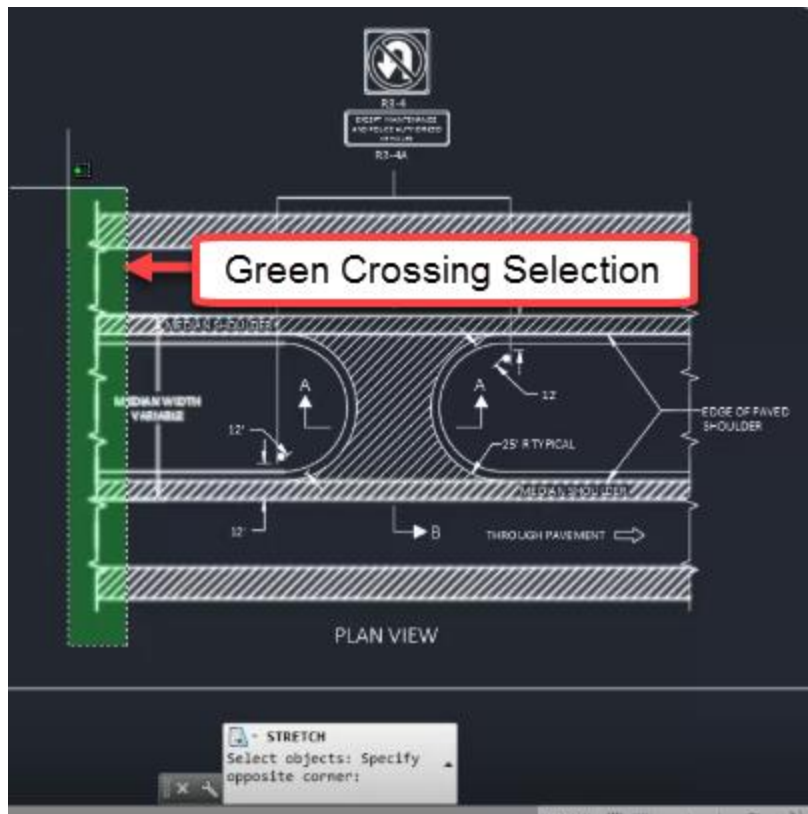
1. Continue working in **acad-modify-01.dwg**
2. **Ribbon > Home tab > Modify panel > Stretch**

 **Info:** **str** is a command line "alias" that also invokes the **stretch** command.

3. Use a Window Selection to select all "breakline symbol" Polylines on the left side of the PLAN VIEW detail
 - A.



- B. Right-click to finish selection
 - I. Left-click to specify base point
 - II. Move Cursor and Left-click to specify second point
 - III. Observe move-only behavior
4. **Ctrl+z** to undo last command.
5. **Ribbon > Home tab > Modify panel > Stretch**
6. Use a Crossing Selection to select all "breakline symbol" Polylines on the left side of the PLAN VIEW detail
 - A. **enter**



- B. Right-click to finish selection
 - I. Left-click to specify base point
 - II. Move Cursor and Left-click to specify second point
 - III. Observe intended Stretch behavior

Mirror & Offset

Start with **acad-modify-02.dwg**

[acad-modify-05.mp4](#) 5:52

Mirror

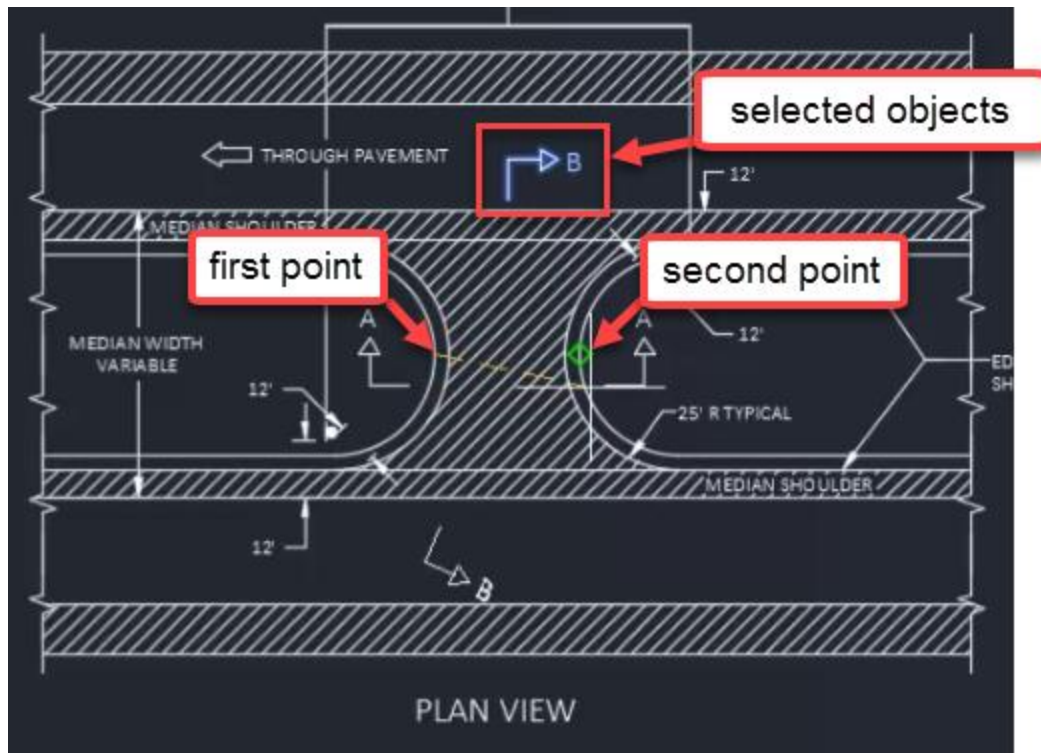
The Mirror command allows you to essentially copy, rotate, and paste an object in the X-Y plane about a mirror line you specify. You can then choose to keep or remove the original object you have mirrored. This can greatly reduce your task time whenever you are creating object with an axis of symmetry in the X-Y plane.

1. Open **acad-modify-02.dwg**
2. Zoom and Pan to PLAN VIEW detail area of drawing
3. **Ribbon > Home tab > Modify panel > Mirror**

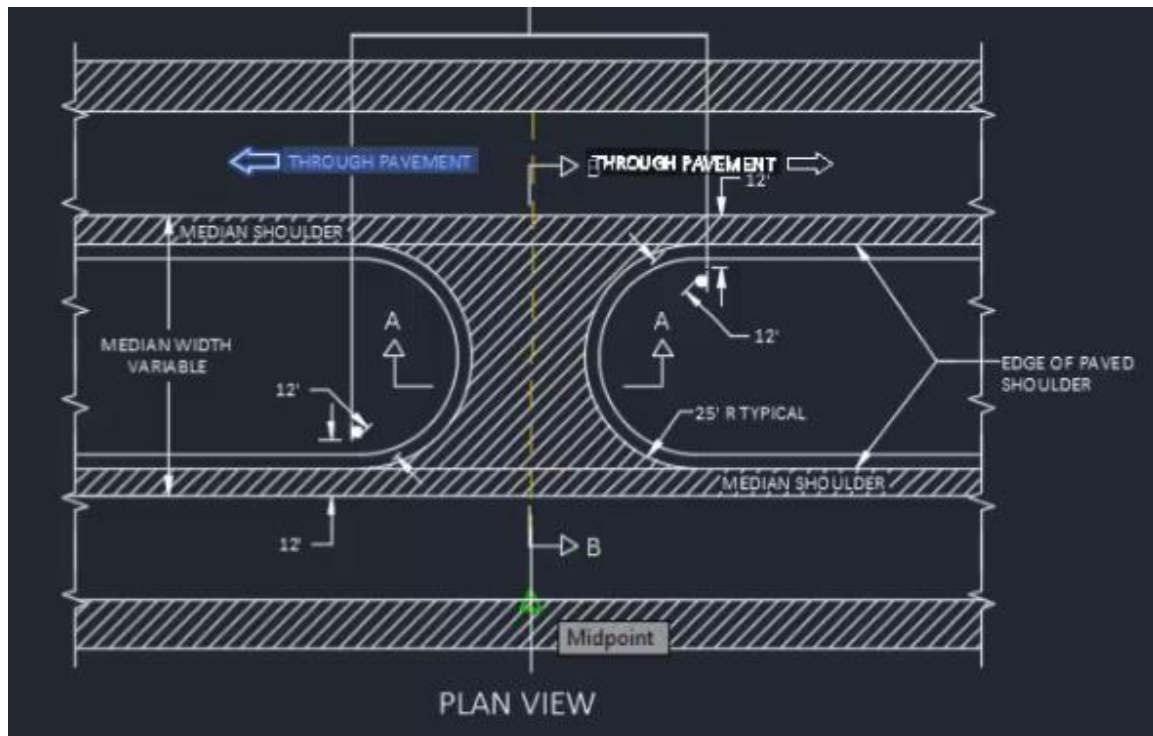
Info: **m** is a command line "alias" that also invokes the **mirror** command.

4. Select "section line arrow" and "B" Text in upper pavement area of PLAN VIEW detail

- A. **Right-click**
- B. Turn on **Quadrant** Osnap
- C. Use Quadrant Osnap to specify first point of mirror line at quadrant point on median Arc
- D. Use Quadrant Osnap to specify second point of mirror line at center of opposite median Arc



- A. **Erase source objects: N**
 - I. **enter**
5. **mi** **enter**
 - A. Select "THROUGH PAVEMENT" Text and adjacent "arrow symbol"
 - B. **Right-click**
 - C. Turn on **Midpoint** Osnap
 - D. Use Midpoint Osnap to specify first point of mirror line at upper midpoint of edge-of-pavement Line
 - E. Use Midpoint Osnap to specify second point of mirror line at lower midpoint of edge-of-pavement Line



F. Erase source objects: N

I.


6. Select newly created "THROUGH PAVEMENT" Text and adjacent "arrow symbol"

7.

A. Specify base point and second point to move objects to lower pavement area of PLAN VIEW detail

Offset

The Offset command allows you to create an object in reference to existing Polyline, Line or Arc objects. The geometry of the newly created objects is dictated by a constant distance measured perpendicularly from the source object. You can call out the offset distance using a known numeric value or by specifying an offset location using your cursor. This tool is especially helpful when laying out proposed roadway or parcel linework (i.e. Edge of Pavement, ROW)

 **Tip:** Using modify commands such as Offset to manipulate Polylines is a great way to lay the foundation for dynamic Civil 3D Objects. This is because many dynamic Civil 3D Objects (i.e. Alignment, Feature Line) can be initially created from simpler AutoCAD Objects (i.e. Polyline).

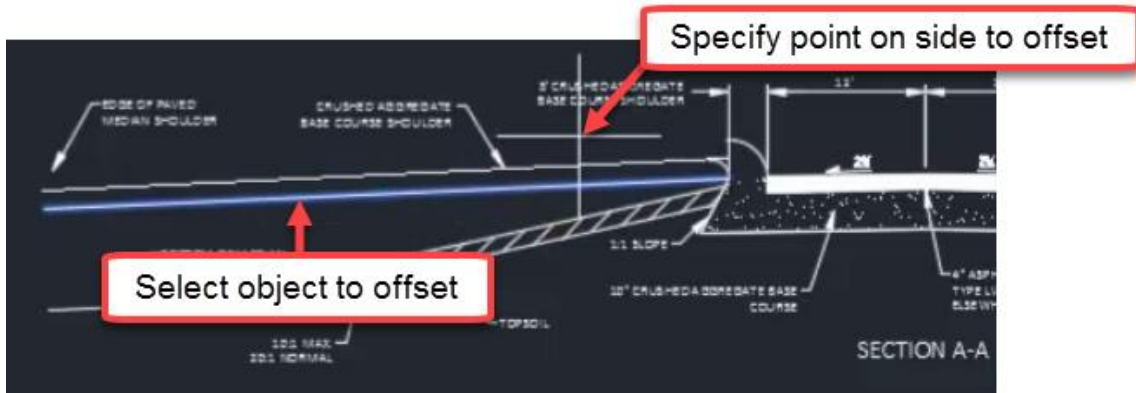
1. Continue working with acad-modify-02.dwg
2. Zoom and Pan to SECTION A-A detail area of drawing
3. **Ribbon > Home tab > Modify panel > Offset button**

 **Info:** `of` is a command line "alias" that also invokes the `offset` command.

A. **Specify offset distance: 1.5**

B.

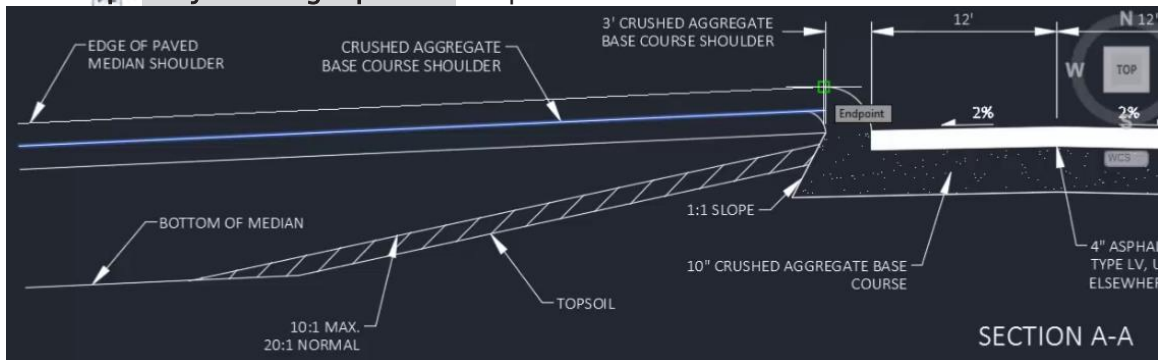
- C. **select object to offset:** select subgrade Line on left side of SECTION A-A detail
- D. **Specify point on side to offset:** left-click above subgrade Line



- A. **enter** or **esc** to end command.

4. **of enter**

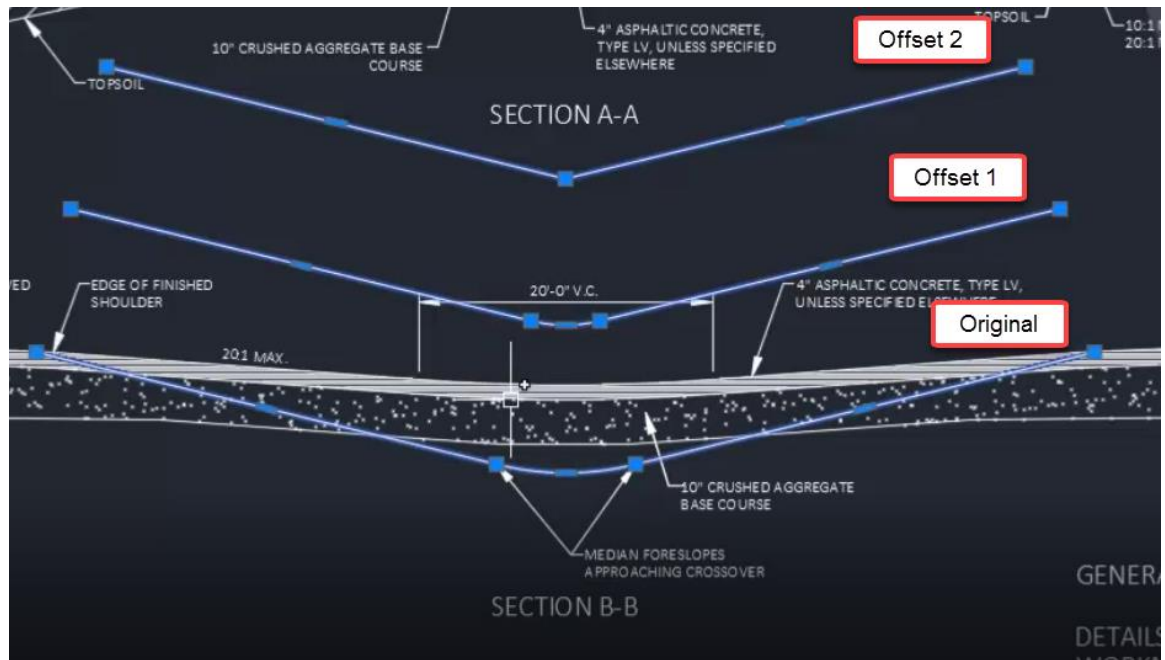
- A. **Specify offset distance:** **Through**
- B. Turn on **Endpoint** Osnap
- C. **Specify through point:** Endpoint of median nose Arc



- D. **select object to offset:** select "CRUSHED AGGREGATED BASE COURSE SHOULDER" Line on right side of SECTION A-A detail
- E. **Specify through point:** Endpoint of median nose Arc on right side of SECTION A-A detail

5. **of enter**

- A. **select object to offset:** MEDIAN FORESLOPES Polyline in SECTION B-B detail
- B. **Specify offset distance:** **10**
 - I. **enter**
- C. specify point on side to offset: above selected Polyline
- D. Repeat above steps selecting previously offset Polyline as object to offset
 - I. Observe disappearance of Arc segment on offset Polyline



Trim, Extend & Lengthen

Continue with [acad-modify-02.dwg](#)

[acad-modify-06.mp4](#) 5:36

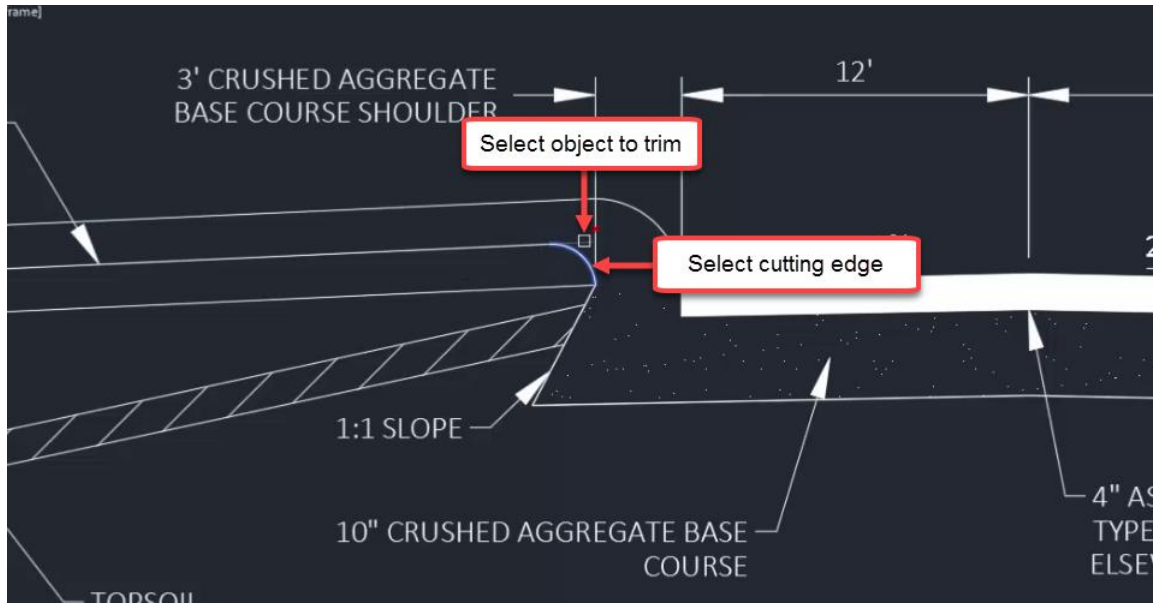
Trim

The Trim command allows you to modify existing geometry such that a section is removed based on intersection with other referenced existing geometry. For example, a Line can be shortened to the point at which it intersects with another Line. The Trim command applies to objects such as Line, Polyline, Circle, Ellipse, and Arc.

1. Continue working with [acad-modify-02.dwg](#)
2. Zoom and Pan to SECTION A-A detail area of drawing
3. **Ribbon > Home tab > Modify panel > Trim**

Info: `tr` is a command line "alias" that also invokes the `trim` command.

- A. **select objects:** select smaller Arc intersecting with Line representing AGGREGATE SHOULDER
- B. `spacebar`
- C. **Trim:** select segment of Line you wish to trim
- D. `enter` or `esc` to end command.



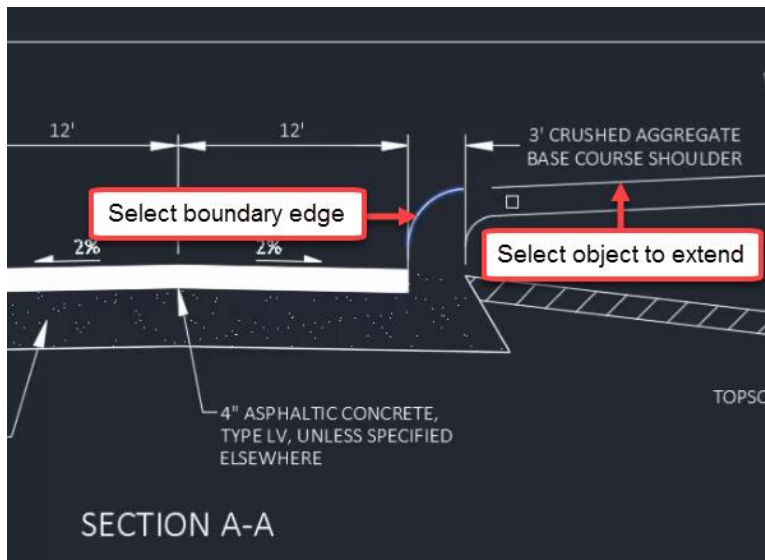
Extend

The Extend command is essentially the reverse of the Trim command. Extend allows you to lengthen a geometry object (i.e. Line, Polyline, Arc) up to the point where it would intersect referenced existing geometry.

1. Continue working with **acad-modify-02.dwg**
2. **Ribbon > Home tab > Modify panel > Extend**

Info: **ex** is a command line "alias" that also invokes the **extend** command.

- A. **select objects:** select median nose Arc on right side of SECTION A-A detail
- B. **spacebar**
- C. **extend:** select Line you wish to extend
- D. **enter** or **esc** to end command.



**Tip:**

Hold **shift** while the Trim command is active in order to switch to the Extend command on the fly.

While selecting objects to Extend or Trim, choose the mid-command option <select all>. This allows you to use any existing geometry object as a potential Extend boundary or Trim cutting edge.

Lengthen

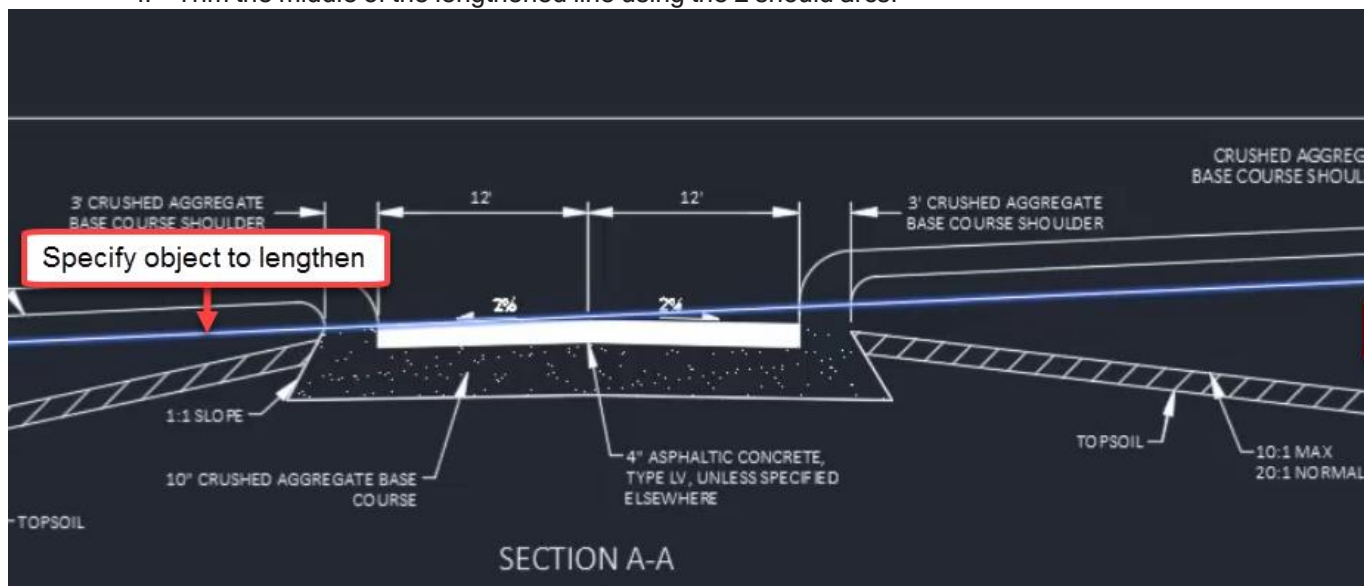
The Lengthen command allows you to continue an object along its current direction without the need for existing geometry to serve as a boundary to extend to. You can use Object Snaps to specify the amount you wish to lengthen the object. The Lengthen command also includes mid-command options to measure selected object geometry.

1. Continue working with **acad-modify-02.dwg**
2. **Ribbon > Home tab > Modify flyout > Lengthen**



Info: **len** is a command line "alias" that also invokes the **length** command.

- A. **select an object to measure or:** **DY**
 - I. **enter**
- B. **select an object to change:** select Line on left side of SECTION A-A representing SUBGRADE
- C. **specify new end point:** use **Endpoint** Osnap to select the end of the Line representing CRUSHED AGGREGATE BASE COURSE SHOULDER on the right side of SECTION A-A detail
- D. **enter**
- E. **tr** **enter**
 - I. Trim the middle of the lengthened line using the 2 should arcs.



Fillet & Break

Start with **acad-modify-03.dwg**

[acad-modify-07.mp4](#) 6:14

Fillet

The Fillet command allows you to insert an Arc at the intersection (or apparent intersection) of two Lines (or Polylines) and trim the Lines at the points of tangency of the Arc. Fillet mid-command options allow you to specify Radius, apply Fillets to all line segment intersections on a Polyline, or continue the command and apply it multiple times consecutively.

1. Open **acad-modify-03.dwg**
2. Zoom and Pan to R3-4 sign above PLAN VIEW detail
3. **Ribbon > Home tab > Modify panel > Fillet**

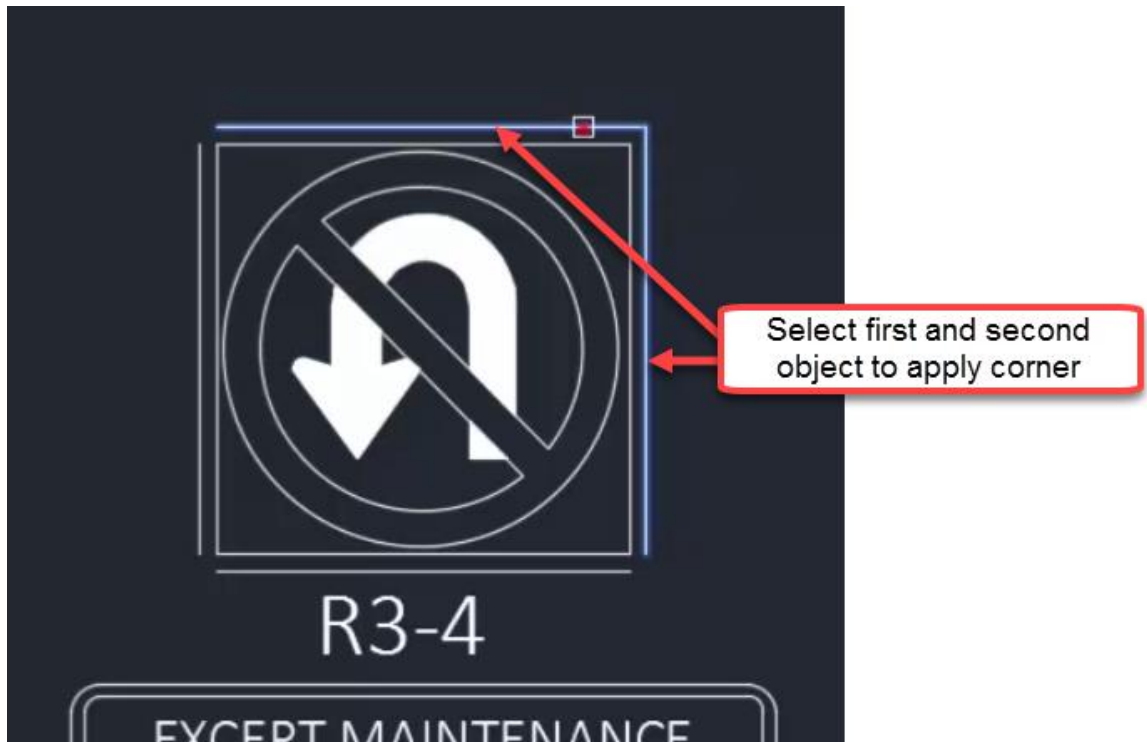
Info: **f** is a command line "alias" that also invokes the **fillet** command.

A. **Select first object or: R**

I. **enter**

B. **specify fillet radius: 0**

I. **enter**



C. **Select first object:** select one of the outermost R3-4 detail Lines

D. **Select second object to apply corner:** select adjacent R3-4 detail Line

4. **f** **enter**

A. **Select first object or: R**

I. **enter**

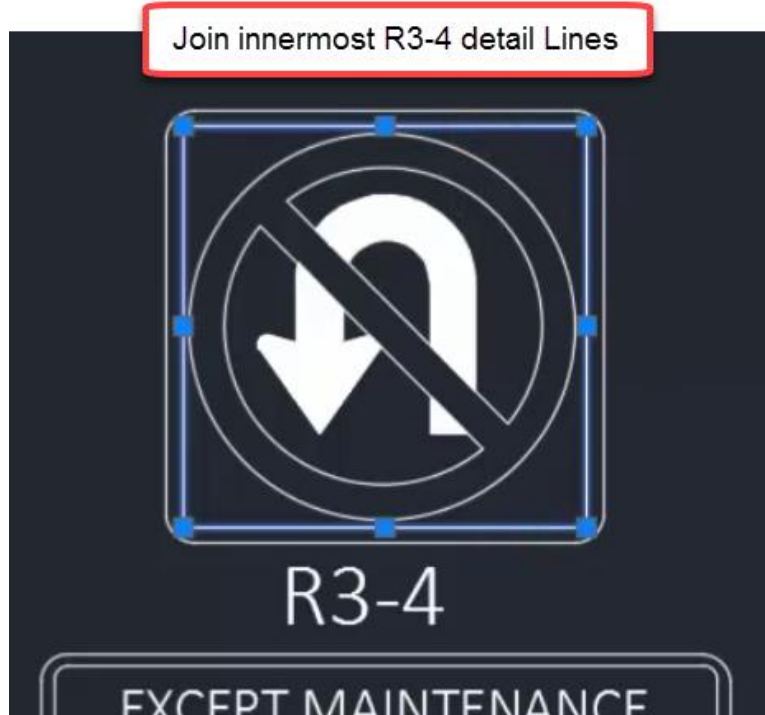
B. **specify fillet radius: 0.35**

I. **enter**


C. **Select first object:** select one of the outermost R3-4 detail Lines

D. **Select second object to apply corner:** select adjacent R3-4 detail Line

5. **f**
 - A. **Select first object or: Multiple**
 - I.
 - B. Apply Fillets to all remaining outermost R3-4 detail Lines
 - I.
6. Select all four innermost Lines on R3-4 detail
 - A. **j**



- B. **f**
- C. **Select first object or: R**
 - I.
- D. **specify fillet radius: 0.2**
 - I.
- E. **Select first object or: polyline**
 - I.
- F. **Select 2d polyline:** select Polyline formed in Step 6.A

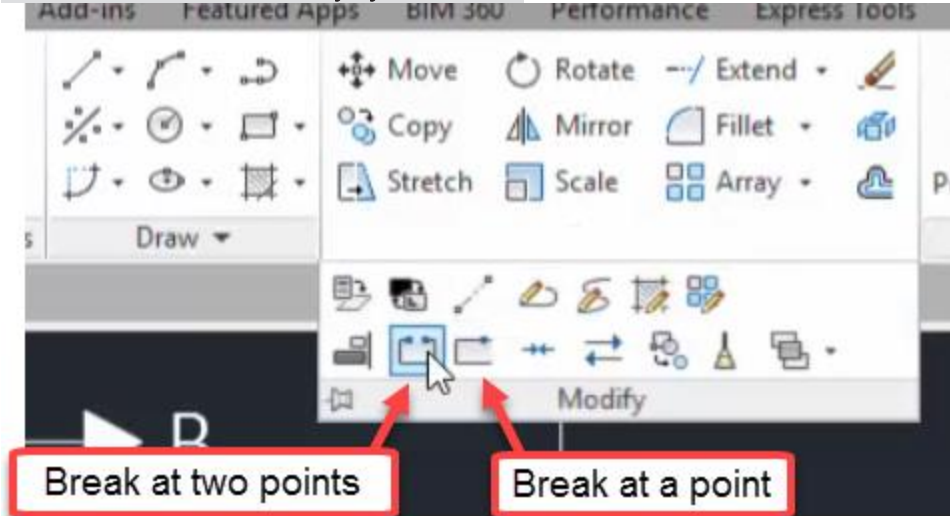
 **Tip:** Use the Fillet command with radius=0 to extend line segments to their point of apparent intersection. The arc segment will then be omitted.

Break

The Break command allows you to create two Lines or Polylines from a single existing Line. You have the option to Break the Line at a single point so that the two resulting Lines share a common endpoint location or to Break the Line at two points so that a gap is formed between the two resulting Lines.

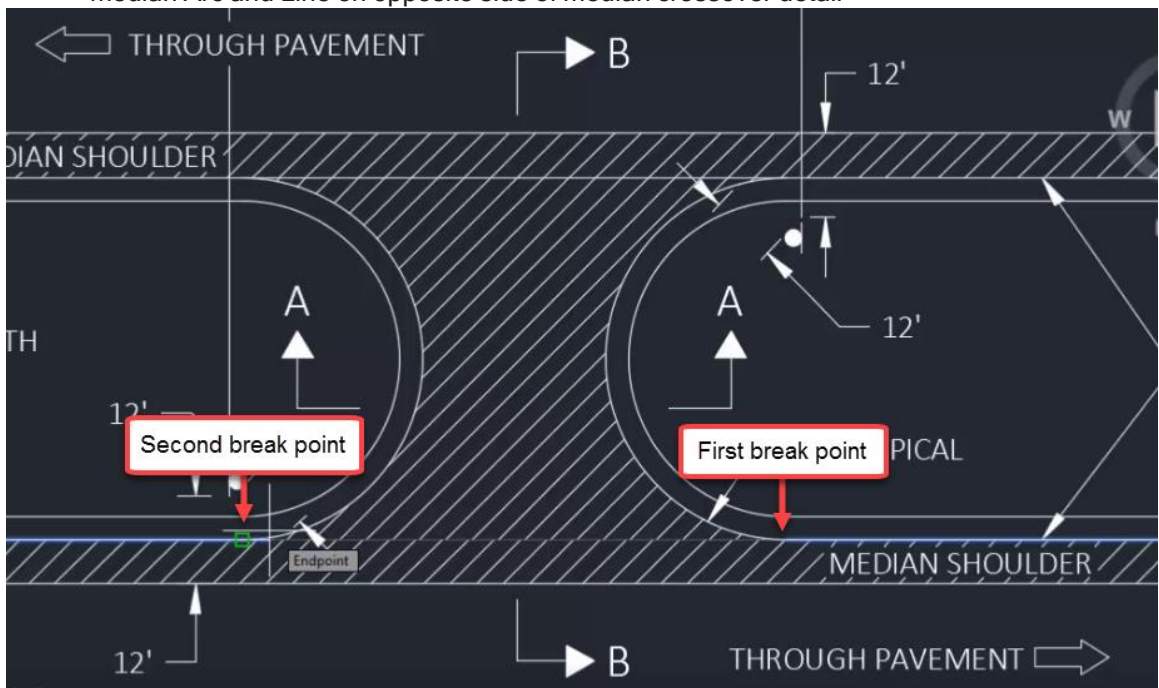
1. Continue working with **acad-modify-03.dwg**
2. Zoom and Pan to PLAN VIEW detail area of drawing

3. Ribbon > Home tab > Modify flyout > Break



Info: `br` is a command line "alias" that also invokes the `break` command.

- A. **Select object:** select Line bounding MEDIAN SHOULDER on bottom side of PLAN VIEW detail tangent to median Arc
- B. **Specify second break point or:** `first point`
- C. **Specify first break point:** Use **Endpoint** Osnap to select intersection of median Arc and Line
- D. **Specify second break point or:** Use **Endpoint** Osnap to select intersection of median Arc and Line on opposite side of median crossover detail



4. Ribbon > Home tab > Modify flyout > Break at Point

- A. **Select object:** select Line bounding MEDIAN SHOULDER on top side of PLAN VIEW detail tangent to median Arc

B. **Specify second break point:** Use **Endpoint** Osnap to select intersection of median Arc and Line

5. Repeat the previous step on the opposite side of median crossover detail.
6. Select and **delete** the middle line that was created from the previous 2 steps.

Array

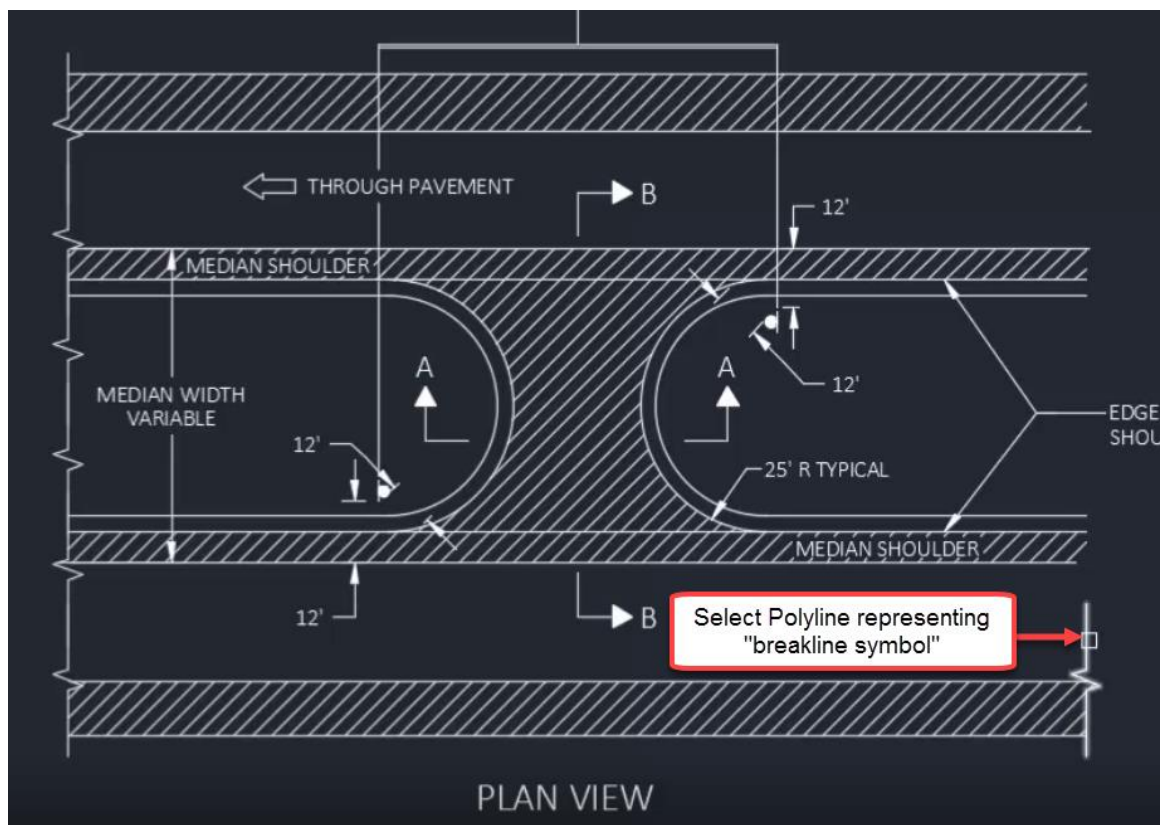
Continue with **acad-modify-04.dwg**

[acad-modify-08.mp4](#) 4:36

The Array command allows you to copy a selected object and paste the object repetitively in a Rectangular, Polar, or Path based Array. A Rectangular Array is arranged in rows and columns. A Polar Array arranges the copied object at a radius and incremental angle about a specified location. A Path Array arranges the copied object at a specified location along a path based on an existing Line or Polyline. This section will cover the Rectangular Array.

1. Open **acad-modify-04.dwg**
2. Zoom and Pan to PLAN VIEW detail area of drawing
3. Select Polyline representing "breakline symbol"
4. **Ribbon > Home tab > Modify panel > Array (Rectangular)**

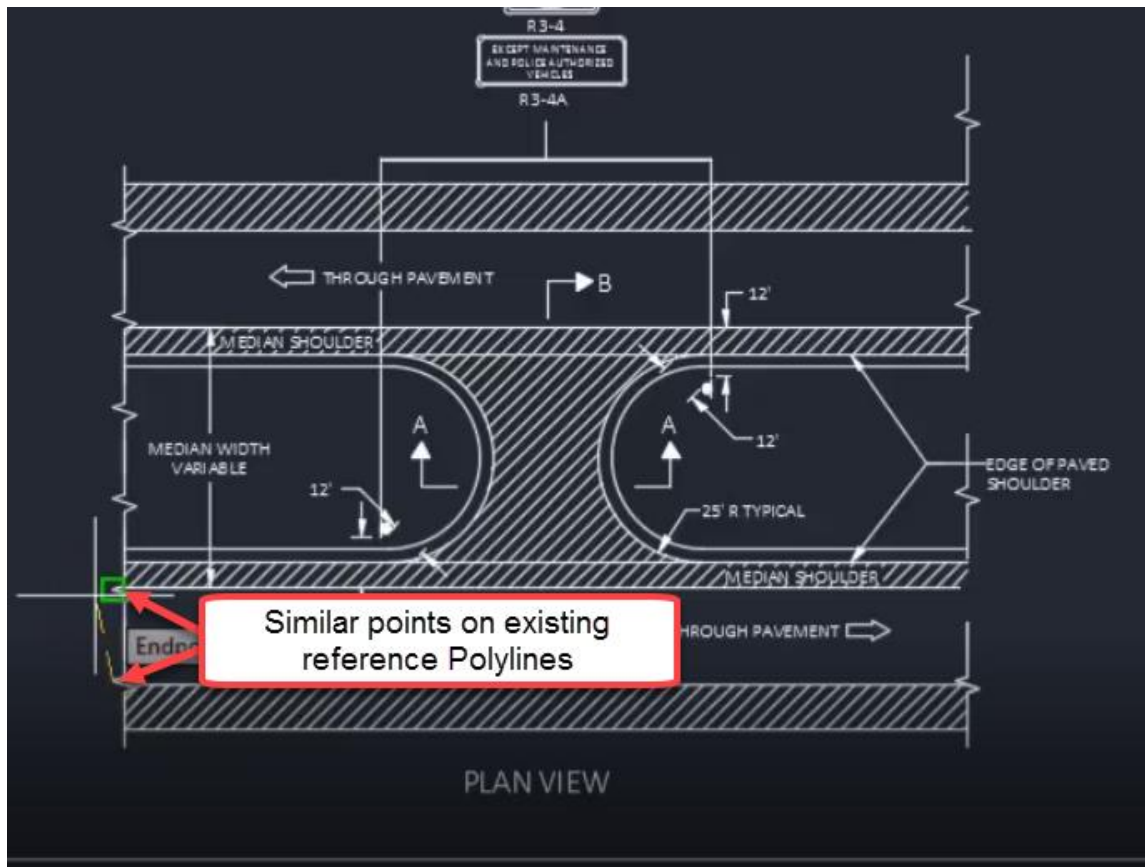
Info: **ar** is a command line "alias" that also invokes the **array** command.



A. **Ribbon > Array contextual tab > Columns panel**

- I. Columns = 1

- B. Ribbon > Array contextual tab > Rows panel
 - I. Rows =6
- C. Select grip to edit array or: Spacing
 - I. enter
- D. Specify distance between rows: Use Endpoint Osnap to select two similar points on "breakline symbol" Polylines on left side of PLAN VIEW
 - I. enter
 - II. enter or esc to end command.



Reverse & Align

Continue with [acad-modify-04.dwg](#)

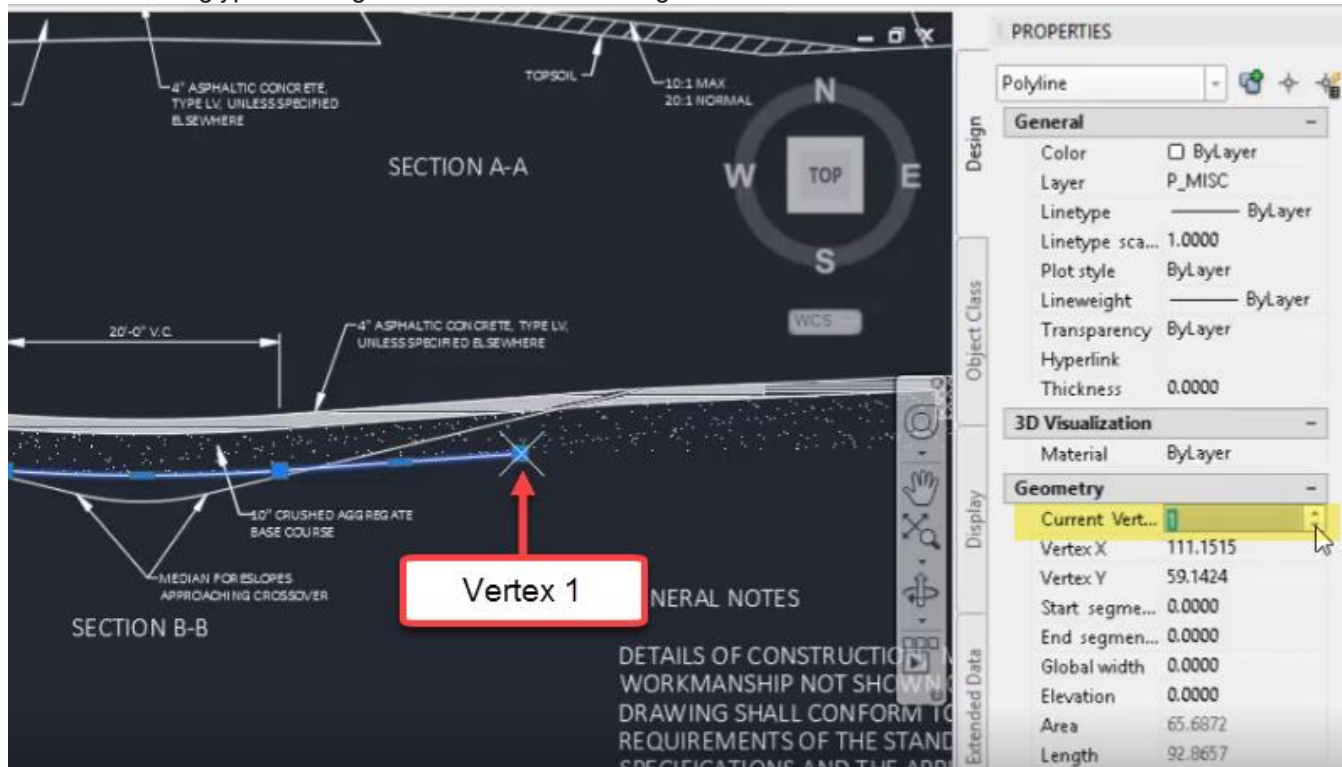
[acad-modify-09.mp4](#) 3:38

Reverse

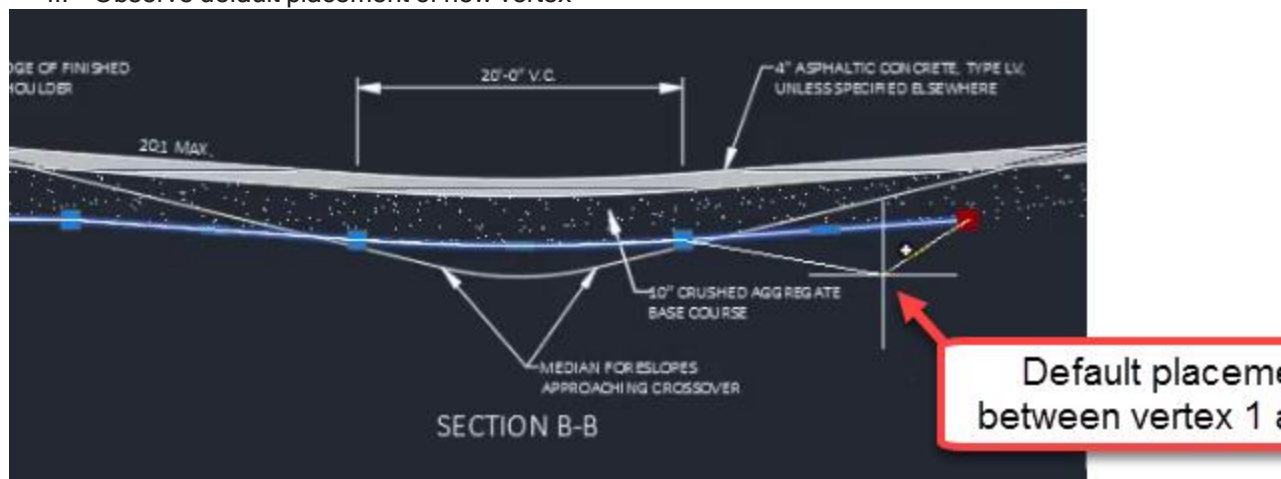
The Reverse command will change the order of Polyline vertices. This is helpful when you wish to add a vertex to the end of an existing Polyline. By default, Civil 3D will add the vertex in front of the highest numbered vertex (the last vertex placed). If you want to add a vertex to the end of the lowest numbered vertex (vertex

1), it will instead be placed between vertex 1 and 2. The order of Polyline and Line vertices also affects how a Linetype is generated. Linetypes will start at vertex 1.

1. Continue working with **acad-modify-04.dwg**
2. Open Properties Palette
 - A. **props**
 - I. **enter**
3. Select Polyline drawn along bottom of 10" CRUSHED AGGREGATE BASE COURSE Hatch
 - A. **Properties palette > Geometry dropdown > Current Vertex**
 - B. Toggle between numbered vertices
 - C. Observe glyph showing vertex location in drawing area



- D. Hover cursor over vertex 1
 - I. **Add vertex**
 - II. Observe default placement of new vertex



- E. **Ribbon > Home tab > Modify flyout > Reverse**
 - I. **Properties palette > Geometry dropdown > Current Vertex**
 - II. Observe reversed order of Polyline vertices
- F. Hover cursor over vertex 5
 - I. **Add vertex**
 - II. Observe default placement of new vertex
 - III. Use desired Osnap to place new vertex

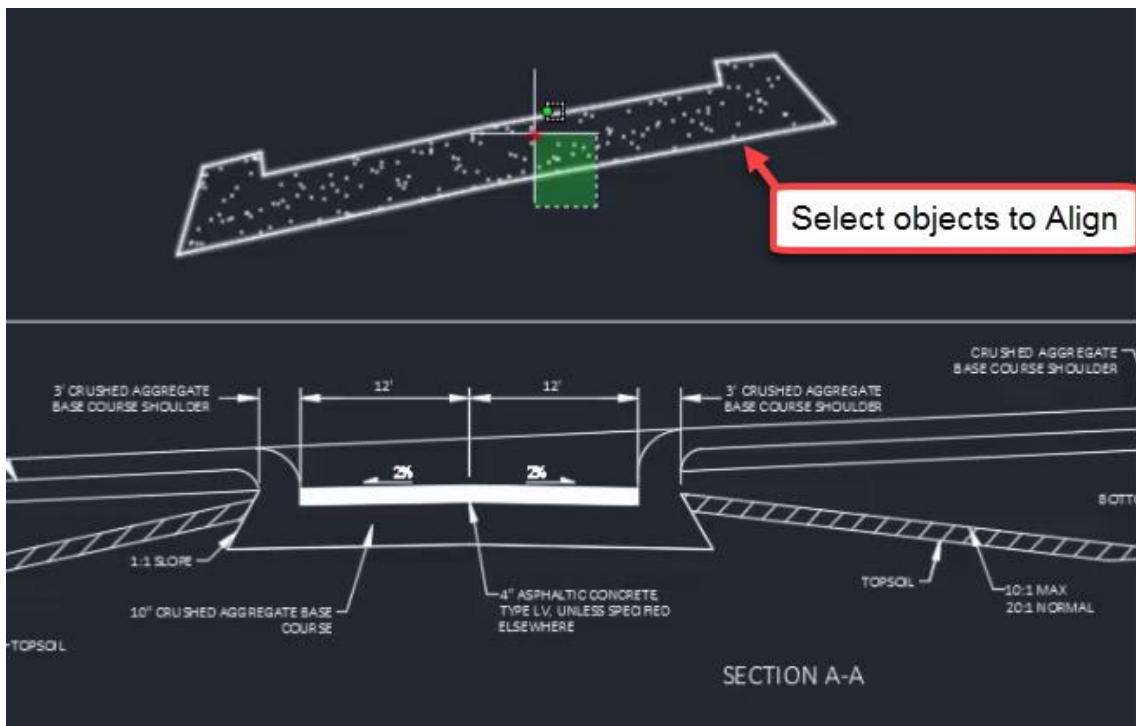
Align

The Align command combines the functionality of the Move, Rotate, and Scale commands. Most basic AutoCAD objects can be affected by the Align command (i.e. Polyline, Block, Hatch, Text). Once the command is activated, you will select objects to Align then select at least two source and destination points. If any rotation, repositioning, or scaling is necessary to replace the source points with destination points, the Align tool will do this for you.

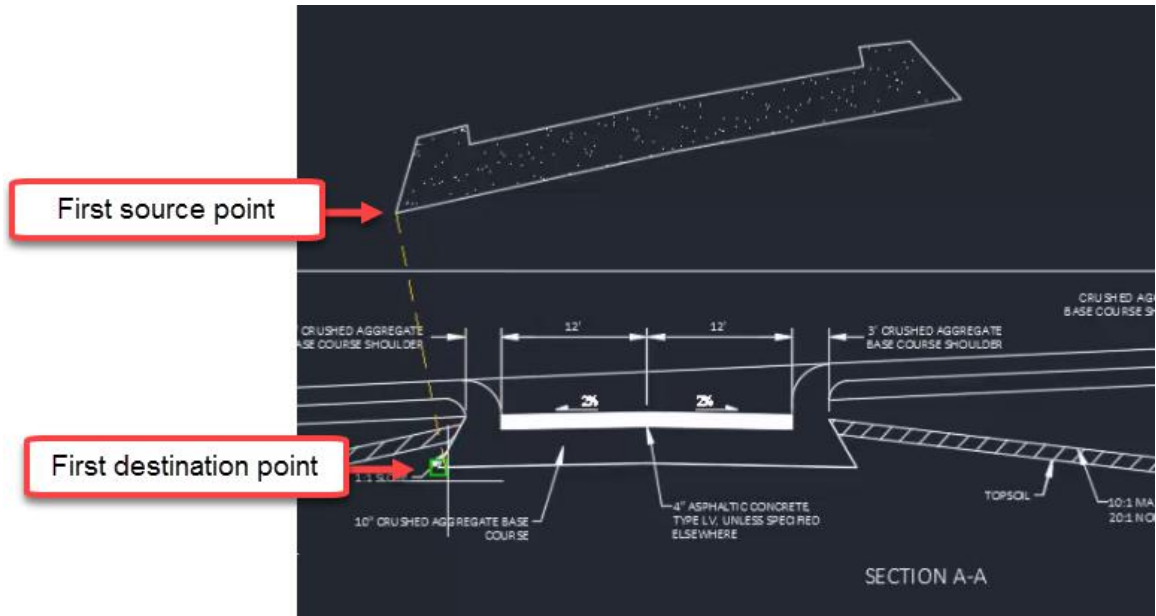
1. Continue working with **acad-modify-04.dwg**
2. Zoom and Pan to area including SECTION A-A detail and misaligned objects above sheet border Line
3. **Ribbon > Home tab > Modify flyout > Align**

Info: **a]** is a command line "alias" that also invokes the **align** command.

- A. **select objects:** select misaligned objects above sheet border Line
 - I. Right-click



- B. **specify first source point:** use **Endpoint Osnap** to select lower left Polyline vertex
- C. **specify first destination point:** use **Endpoint Osnap** to select analogous destination point on SECTION A-A detail



- D. **Specify second source point:** use **Endpoint** Osnap to select lower right Polyline vertex
- E. **Specify second destination point:** use **Endpoint** Osnap to select analogous destination point on SECTION A-A detail
- F. **Specify third source point or <continue>:**
 - I. **spacebar**
- G. **Scale objects base on alignment point?:** y
 - I. **enter**

Hatch

Last updated: 2023-01-04

Total video time: 15:15

A Hatch is an object that fills in a bounded area and displays either a Solid, Pattern, or Gradient. The display of the Hatch can be affected by setting a hatch scale, rotation, color (typically ByLayer), and/or transparency. The origin of the Hatch pattern can be reset so that it displays appropriately depending on the shape of the area filled, the hatch rotation, and the hatch scale.

There are also options to associate the Hatch with a boundary object such as a Polyline, so that a change to the boundary object will affect the Hatch accordingly such as with a Move, Scale or Rotate command. A Hatch object can be made Annotative so that the scale of the drawing dictates the scale of the Hatch. There are several additional Hatch options such as Match Properties and Separate Hatches that affect the way a Hatch is defined.

Warning: Having a large number of Hatch objects can significantly reduce drawing performance and stability. This is especially true if Hatch transparency and/or associative hatches are used.

Info: Many of the desired effects of a Hatch object are handled by Styles when working with Civil 3D objects (i.e. Surface, Pipe Network, or Corridor objects). This has the benefit of the "hatched" area of the Civil 3D object being created automatically as part of the object, being dynamically linked to the object, and being turned on/off at any time by editing Style display settings.

Hatch Creation, Pattern, & Properties

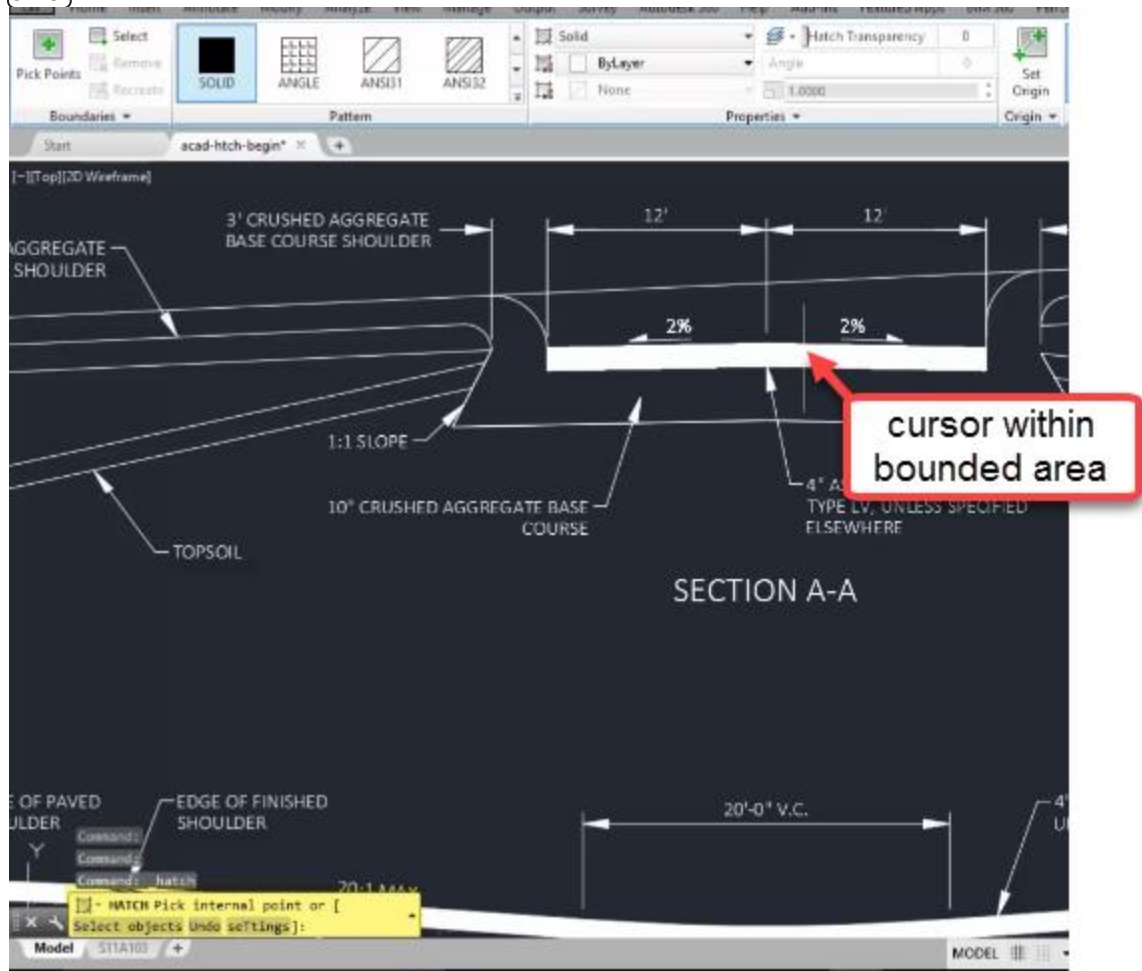
Exercise files: [acad-data-c3d20.zip](#)

Start with [acad-htch-begin.dwg](#)

[acad-htch-01.mp4](#) 7:11

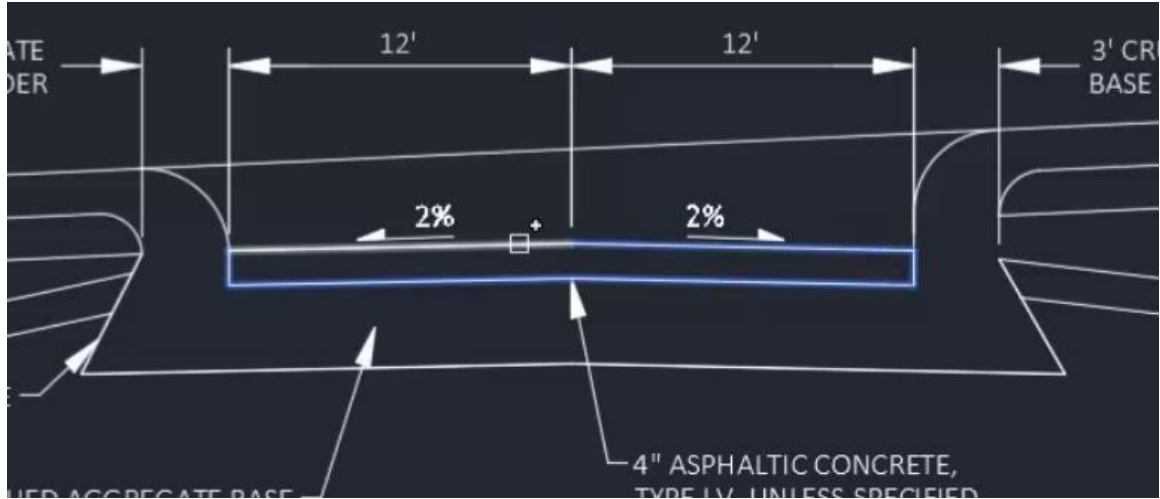
Hatch creation

1. Open [acad-htch-begin.dwg](#)
2. Zoom and Pan to SECTION A-A detail
3. Ribbon > Home tab > Draw panel > Hatch
4. **Hatch Pick internal point or:** leave default to pick internal point
 - A. Or, if necessary, **Hatch select objects or: pick internal point**
 - B. Move cursor inside area bounded by Lines representing 4" ASPHALTIC CONCRETE
 - C. Observe Hatch preview
 - D. Left-click to place Hatch
 - E. **enter**

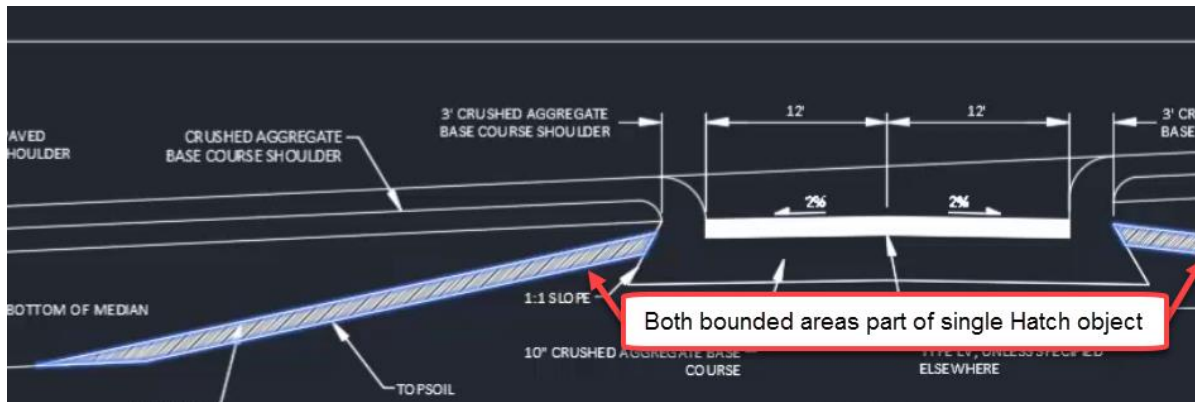


- F. Select previously created Hatch
 - I. **delete**

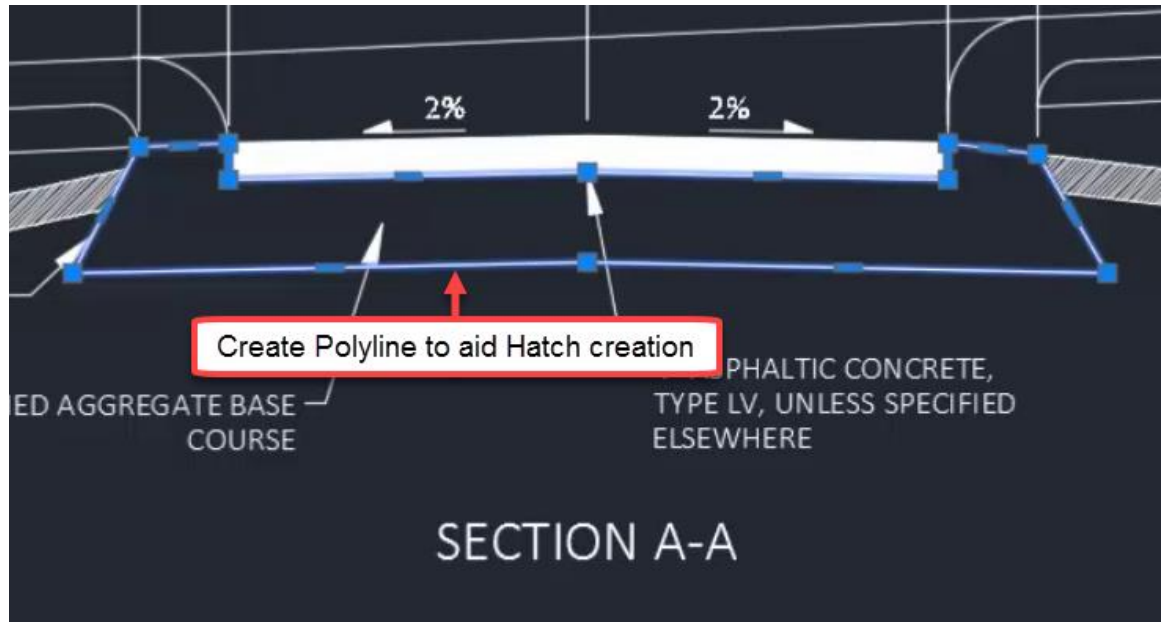
5. **Ribbon > Home tab > Draw panel > Hatch**
 - A. **Ribbon > Hatch contextual tab > Boundaries panel > Select**
 - B. Or, if necessary, **Hatch select objects or: pick internal point**
 - C. Select individual Lines bounding SECTION A-A PAVEMENT area
 - I. **enter**




- D. Select previously created Hatch
 - I. **delete**
6. Select individual Lines bounding SECTION A-A PAVEMENT area
 - A. **enter**
7. **Ribbon > Home tab > Draw panel > Hatch**
 - A. **Ribbon > Hatch contextual tab > Boundaries panel > Select**
 - B. Select single Polyline bounding SECTION A-A PAVEMENT area
 - I. **enter**
8. **Ribbon > Home tab > Draw panel > Hatch**
 - A. **Ribbon > Hatch contextual tab > Pattern panel > ANSI31**
 - B. **Ribbon > Hatch contextual tab > Boundaries panel > Pick Points**
 - C. Left-click inside Lines bounding both SECTION A-A TOPSOIL areas
 - I. **enter**



9. **Ribbon > Home tab > Draw panel > Polyline**
 - A. Use Endpoint Osnap to pick vertices bounding SECTION A-A 10" CRUSHED AGGREGATE BASE COURSE area



 **Tip:** It may be necessary to create a Polyline to help with Hatch creation if existing linework does not get you the results you are after. You can delete the Polyline afterward if desired and still retain the Hatch.

Pattern & Properties

Use the Pattern panel flyout found on the Hatch contextual tab to choose from the available Patterns. Use the Properties panel to set fill type (Pattern, Solid, or Gradient), scale, rotation angle, and transparency. A Hatch scale will work in combination with the drawing scale if the Hatch is set to be annotative (see Associative & Annotative section).

10. **Ribbon > Home tab > Draw panel > Hatch**
 - A. **Ribbon > Hatch contextual tab > Pattern panel > ANGLE**
 - B. **Ribbon > Hatch contextual tab > Boundaries panel > Select**
 - I. Select Polyline bounding SECTION A-A 10" CRUSHED AGGREGATE BASE COURSE area
 - a. **enter**
 - II. Select Polyline bounding SECTION A-A 10" CRUSHED AGGREGATE BASE COURSE area
 - a. **delete**
11. Select previously created TOPSOIL Hatch
 - A. **Ribbon > Hatch contextual tab > Properties panel**
 - I. Hatch pattern scale = 10
 - B. **Ribbon > Hatch contextual tab > Pattern panel flyout**
 - I. Patten = **AR-SAND**

Associative & Annotative

Start with [acad-htch-01.dwg](#)

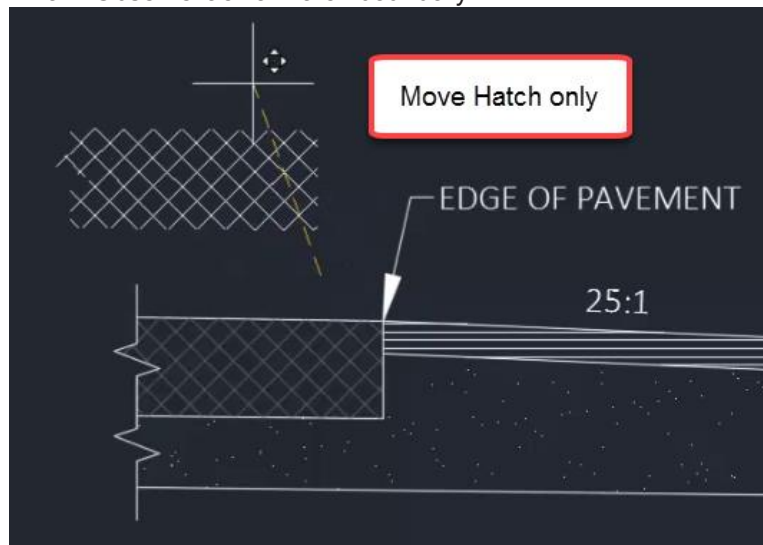
[acad-htch-02.mp4](#) 5:04

Associative Boundaries

A Hatch is an independent object. As such, it does not depend on the presence of a boundary object in order to be retained after it is first generated. If desired, however, a Region or Polyline boundary can be created to aid in moving or retaining the original shape of a Hatch. For example, a Polyline boundary provides basepoint grips when performing a Move command on a Hatch. A Region will retain the original shape of the Hatch in the event the Hatch needs to be rebuilt. In order for the Hatch to move with or respond to edit to the boundary, the boundary must be made associative.

1. Open **acad-htch-01.dwg**
2. Zoom and Pan to left side of SECTION B-B detail
3. Select Hatch representing PAVEMENT section
 - A. **Enter**
 - I. Select basepoint and second points

a. Observe lack of Hatch boundary

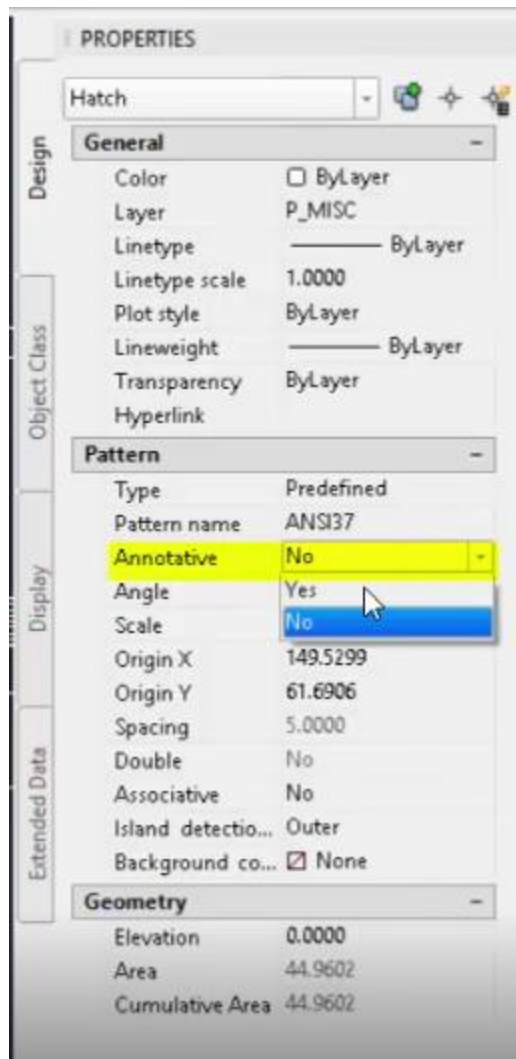


4. Select Hatch
 - A. Observe available grips
 - B. **Enter**
 - I. Observe lack of grips during Move command
 - II. **esc**
5. **Ctrl+z** to undo initial Move
6. Select Hatch
 - A. **Ribbon > Hatch contextual tab > Boundaries panel > Recreate**
 - I. **Enter type of boundary object: Polyline**
 - a. **enter**
 - II. **Associate hatch with new boundary? Y**
 - a. **enter**
 - B. **esc**
7. Select Hatch boundary Polyline
 - A. **Enter**
 - I. Select basepoint and second point
 - II. Observe Hatch association with Polyline
8. Select Hatch boundary Polyline
 - A. **Enter**
 - I. Use Endpoint Osnap to move Polyline back to original location

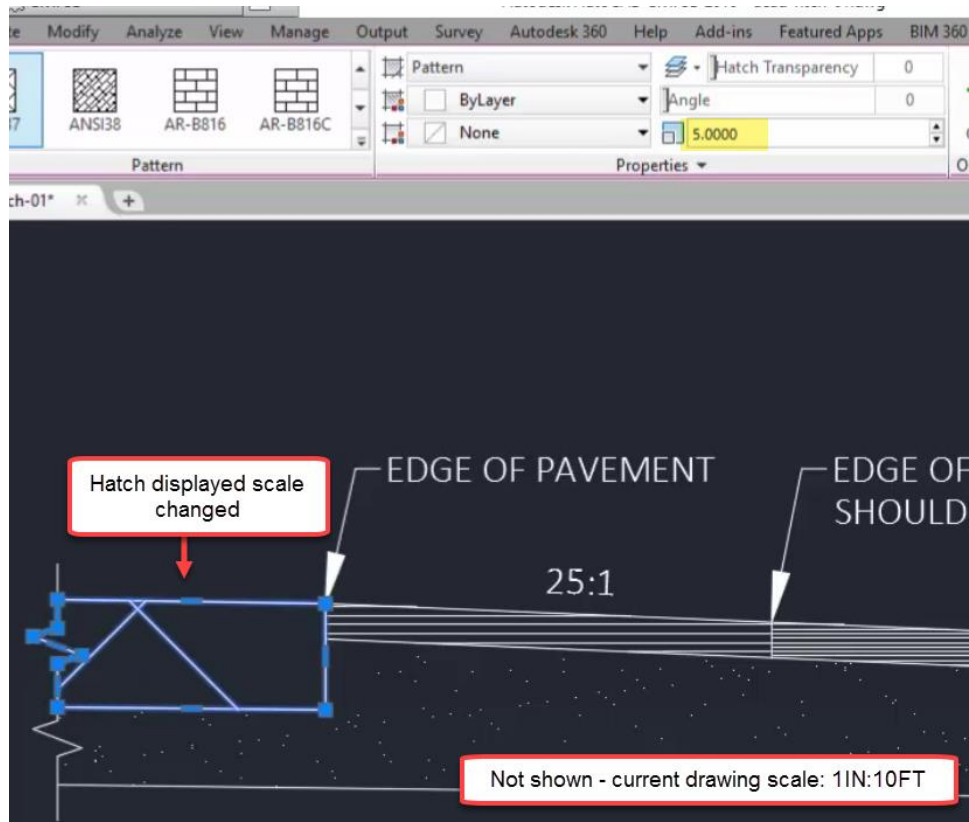
Annotative

Annotative scaling is used to dynamically set an annotative object's displayed scale based on the current drawing scale. It can also be used to control visibility of annotative objects based on inclusion of scales in an object's annotative scales list. The end goal here is to display objects at the correct scale when plotting layouts. More detail on annotative scaling in general can be found in the training module dedicated to the topic. This section will walk you through making a Hatch annotative and managing the annotative scales list. You will also see how the Hatch pattern scale is different from a Hatch annotative scale, and how the two can work together.

1. Continue working in **acad-htch-01.dwg**
2. Select Hatch representing PAVEMENT section on left side of SECTION B-B detail
 - A. **Ribbon > Hatch contextual tab > Properties panel**
 - I. Observe Hatch pattern scale = 5.0000
 - B. **Properties palette > Pattern dropdown**
 - I. Annotative = Yes



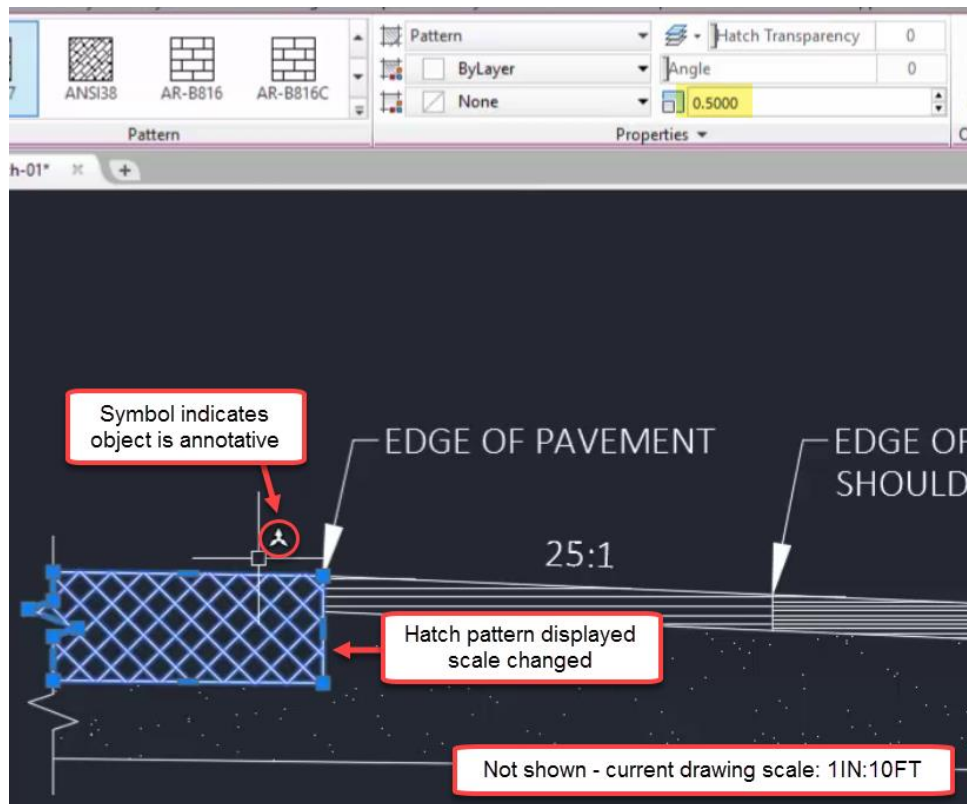
A. Observe Hatch pattern displayed scale change



Hatch

B. Ribbon > Hatch contextual tab > Properties panel

I. Hatch pattern scale: 0.5



3. Status bar > Current drawing scale flyout

- Select **1 IN:5 FT**
- Observe no change in Hatch pattern displayed scale

4. Status bar > Current drawing scale flyout

- Select **1 IN: 10 FT**

5. Select Hatch representing PAVEMENT section on left side of SECTION B-B detail

A. Ribbon > Hatch contextual tab > Properties panel

I. Pattern dropdown > Annotative scale > dialog box icon

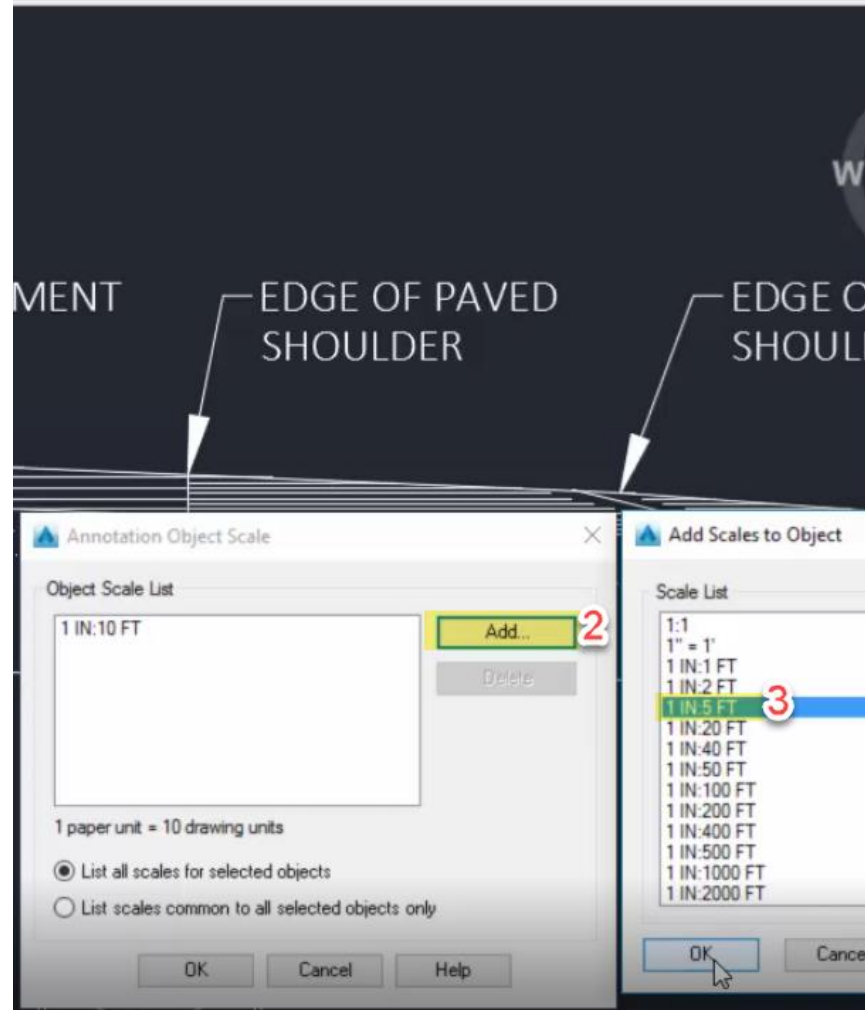
a. Annotation Object Scale dialog

i. **Add...**

ii. Add Scales to Object dialog

i. **1 IN:5 FT**

ii. **OK**



6. **Status bar > Current drawing scale flyout**
 - A. Select **1 IN:5 FT**
 - B. Observe change in Hatch pattern displayed scale

Match Properties & Separate Hatches

Continue with [acad-htch-01.dwg](#)

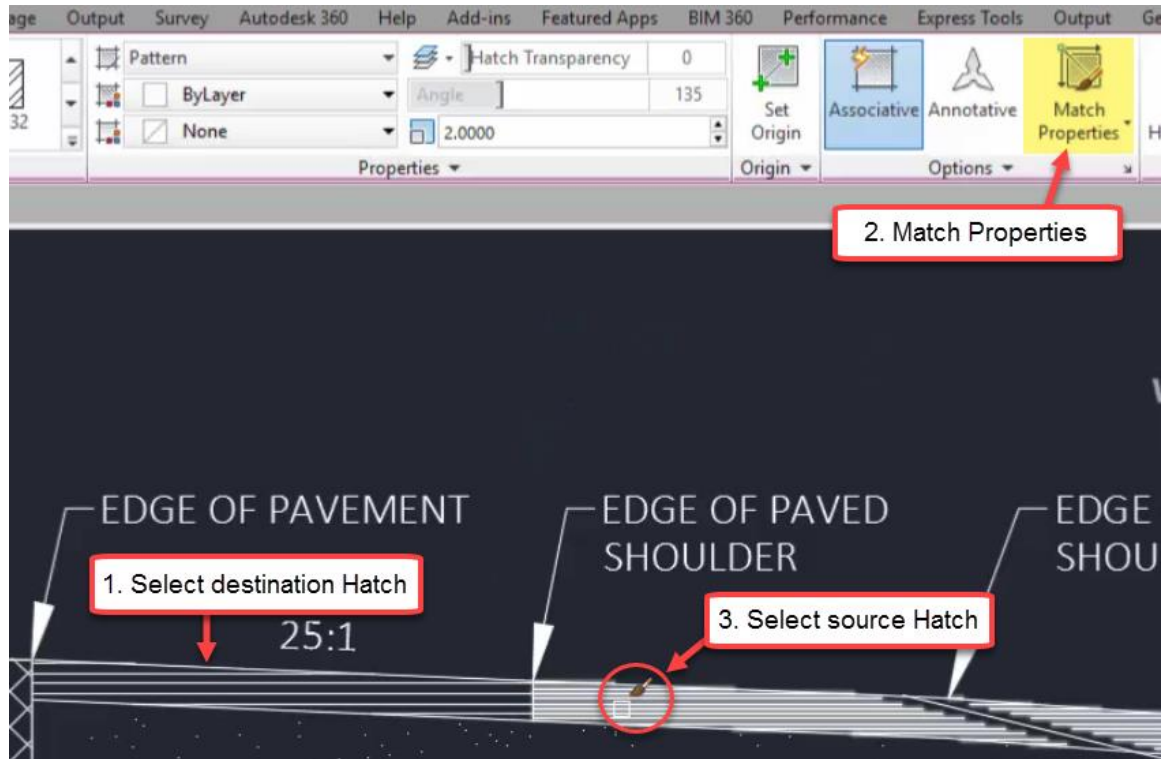
[acad-htch-03.mp4](#) 3:00

Match Properties

Use the Match Properties button found on the Hatch contextual tab to push pattern, color, transparency, and Hatch pattern scale from a source to destination Hatch. This saves you time if you need to update multiple Hatches to have similar Hatch properties.

Hatch

1. Continue working in **acad-htch-01.dwg**
 - A. Select PAVED SHOULDER Hatch on left side of SECTION B-B detail
 - B. **Ribbon > Hatch contextual tab > Options panel > Match Properties**
 - I. Select FINISHED SHOULDER as source Hatch



Separate Hatches

You can set your Hatch creation options so that picking multiple bounded areas while in a single Hatch command creates either a single Hatch throughout all bounded areas or individual Hatch objects for each bounded area. You can also break an existing single Hatch that covers multiple bounded areas into separate Hatch objects for each bounded area.

1. Continue working in **acad-htch-01.dwg**

Hatch

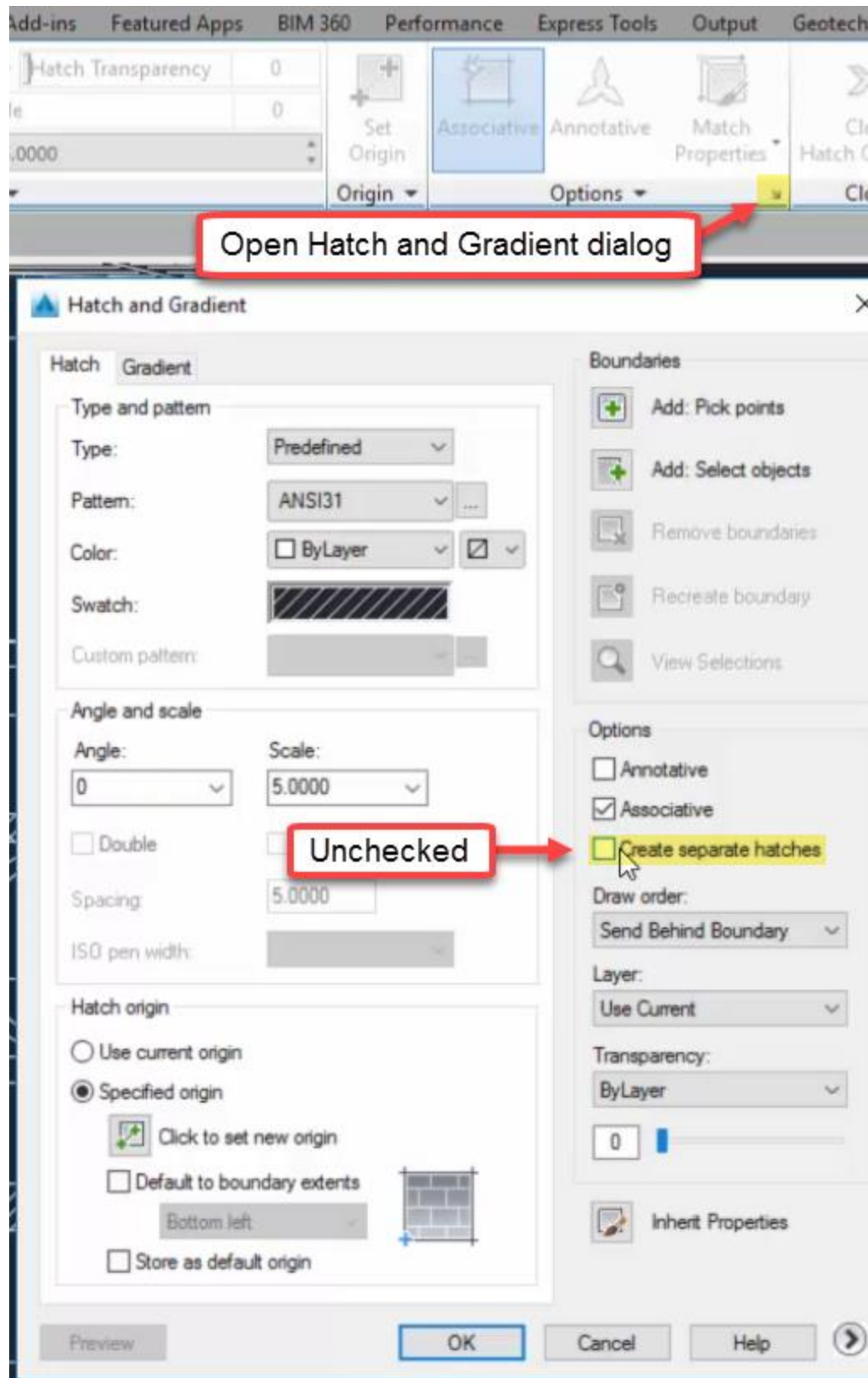
A. Zoom and Pan to PLAN VIEW detail

B. Ribbon > Home tab > Draw panel > Hatch

Hatch

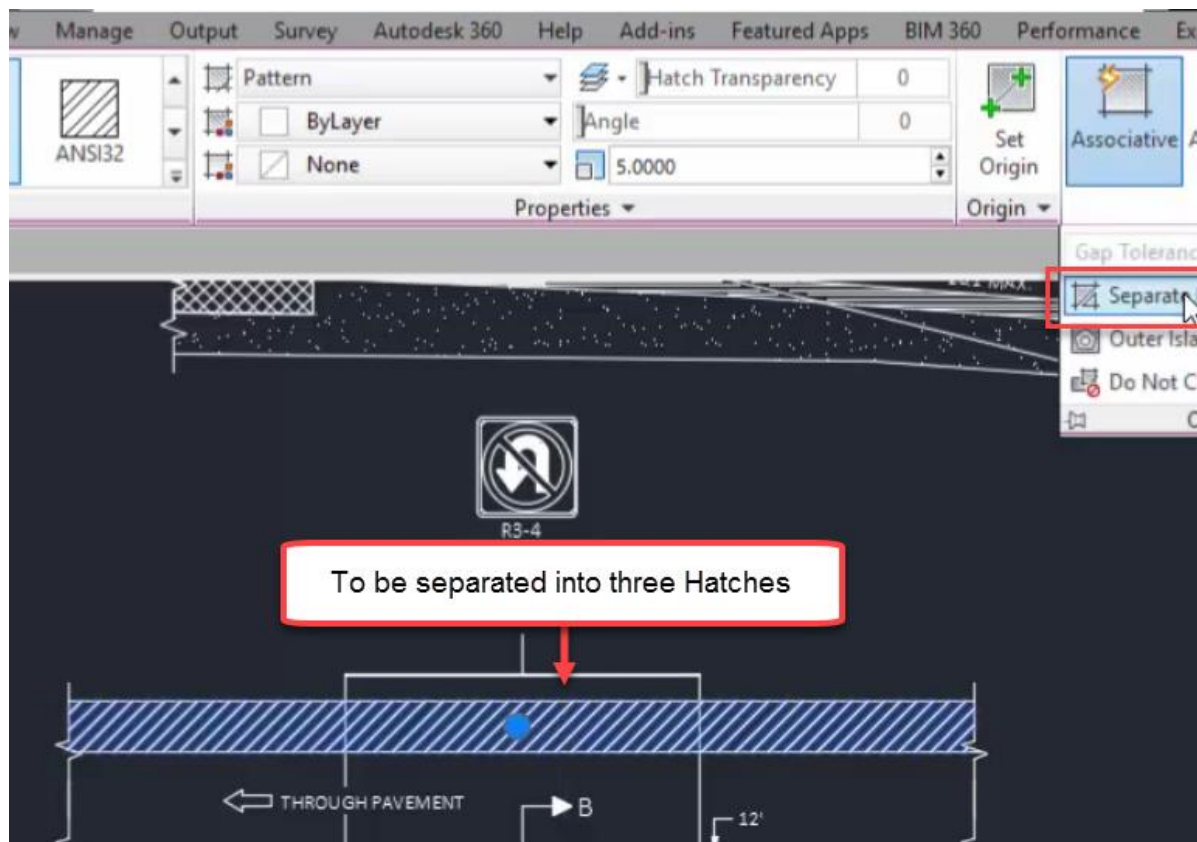
- I. **Ribbon > Hatch contextual tab > Options flyout**

- a. Hatch and Gradient dialog
 - i. Create separate hatches = unchecked



Grips

- II. Pick internal points in the three bounded areas along top of PLAN VIEW detail
 - a. **enter**
 - b. Observe a single Hatch object created that covers all three bounded areas
- C. **Ribbon > Home tab > Draw panel > Hatch**
 - I. **Ribbon > Hatch contextual tab > Options flyout**
 - a. Hatch and Gradient dialog
 - i. Create separate hatches = checked
 - II. Pick internal points in the MEDIAN SHOULDER and median crossover areas through center of PLAN VIEW detail
 - a. **enter**
 - b. Observe multiple Hatch objects created for the bounded areas
- D. Select Hatch created in step 1.B
 - I. **Ribbon > Hatch contextual tab > Options dropdown > Separate Hatches**
 - II. Observe single Hatch split into multiple Hatches



Grips

Last updated: 2023-01-04

Total video time: 22:50

Object Grips are used to interact with and edit objects in through the drawing view (i.e. Model Space). Upon selecting an object, available Grips will display for the object(s) selected. Depending on the type of object selected, you may have Multifunction Grips allowing access to several options for Grip editing. Additionally, for all Grips, you can cycle between Grip Modes including Move, Rotate, Scale, and Mirror. Though many of the edits you perform using Grips can be handled elsewhere, utilizing Grip edits in combination with object snaps, polar tracking, and dynamic input can significantly expedite your object editing workflow.

Page: 72

Published on: 9/10/2024

Basics: stretch vs move

Exercise files: [acad-data-c3d20.zip](#)

Start with **acad-grips-begin.dwg**

[acad-grips-01.mp4](#) 3:50

Arguably the most basic Grip function is the Stretch. Within the category of Stretch Grip functions, are two distinct types of editing behavior: Stretch and "move". In general, an endpoint Grip has a Stretch behavior and a midpoint or insertion Grip has "move" behavior. The Stretch behavior relocates the Grip and changes the length or radius and rotation or center point of an object as necessary. The "move" behavior will relocate the Grip and object while retaining all other object geometry properties such as length and rotation.

Grips with Stretch function exhibiting "stretch" behavior:

- Polyline vertex and endpoint
- Line endpoint
- Arc endpoint

Grips with Stretch function exhibiting "move" behavior

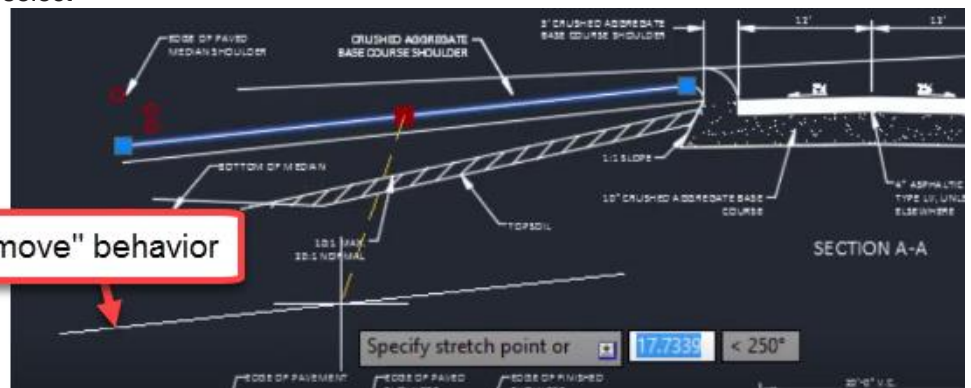
- Text insertion point
- Line midpoint
- Circle center
- Block insertion point
- COGO Point



Info: The COGO Point is a Civil 3D object. COGO Points are covered in detail in later training modules and thus are not included in the example workflows here.

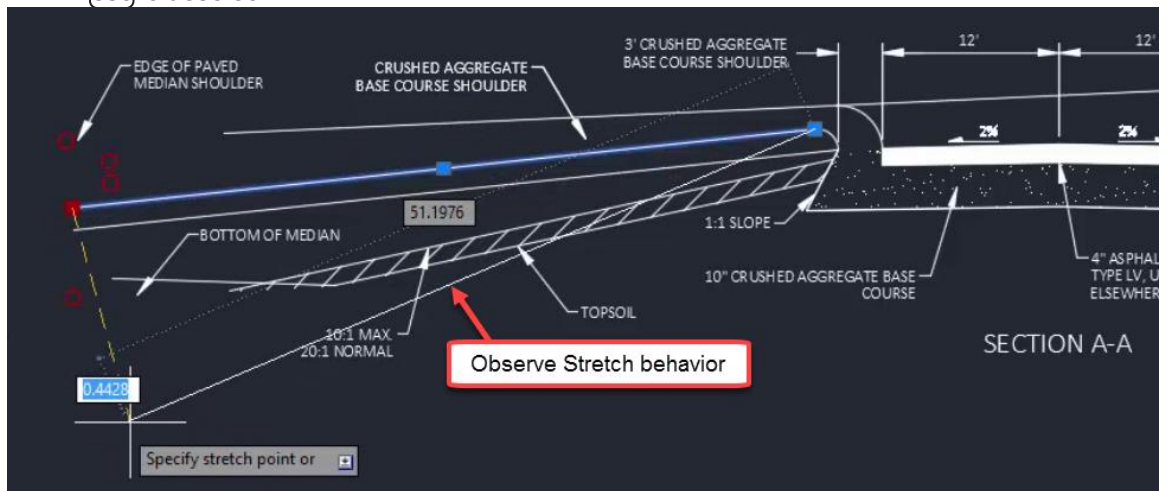
1. Open **acad-grips-begin.dwg**
2. Select CRUSHED AGGREGATE BASE COURSE SHOULDER Line on left side of SECTION A-A detail
 - A. Observe display of two endpoint Grips and one midpoint Grip
 - B. Left-click midpoint Grip to activate
 - I. Move cursor and observe behavior
 - II. **[esc]** to deselect

Observe "move" behavior



Grips

3. Select **R3-4** Block at top of PLAN VIEW detail
 - A. Observe display of insertion point Grip
 - B. Left-click insertion point Grip to activate
 - I. Move cursor and observe behavior
 - II. **esc** to deselect
4. Select SECTION A-A Text
 - A. **Properties palette > Text dropdown > Justify**
 - I. Observe Justify = Center
 - B. Left-click insertion point Grip
 - I. Move cursor and observe behavior
 - II. **esc** to deselect
5. Zoom & Pan left of SECTION A-A detail
6. Select red guiding Circle
 - A. Observe display of four quadrant Grips and one center Grip
 - B. Left-click center Grip to activate
 - I. Move cursor and observe behavior
 - II. **esc** to deselect
7. Select CRUSHED AGGREGATE BASE COURSE SHOULDER Line on left side of SECTION A-A detail
 - A. Left-click endpoint Grip to activate
 - I. Move cursor and observe behavior
 - II. **esc** to deselect



8. Select the Polyline bounding 10" CRUSHED AGGREGATE BASE COURSE Hatch
 - A. Left-click insertion Grip to activate
 - I. Move cursor and observe behavior
 - II. **esc** to deselect
9. Select the SECTION A-A detail median nose Arc
 - A. Left-click center Grip to activate
 - I. Move cursor and observe behavior
 - II. **esc** to deselect

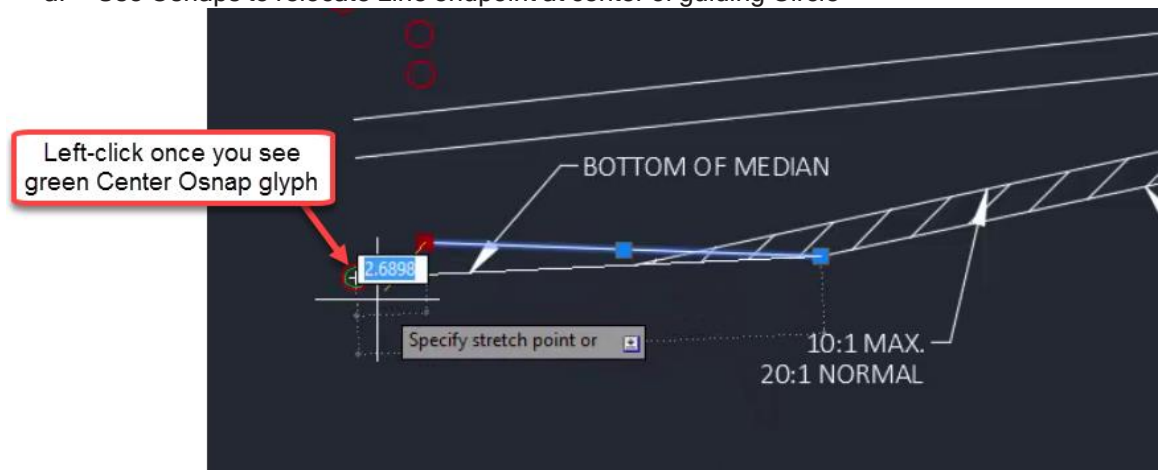
Shift+select multiple

Continue with **acad-grips-begin.dwg**

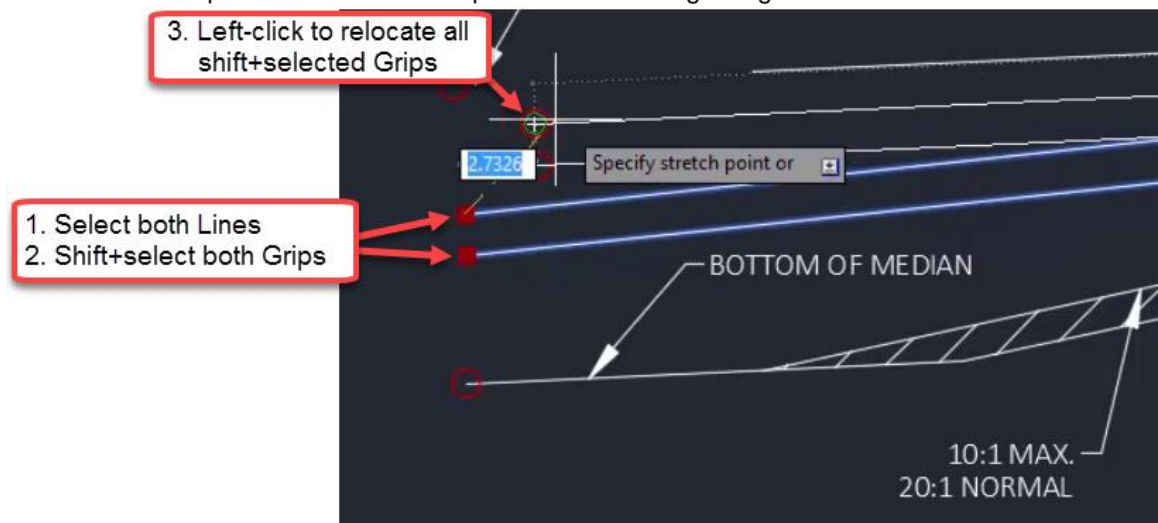
[acad-grips-02.mp4](#) 6:08

Hold the Shift key and select multiple Grips to simultaneously apply a similar Grip edit to multiple object Grip locations. The Grips will display red once selected and activated. Release the Shift key and select one of the activated Grips to apply a Grip edit as normal. The Grip edit will then be applied to all Grips included in the selection.

1. Continue working in **acad-grips-begin.dwg**
2. Zoom and Pan left of SECTION A-A detail
3. Observe location of red guiding Circles
4. Turn on **Center** and **Endpoint** Object Snaps
5. Select BOTTOM OF MEDIAN Line
 - A. Left-click left-most endpoint Grip
 - I. **Specify stretch point or:**
 - a. Use Osnaps to relocate Line endpoint at center of guiding Circle



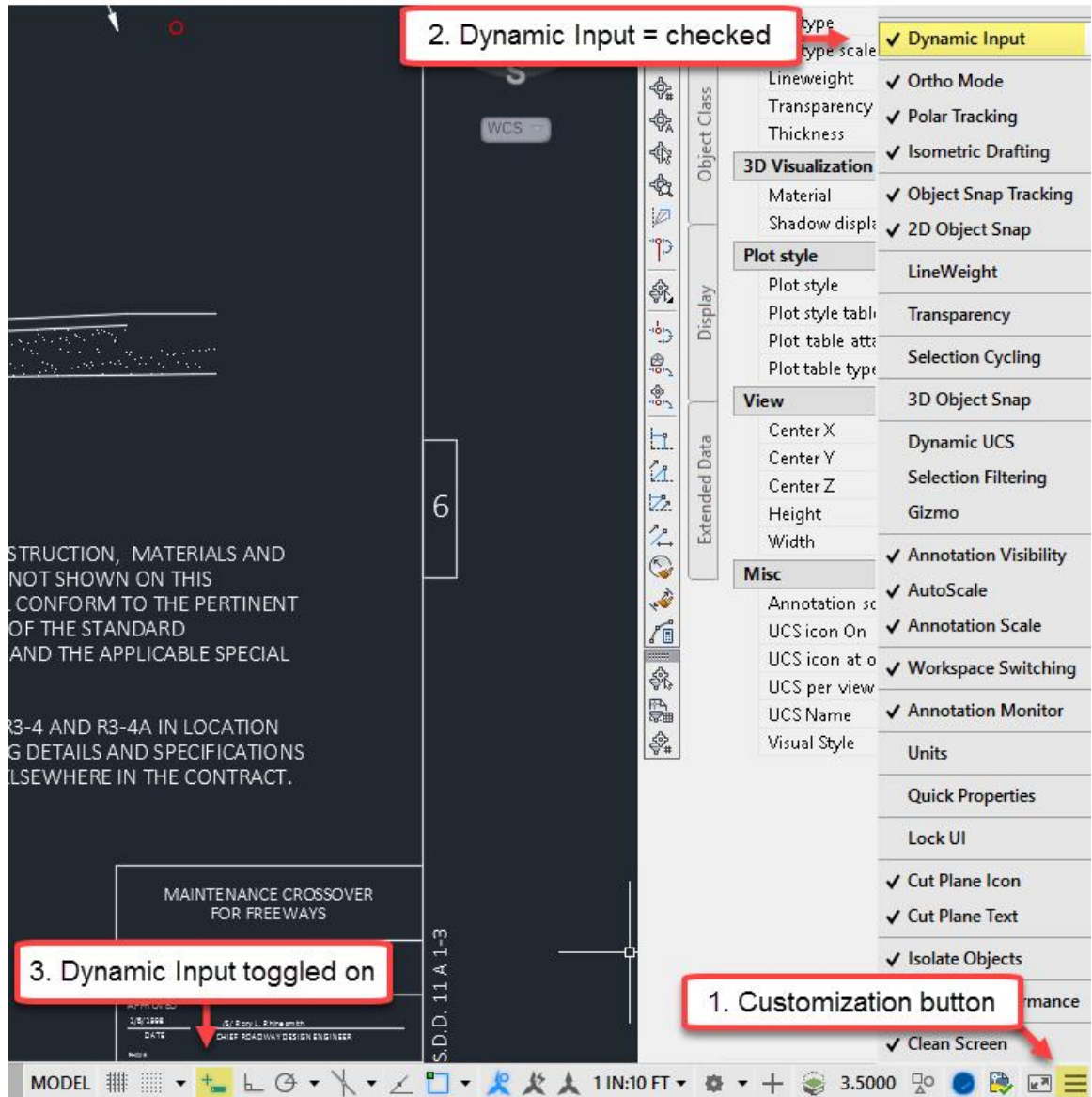
6. Select both CRUSHED AGGREGATE BASE COURSE and SUBGRADE Lines
 - A. **shift+select** both leftmost endpoint Grips
 - I. Release shift key
 - II. Left-click one of the shift+selected Grips
 - a. Use Osnaps to relocate Line endpoints at center of guiding Circles



- III. **esc** to deselect
7. Select PAVED MEDIAN SHOULDER Line
 - A. Verify Dynamic Input is on
 - I. **Status bar > Customization button**
 - a. Dynamic Input = checked

II. **Status bar**

a. Dynamic Input toggled on



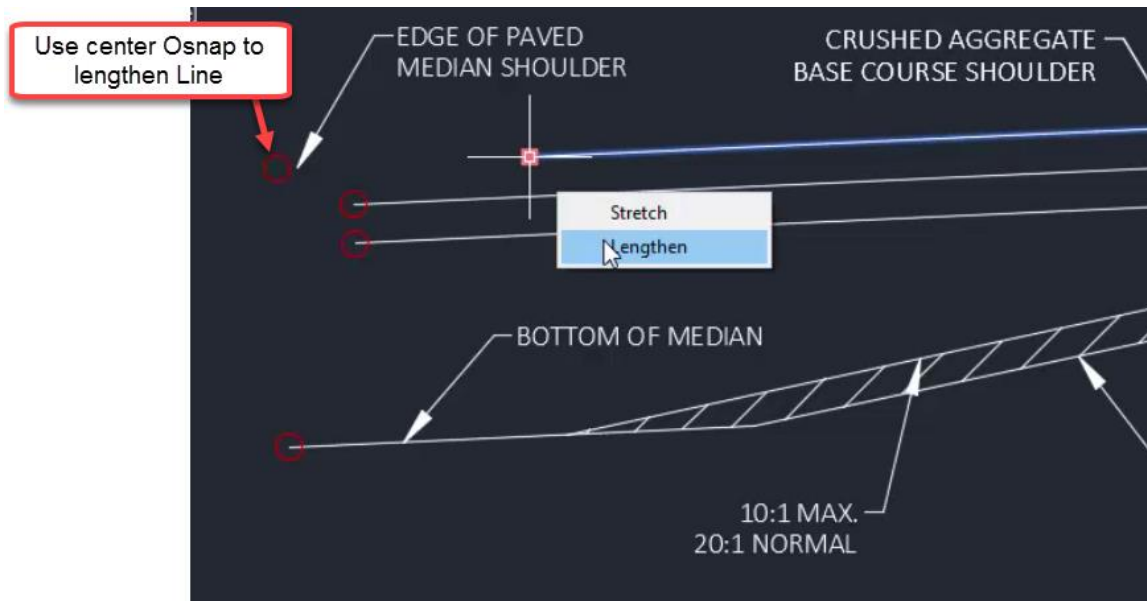
B. Hover cursor over leftmost Line endpoint

I. Observe Dynamic Input tooltip

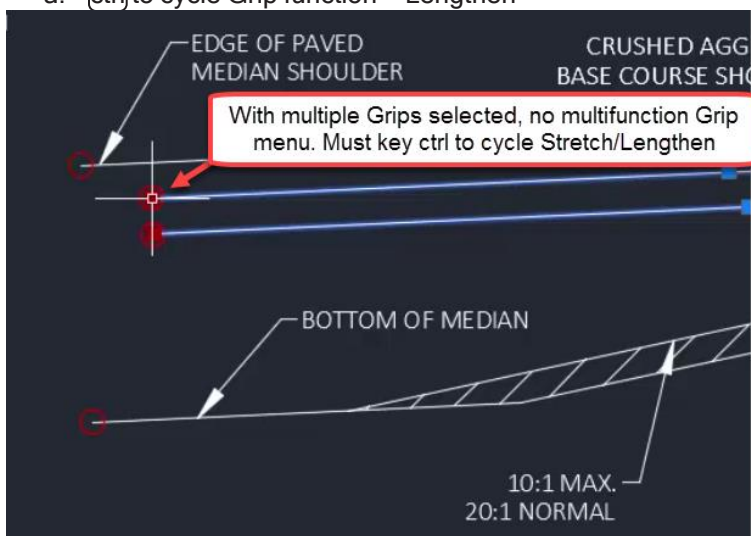
a. **Lengthen**

II. **Specify end point: 5** **enter**

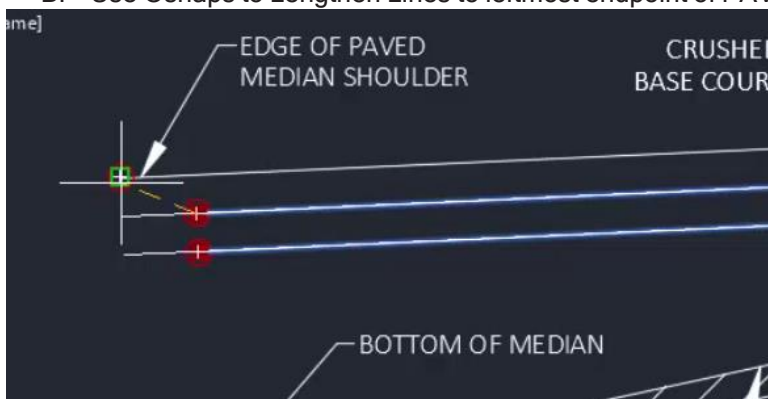
III. Use Osnaps to Lengthen Line to center of red guiding Circle



8. Select both CRUSHED AGGREGATE BASE COURSE and SUBGRADE Lines
 - A. **(shift+select)** both leftmost endpoint Grips
 - I. Release shift key
 - II. Left-click one of the shift+selected Grips
 - a. **(ctrl)** to cycle Grip function = Lengthen

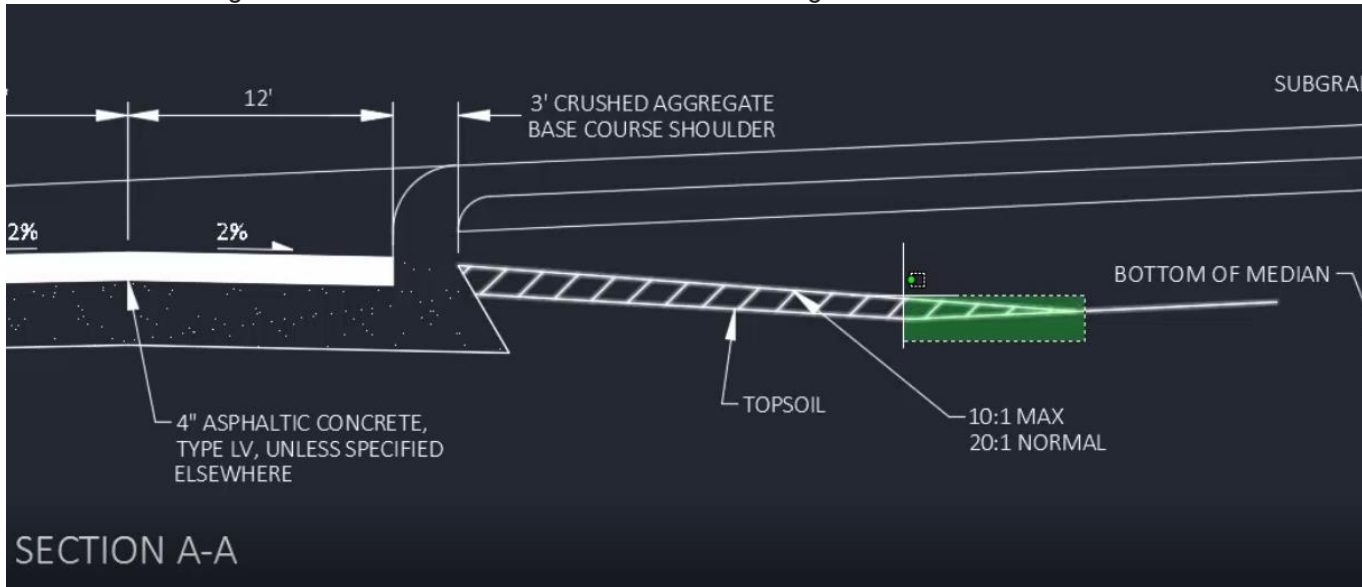


- B. Use Osnaps to Lengthen Lines to leftmost endpoint of PAVED MEDIAN SHOULDER Line

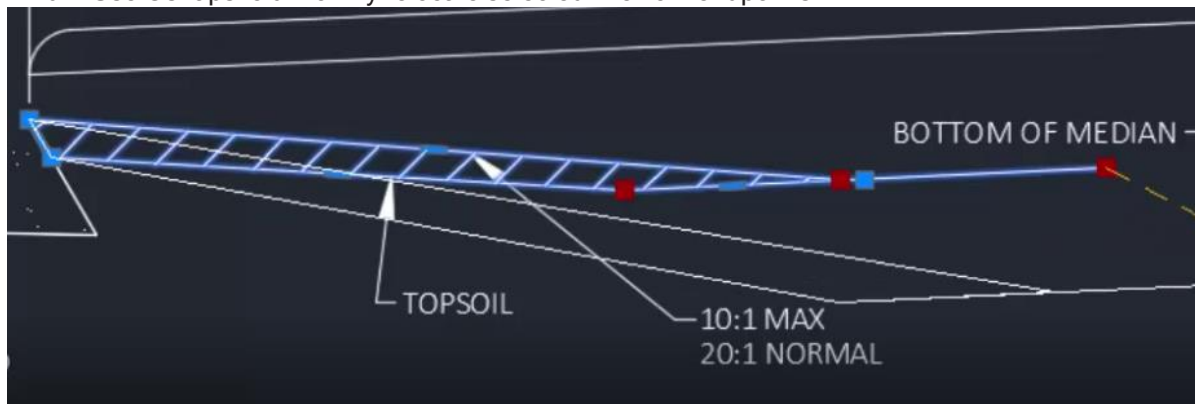


Grips

- C. **esc** to deselect
9. Pan to right of SECTION A-A detail
 - A. Use crossing selection to select TOPSOIL Hatch and bounding Lines



- A. **shift-select** appropriate endpoints of selected objects
 - I. Release shift key
 - II. Select rightmost endpoint of BOTTOM OF MEDIAN Line
 - a. Move cursor and observe behavior
 - b. Use Osnaps to uniformly relocate selected linework endpoints



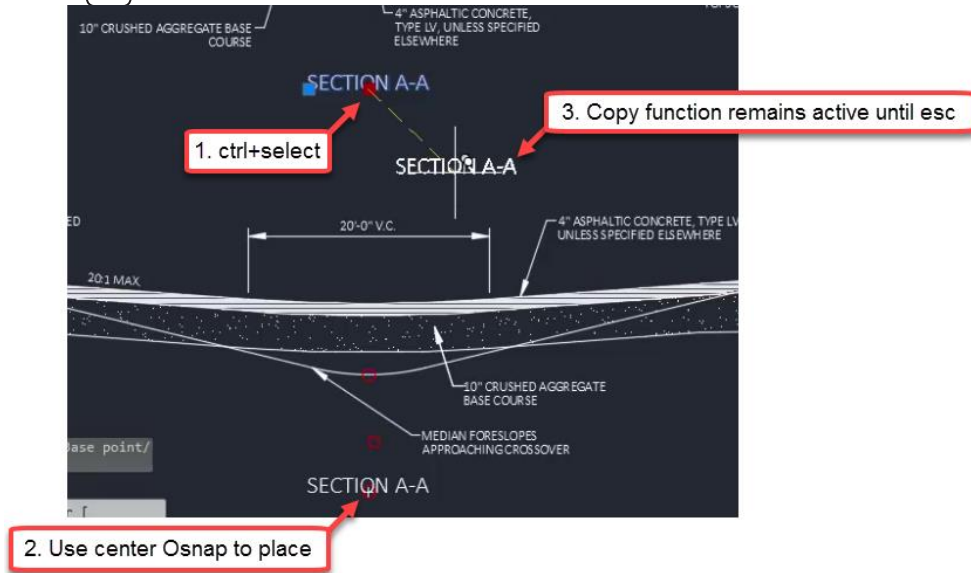
Ctrl+select to copy

Continue with **acad-grips-begin.dwg**

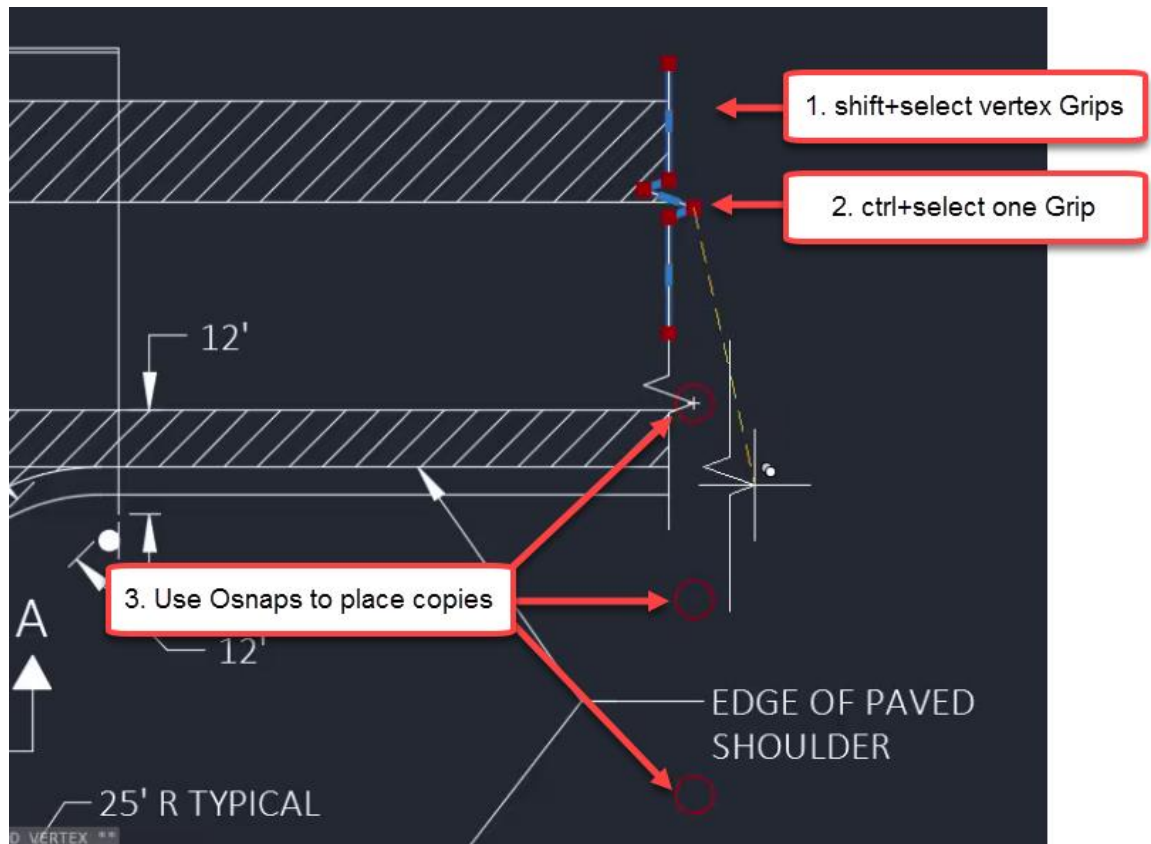
[acad-grips-03.mp4](#) 2:10

Hold the ctrl key when selecting a Grip to make a copy of the objects attached to the Grip. For example, ctrl+select a Text Grip to copy the full Text object. Ctrl+select a Polyline vertex to copy and the Line segments touching the selected Grip(s). You can combine the ctrl+select technique with the shift+select technique to copy multiple objects attached to the shift+selected Grips

1. Continue with **acad-grips-begin.dwg**
2. Select SECTION A-A Text
 - A. **ctrl+select** insertion point Grip
 - I. Release ctrl key
 - II. Pan to SECTION B-B detail
 - a. Use Osnaps to place copied Text at center red guiding Circle
 - b. **esc** to deselect



3. Pan to PLAN VIEW detail
4. Select breakline symbol Polyline at top-right of PLAN VIEW detail
 - A. **shift+select** all vertex Grips
 - B. Release shift key
 - I. **ctrl+select** right-most vertex Grip
 - II. Release ctrl key
 - a. Use Osnaps to place copies at all remaining red guiding Circles



b. `esc` to deselect

Grip modes

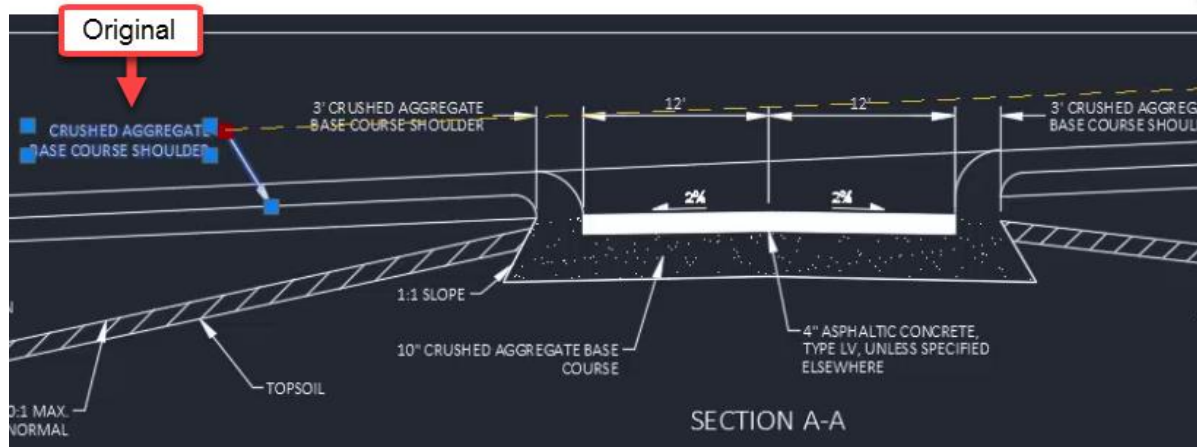
Start with **acad-grips-01.dwg**

[acad-grips-04.mp4](#) 6:57

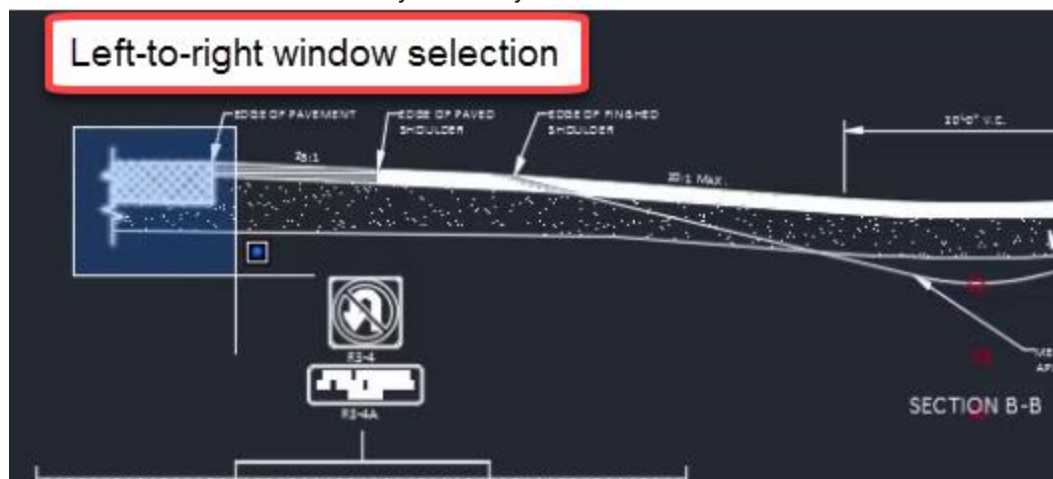
In addition to object-specific Grip edit behavior, all Grips have the ability to edit associated objects using four standard behaviors. These standard Grip editing behaviors are known as Grip Modes. They include Move, Rotate, Scale, and Mirror. Once an object is selected and a Grip is activated, use the enter key to cycle between Grip Modes. Once you begin cycling, you are limited to one of the four standard Grip Modes. Hit esc and re-activate a Grip to perform a non-Grip Mode edit such as Stretch or Lengthen.

1. Open **acad-grips-01.dwg**
2. Zoom and Pan to PLAN VIEW detail
3. Select Line just below R3-4A signage
 - A. Left-click topmost endpoint Grip
 - I. Observe command line prompt **Specify stretch point or:**
 - II. Move cursor and observe behavior
 - a. `enter`
 - III. Observe command line prompt change **Specify stretch Move or:**
 - IV. Repeat steps 3.A.I - 3.A.III to cycle all Grip Modes
 - V. `esc`
 - B. `esc` to deselect
4. Zoom and Pan to SECTION A-A detail

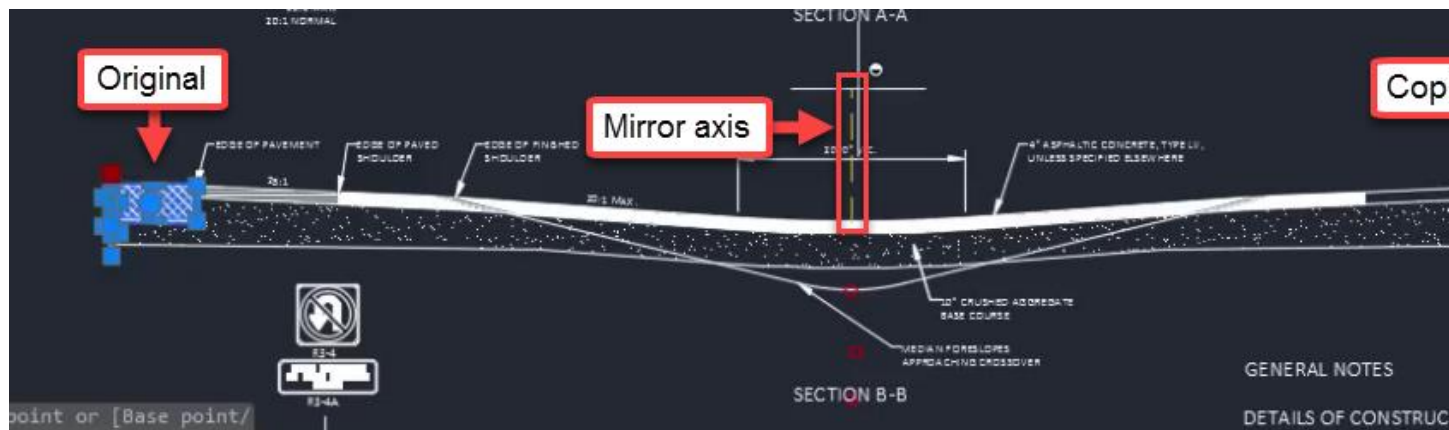
5. Select CRUSHED AGGREGATE BASE COURSE SHOULDER Multileader
 - A. Left-click leader Grip
 - I. **(enter)**
 - II. **Specify move point or: Copy**
 - a. Left-click to place a copy of Multileader on right side of SECTION A-A detail
 - b. **(esc)** to deselect



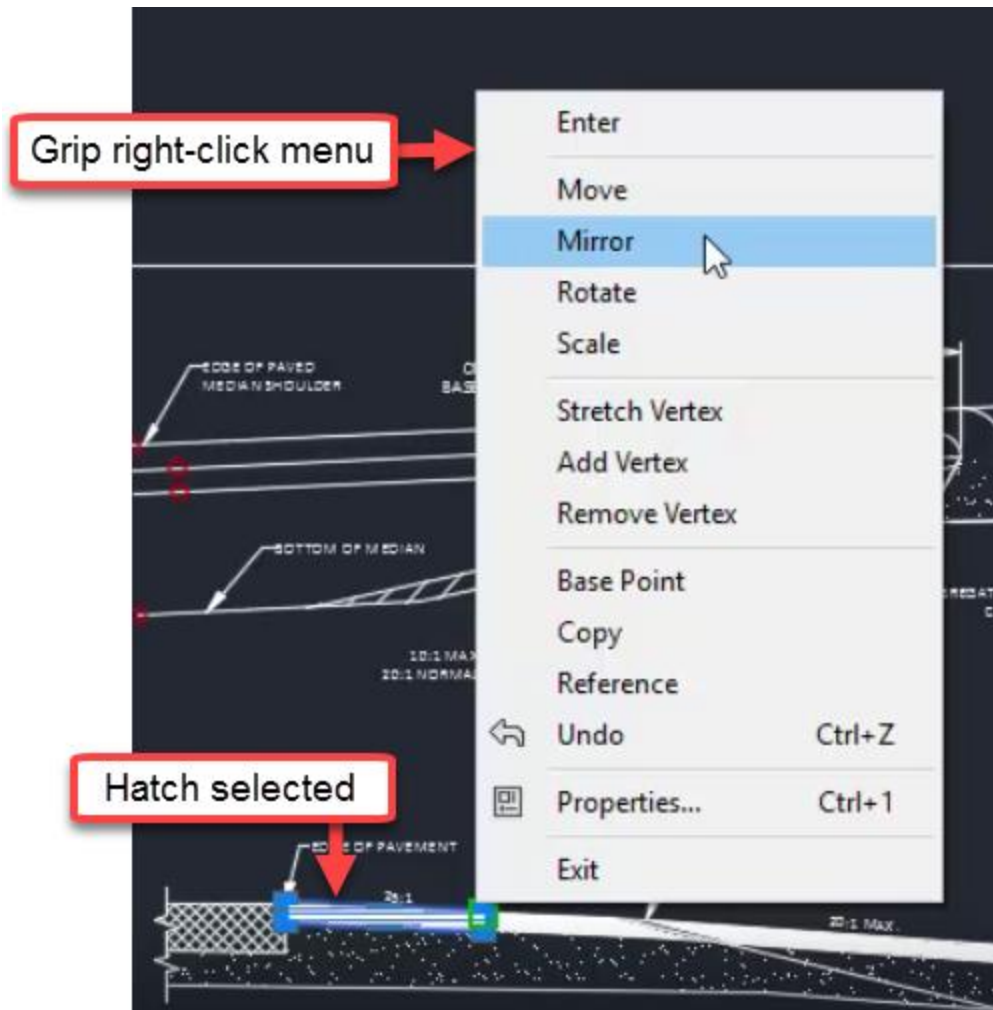
6. Pan to SECTION B-B detail
7. Verify **midpoint** Object Snap is on
8. Window select breakline symbol Polyline and Hatch near EDGE OF PAVEMENT Multileader



9. Left-click one of the displayed Grips
 - A. **(enter)** to cycle to Mirror Grip Mode
 - I. **Specify second point or: Base point**
 - a. Use midpoint Object Snap to specify midpoint of 4" ASPHALTIC CONCRETE Polyline
 - II. **specify second point or: copy**
 - a. Hold **(shift)** for temporary Orthomode
 - b. Left-click second mirror point above basepoint
 - c. **(esc)** to deselect



10. Select PAVED SHOULDER Hatch one left side of SECTION B-B detail
 - A. Left-click a displayed Grip
 - I. Right-click
 - a. **Mirror**
 - i. **Specify second point or: Base point**
 - i. Use midpoint Object Snap to specify midpoint of 4" ASPHALTIC CONCRETE Polyline
 - ii. **Specify second point or: copy**
 - i. Hold **(Shift)** for temporary Orthomode
 - ii. Left-click second mirror point above basepoint
 - iii. **(esc)** to deselect



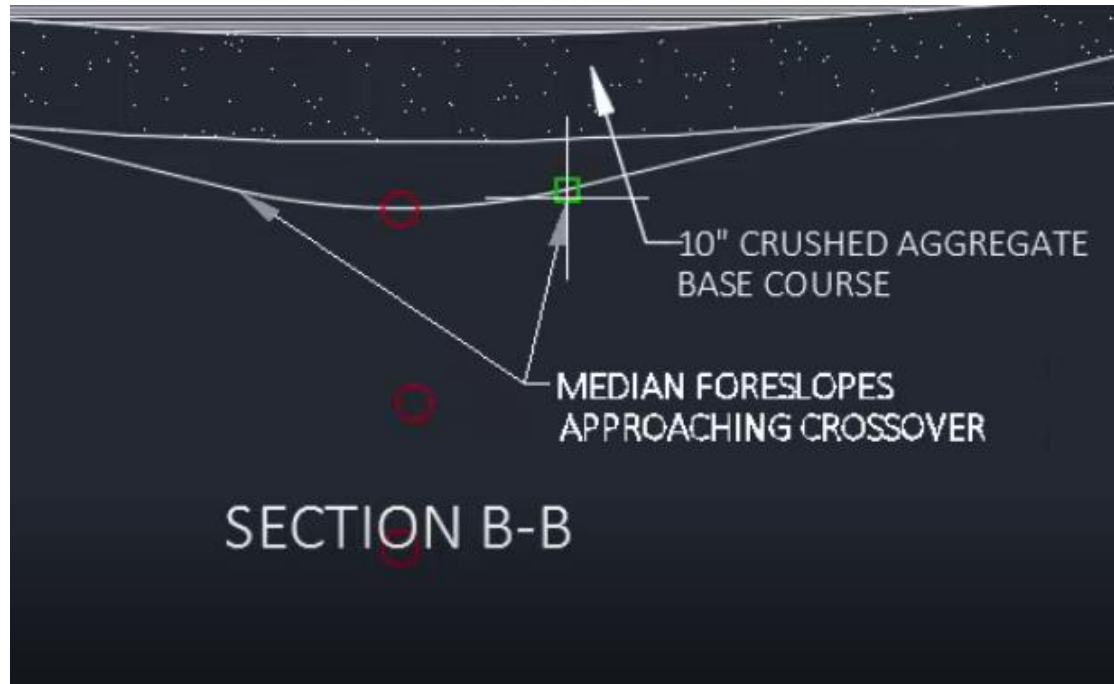
Multifunction grips

Continue with [acad-grips-01.dwg](#)

[acad-grips-05.mp4](#) 3:45

In addition to the four standard Grip Modes, some objects have Multifunction Grips. The first example we saw of this was the Line endpoint Grip. This is a Multifunction Grip with Stretch and Lengthen functions. Once a Multifunction Grip is activated, use the ctrl key to cycle between Grip functions. When only a single Multifunction Grip is activated, hover your cursor over the Grip to see a Multifunction Grip menu. This menu will not display when multiple Grips are activated such as when shift+selecting multiple Grips.

1. Continue with [acad-grips-01.dwg](#)
2. Zoom and Pan to SECTION B-B detail
3. Select MEDIAN FORESLOPES APPROACHING CROSSOVER Multileader
 - A. Left-click the leader landing Grip
 - I. **ctrl** to cycle Grip functions to Add Leader
 - a. **specify leader arrowhead location:**
 - i. Use endpoint Object Snap to specify location at Arc endpoint



- II. **ctrl** to cycle Grip functions to Stretch
 - a. Use red guiding Circle to relocate leader vertex
- B. Select Polyline representing MEDIAN FORESLOPES APPROACHING CROSSOVER
 - I. Left-click Polyline arc segment midpoint Grip
 - a. **ctrl** to cycle Grip functions to Convert to Line
 - b. **enter**
- C. Select Polyline representing MEDIAN FORESLOPES APPROACHING CROSSOVER
 - I. Left-click Polyline line segment midpoint Grip
 - a. **ctrl** to cycle Grip functions to Convert to Arc
 - i. **specify midpoint of arc segment:**
 - i. Use Osnaps to place specify center of red guiding Circle
 - ii. **esc** to deselect

Structures plan production

Info: For more information about the Civil 3D Knowledge Base topic display and formatting, see Getting started.

Structures profile

Last updated: 2024-08-12

Prerequisite: You must be using the [WisDOT Civil 3D standards](#) before following the rest of the Structures Plan production guide. Also make sure your WisDOT Civil 3D standards are [up to date](#). Details of each update can be found in the "What's New" section of the Civil 3D version info page. (Updates specific to the Structures profile are separated as "Structure resource files" in the updates details)

Overview

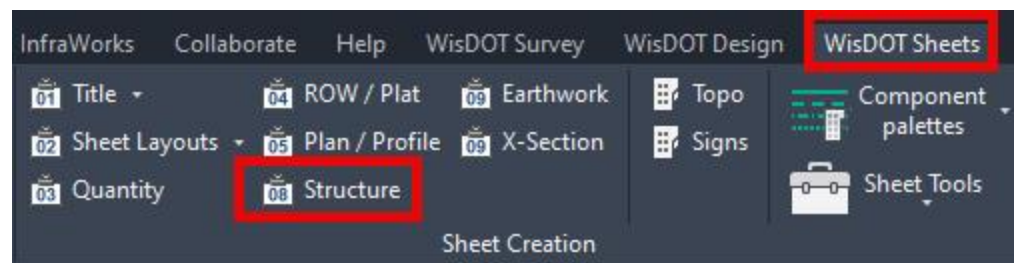
Loads the structures profile and palette content used in the creation of structures plans, including bridges, culverts, retaining walls, sign structures, and miscellaneous structures. The WisDOT Structures profile differs from the default WisDOT Roadway Design profile by adding the Structures Drawing Templates to the Start Tab "New" menu and to the quick access toolbar. It also opens the Structures Palette and sets the following system variables:

- **ANNOAUTOSCALE 0** sets the [ANNOAUTOSCALE](#) variable so new annotation scales will not automatically be added to annotative objects when the annotation scale is changed.
- **ATTREQ 0** sets the [ATTREQ](#) variable so blocks with attributes will use default attributes with no attribute dialog box opening when the block is placed.
- **ATTIPE 1** sets the [ATTIPE](#) variable so the full Text Formatting toolbar is displayed when editing multiline block attributes.
- **DGNIMPORTMODE 1** sets the [DGNIMPORTMODE](#) variable so MicroStation DGN files import correctly with the Convert DGN Drawing .
- **EDGEMODE 1** sets the [EDGEMODE](#) variable so the **TRIM** and **EXTEND** commands determine cutting and boundary edges using imaginary extension lines
- **FILETABPREVIEW 0** & **FILETABTHUMBHOVER 0** sets the [FILETABPREVIEW](#) and [FILETABTHUMBHOVER](#) variables so thumbnails are not displayed when hovering over a drawing file tab.
- **OSNAPZ 1** sets the [OSNAPZ](#) variable so object snaps are automatically projected onto a plane parallel to the XY plane of the current UCS at the current elevation.
 - This setting can also be toggled with the Workspace - OsnapZ: OFF/ON tool.

Usage

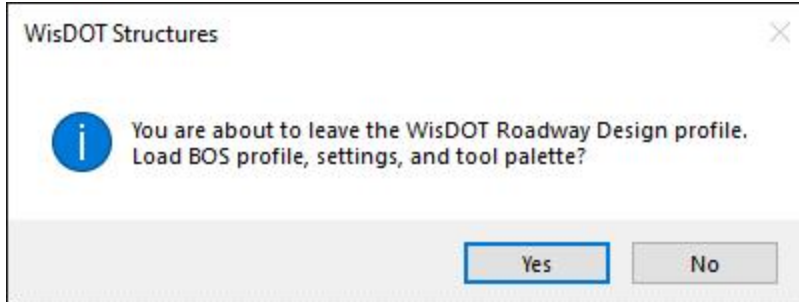
WisDOT Sheets tab > Sheet Creation panel > 08 Structure

The palettes can also be loaded from the command line: **DOTSHEETS-08**.




WisDOT structures dialog box

If you aren't already using the Structures Profile, a dialog box will open warning that you are about to leave the WisDOT Roadway Design profile. Click Yes to continue.



If this is the first time you are opening the Structures Profile, a shortcut will be added to your desktop named **Civil 3D 2024 WisDOT-BOS**.



 **Tip:** To access the Structures Profile in the future, use the **Civil 3D 2024 WisDOT-BOS** desktop shortcut.

Structures drawing templates

Last updated: 2024-05-17

WisDOT drawing (DWG) files are created from drawing templates (*.dwt). There are two primary types of WisDOT drawing template files.

1. **Start templates:** Used to create a new DWG file.
2. **Sheet templates:** Used to import a sheet layout into an existing DWG file.

For more information about start and sheet templates, see [WisDOT Civil 3D start and sheet templates and how to use them](#).

Start templates

WisDOT start templates are stored in `C:\WisDOT\Std\C3D20xx\Templates\Begin-dwg`.

Template	Base Units	Usage
struct-decimal-start.dwt	Decimals of a foot	Used for coordinate correct drawings

Template	Base Units	Usage
		like the General Plans and Sub-surface Exploration sheets.
struct-inch-start.dwt	Fractions of an inch	Used for all other "details" drawings where it is not important for the drawing to be coordinate correct.



Tip: Check which WisDOT Structures template a drawing was started with using the Check Drawing Type tool.

Structures template content

Start templates contain the following standardized styles and layers:

- Structures Template Layers
- Structures Template Plot Colors
- Structures Template Linetypes
- Structures Template Textstyles
- Structures Template Dimension Styles
- Structures Template Multileader Styles
- Structures Template Annotation Scales

How to use the structures start templates

1. There are four primary methods to create a basic WisDOT Structures Civil 3D file.
 - A. WisDOT Structures tool palettes
 - I. Toggle tool palettes on: **Ribbon > WisDOT Sheets tab > Manage panel > Palettes**
 - II. From the **Templates** palette, click one of the options under **Start-up Template**.


Name on Palette	Template
LAYOUT & GEO (decimal-ft)	struct-decimal-start.dwt
DETAILS (architectural-in)	struct-inch-start.dwt

- B. Start Tab "New" menu
 - I. Select the Start tab. (The tab farthest to the left of any open drawing tabs.)
 - II. On the left side of the page, click the dropdown arrow on the "New" button and select a drawing template from the menu.




Info:

- The WisDOT structures templates will only be visible here if you are using the Structures Profile.
- You may select **Browse templates...** from the menu to choose a structures drawing template from the **Begin-dwg** folder. Roadway Design

 start templates are in this folder too. Make sure you select a template that starts with **struct-...** to use structures templates.

C. Quick Access Toolbar


I. **Quick Access Toolbar > New**

 **Info:** Using the Quick Access Toolbar button, a new drawing will be created from the default drawing template setting for **QNEW**. The default WisDOT Structures drawing template is **struct-inch-start.dwt**.

D. C3D Application menu


I. **C3D Application menu > New > Drawing**

II. Browse to **C:\WisDOT\Std\C3D20xx\Templates\Begin-dwg** and select a drawing "start" template.

 **Info:** Roadway Design start templates are in this folder too. Make sure you select a template that starts with **struct-...** to use structures templates.

III. **Open**

2. A new drawing tab will open with the name **Drawing[#].dwg**.
3. **SAVE** file with correct name and location.

 **Info:** For more information about file naming see the Structures Layout File Naming Conventions page.

Sheet templates #sheet

WisDOT sheet templates are stored in **C:\WisDOT\Std\C3D20xx\Templates\Sheets**. There is one template file for structures drawings: **08-STRUCT.dwt**.

There are 6 sheet templates stored within the template file:

Sheet Name	Usage	Name on Palette	Description
SHT1	BOS	SHEET 1	Used for the first sheet in a plan set (general plans sheet)
SHT2	BOS	SHEET 2	Used for all sheets except the first sheet and the subsurface exploration sheet
SHT4	BOS	SHEET 4 (GEOTECH)	Used for the subsurface exploration sheet
SHT1C	Consultant	SHEET 1	Used for the first sheet in a plan set (general plans sheet)

Sheet Name	Usage	Name on Palette	Description
SHT2C	Consultant	SHEET 2	Used for all sheets except the first sheet and the subsurface exploration sheet
SHT4C	Consultant	SHEET 4 (GEOTECH)	Used for the subsurface exploration sheet



Info:

- Each sheet template contains a sheet border block and a viewport. The sheet border contains the WisDOT Bureau of Structures logo in sheets that are intended for use by WisDOT BOS, or leaves a space for consultant logos on sheets for consultants. The provided viewport contains viewport overrides for **B_ANNO_MASK** and **B_REV_ANNO_MASK** layers so they display and plot properly. If these layers are used, it's recommended to copy the existing viewport instead of creating new viewports. In addition, these settings are applied by using the Structures Palette buttons as explained above. They will not be applied if a template is manually created from a template. Once copied, the new viewport may not appear correctly until the drawing regenerated with **REA**.
- Sheet border attributes contain fields that are set up to work with the Structures Sheet Sets template. See the sheet set page for more information.

How to use structures sheet templates

- Toggle tool palettes on: **Ribbon > WisDOT Sheets tab > Manage panel > Palettes**
- From the **Templates** palette, click one of the options under **Sheet Layouts - BOS** or **Sheet Layouts - Consultant**.
Alternatively: **BOSLAYOUTTEMPLATE [SHT#]** where **[SHT#]** is replaced with the sheet name as shown in the table above.
- A new sheet tab will open with the name **SHT[#]**.
- Rename the sheet as needed.

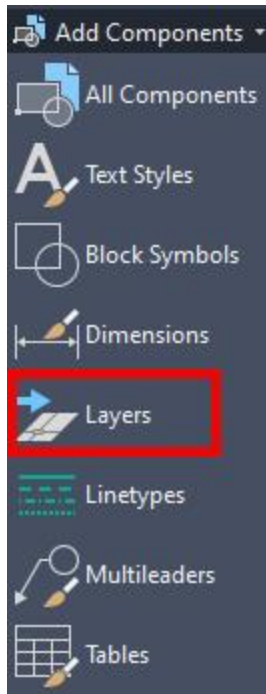
Structures template layers

Last updated: 2024-05-01

Overview

The WisDOT Structures Civil 3D customizations require custom AutoCAD layers. WisDOT Structures custom layers are embedded in the two structures start templates. For more information about roadway layers, see the WisDOT layers page. For basic information about using and manipulating layers, see the Layers and their properties page.

If structures layers are missing from a drawing, they can be imported using the Import Structures Layers tool. WisDOT Roadway layers can also be imported as needed using the Add individual component tool for layers. Unused non-standard layers can then be purged from a structures file by using the Purge Non-Structures Styles tool.



Layers list



Info:

- Many of the structures layers have more broad (**B_ANNO**) and more restrictive (**B_ANNO_TEXT_TITLE**) alternatives. Either are acceptable to use.
- WisDOT Structures follow the WisDOT plot standards. Changing the color of an element in Civil 3D will change what color it plots according to the plot style tables as explained in the WisDOT plot standards page and the "Structures template plot colors" on page 97 page.
- Details of the linetypes used in structures layers can be found on the "Structures template linetypes" on page 99 page.

Name	Color	Linetype	Lineweight	Description
B_ALI	8	Wisdot4	50	Alignment
B_ALI_PGL	8	Wisdot6	50	Profile Grade Line, offset from alignment
B_ALI_TAN	magenta	Continuous	18	Tangent Line, when alignment is curved
B_ANNO	white	Continuous	18	Miscellaneous Annotations
B_ANNO_BREAK	white	Continuous	18	Breakline
B_ANNO_	255,0,0	Continuous	18	Temporary notes for

Name	Color	Linetype	Lineweight	Description
DESIGN_NOTES				designers (plots red)
B_ANNO_DIM	white	Continuous	18	Dimensions and Leaders
B_ANNO_MASK	250	Continuous	18	Background Mask
B_ANNO_NOPLOT	41	Continuous	18	No Plot
B_ANNO_SYMB	white	Continuous	18	Symbols
B_ANNO_TEXT	white	Continuous	18	Text
B_ANNO_TEXT_TITLE	white	Continuous	40	Title and Subtitle Text
B_BRG	white	Continuous	18	Bearings
B_CNTR	red	Wisdot4	18	Centerline
B_CNTR_BRG	red	Wisdot4	18	Centerline of Bearing
B_CNTR_GIRD	yellow	Wisdot4	18	Girder Centerline
B_CNTR_SUB	red	Wisdot4	18	Substructure Centerline
B_CONC	red	Continuous	40	Miscellaneous Concrete
B_CONC_ABUT	30	Continuous	40	Abutment Concrete
B_CONC_APPR	32	Continuous	40	Structural Approach Slab Concrete
B_CONC_COPING	12	Continuous	40	Retaining Wall Coping Concrete
B_CONC_DECK	red	Continuous	40	Deck Concrete
B_CONC_FILR	white	Continuous	18	Filler for Concrete
B_CONC_FTG	32	Continuous	40	Footing or Leveling Pad Concrete
B_CONC_GIRD	50	Continuous	40	Girder Concrete

Name	Color	Linetype	Lineweight	Description
B_CONC_PIER	30	Continuous	40	Pier Concrete
B_CONC_PPT	12	Continuous	40	Parapet Concrete
B_CONC_SDWLK	14	Continuous	40	Sidewalk Concrete
B_CONC_WALL	red	Continuous	40	Retaining Wall Blocks or Panels
B_DETAIL	white	Continuous	18	Detail
B_DETAIL_GHOST	253	Continuous	25	Ghost Line
B_DETAIL_GHOST_HIDDEN	253	Wisdot2	25	Hidden Ghost Line
B_DETAIL_HIDDEN	white	Wisdot2	25	Hidden Line
B_DETAIL_OBJ	white	Continuous	40	Object Details
B_EXIST	11	Continuous	25	Existing Structure
B_EXIST_ABUT	31	Continuous	25	Existing Abutment Concrete
B_EXIST_APPR	33	Continuous	25	Existing Structural Approach Slab Con- crete
B_EXIST_DECK	11	Continuous	25	Existing Deck Con- crete
B_EXIST_FILR	253	Continuous	18	Existing Filler for Concrete
B_EXIST_FTG	33	Continuous	18	Existing Footing or Leveling Pad Con- crete
B_EXIST_GIRD	51	Continuous	18	Existing Girder
B_EXIST_PIER	31	Continuous	18	Existing Pier Con- crete

Name	Color	Linetype	Lineweight	Description
B_EXIST_PPT	13	Continuous	18	Existing Parapet Concrete
B_EXIST_SDWK	15	Continuous	18	Existing Sidewalk Concrete
B_EXIST_WALL	11	Continuous	18	Existing Retaining Wall
B_GIRD_BF	yellow	Wisdot2	18	Girder Bottom Flange
B_GIRD_TF	52	Wisdot3	18	Girder Top Flange
B_GIRD_WEB	54	Wisdot2	18	Girder Web
B_GRND	96	Continuous	18	Groundline
B_GRND_HATCH	96	Grnd	18	Hatched Groundline
B_GRND_RIPRAP	96	Eripr	18	Riprap
B_REBAR	blue	Continuous	25	Miscellaneous Rebar
B_REBAR_SUB	182	Continuous	25	Substructure Rebar
B_REBAR_SUPER	blue	Continuous	25	Superstructure Rebar
B_REV	255,0,0	Continuous	25	Miscellaneous Revision
B_REV_ALI	255,0,0	Wisdot4	50	Miscellaneous Revision
B_REV_ALI_PGL	255,0,0	Wisdot6	50	Profile Grade Line Revision
B_REV_ALI_TAN	255,0,0	Continuous	18	Tangent Line Revision
B_REV_ANNO	255,0,0	Continuous	18	Miscellaneous Revision Annotations
B_REV_ANNO_DIM	255,0,0	Continuous	18	Dimension & Leader Revision

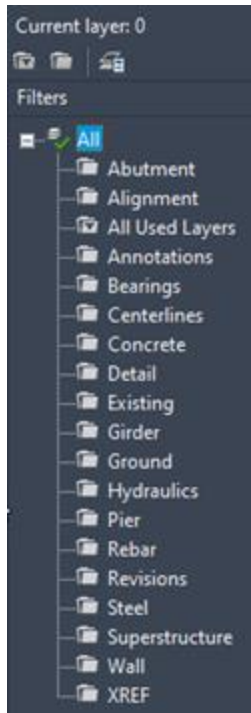
Name	Color	Linetype	Lineweight	Description
B_REV_ANNO_MASK	250	Continuous	18	Background Mask Revision
B_REV_ANNO_TEXT	255,0,0	Continuous	18	Text Revision
B_REV_ANNO_TEXT_TITLE	255,0,0	Continuous	40	Title Text Revision
B_REV_BRG	255,0,0	Continuous	18	Bearing Revision
B_REV_CNTR	255,0,0	Wisdot4	18	Centerline Revision
B_REV_CONC	255,0,0	Continuous	40	Concrete Revision
B_REV_DETAIL	255,0,0	Continuous	18	Detail Revision
B_REV_DETAIL_HIDDEN	255,0,0	Wisdot2	25	Hidden Line Revision
B_REV_GIRD	255,0,0	Continuous	18	Girder Revision
B_REV_REBAR	255,0,0	Continuous	25	Rebar Revision
B_REV_STEEL	255,0,0	Continuous	40	Steel Revision
B_STEEL	92	Continuous	18	Miscellaneous Steel
B_STEEL_BOLT	green	Continuous	18	Steel Bolts, washers, nuts
B_STEEL_DIAPH	96	Continuous	18	Steel Diaphragms
B_STEEL_GIRD	92	Continuous	18	Steel Girders
B_STEEL_PILE	96	Continuous	40	Steel Piling
B_STEEL_RAIL	92	Continuous	18	Steel Railings or Fence
B_STEEL_SHOR	magenta	Eshtplg	18	Shoring
B_XREF	white	Continuous	18	External Reference
B_XREF_CLIP	47	Continuous	18	Xref Clipping Line
B_XREF_DETAIL1	white	Continuous	18	Detail of Global Xref

Name	Color	Linetype	Lineweight	Description
B_XREF_DETAIL2	white	Continuous	18	Detail of Global Xref
B_XREF_GLOBAL	white	Continuous	18	Original, Global Xref
H_BOR_EL	30	Continuous	18	Log Data in Elevation
H_BOR_EL_ROCK	34	Continuous	18	Geotech Boring Rock Elevation
H_BOR_EL_START	42	Continuous	18	Geotech Boring Start Elevation
H_BOR_LOC	30	Continuous	18	Geotech Boring Loc Plan
H_E_STRUCT	30	Wisdot2	18	Existing Structure
H_E_STRUCT_DROPDOWN	30	Wisdot1	18	Existing Structure Dropdown
H_FIS_BFE	cyan	Continuous	18	FIS Base Flood El Lines
H_FIS_CENTR	cyan	Wisdot4	18	FIS Stream Centerline
H_FIS_FLOOD	132	Continuous	18	FIS Flood Hazard Zone Lines
H_FIS_REACHES	140	Wisdot7	18	FIS Reach Dimensions
H_FIS_STRUCT	magenta	Wisdot2	18	FIS Hyd Structures
H_FIS_TEXT	cyan	Continuous	18	FIS Xsec Text
H_FIS_XSEC	8	Continuous	18	FIS Xsec Plan
H_FLOW	cyan	Wisdot7	18	Flow Arrows
H_FLOW_INEFFECTIVE	cyan	Wisdot1	18	Ineffective flow
H_RDWY	red	Continuous	18	Proposed Roadway

Name	Color	Linetype	Lineweight	Description
H_RDWY_CLEARZONE	green	Continuous	18	Clear Roadway
H_REACHES	cyan	Continuous	18	Hydraulic Reach Dim
H_REF_LINE	30	Wisdot6	18	Hydraulic Ref or Centerline
H_SBED	cyan	Continuous	18	Stream Profile
H_SBED_DROPDOWN	cyan	Wisdot1	18	Streambed Drop-down
H_STRUCT	magenta	Continuous	40	Proposed Structure
H_STRUCT_ALT1	yellow	Continuous	18	Proposed Structure Alternative
H_STRUCT_ALT2	red	Continuous	18	Proposed Structure Alternative
H_STRUCT_DROPDOWN	magenta	Wisdot1	18	Proposed Structure Dropdown
H_WSE_OBS	blue	Continuous	18	Observed WSE
H_WSE_Q100	cyan	Continuous	18	Modeled Q100
H_XSEC	cyan	Continuous	18	Hydraulic X section

Filters list

The layer filters can be used to find layers more quickly. The following filters are included in the structures template:



Each filter contains only layers required to draw the filter's structure element. Some layers appear in multiple filters.

Filters	S.. Name	O.	F..	L..	P..	Color	N. Description
All	B_BRG	1	1	1	1	wh...	Bearings
Abutment	B_CNTR_BRG	1	1	1	1	red	Centerline of Bearing
Abutment	B_CONC_ABUT	1	1	1	1	30	Abutment Concrete
Abutment	B_CONC_FILR	1	1	1	1	wh...	Filler for Concrete
Abutment	B_GRND_RIPRAP	1	1	1	1	96	Riprap
Abutment	B_REBAR_SUB	1	1	1	1	182	Substructure Rebar
Abutment	B_STEEL_PILE	1	1	1	1	96	Steel Piling

Structures template plot colors

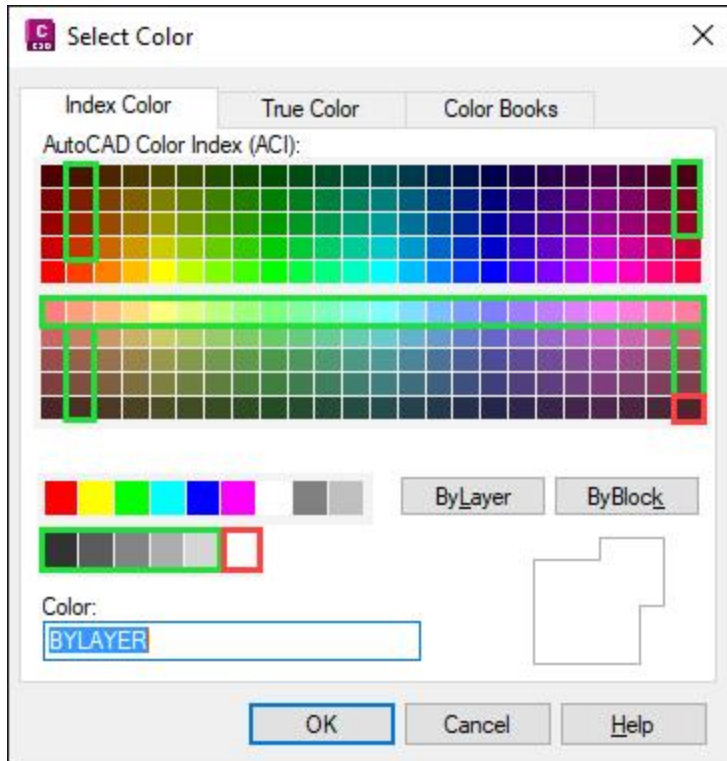
Last updated: 2024-04-29

Overview

WisDOT Structures follow the WisDOT plot standards . Changing the color of an element in Civil 3D will change what color it plots according to the plot style tables as explained in the WisDOT plot standards page and below.

Plot style table

The primary plot style table for standard plan sheets is **wisdot_standard.ctb**. Each AutoCAD color index (ACI) from 1-255 in the plot style table is assigned to either plot as black, gray or white for masking.



White (Masking)

The colors 249 & 255 (shown in the image above with red boxes) are for masking.

Gray










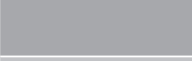
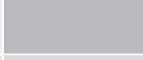
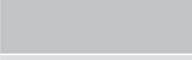


In the WisDOT CTB (color-dependent plot style tables) configuration gray is:

- every color that ends with a 1 (standard gray)
- colors 22-29 (standard gray)
- color 253 (standard gray)
- colors 243-254 (shades of gray detailed below)

These colors are shown with green boxes in the image above.

The colors 243-254 allow for more gray options:

ACI	Color	Plot Color
243		
244		
245		
246		
247		

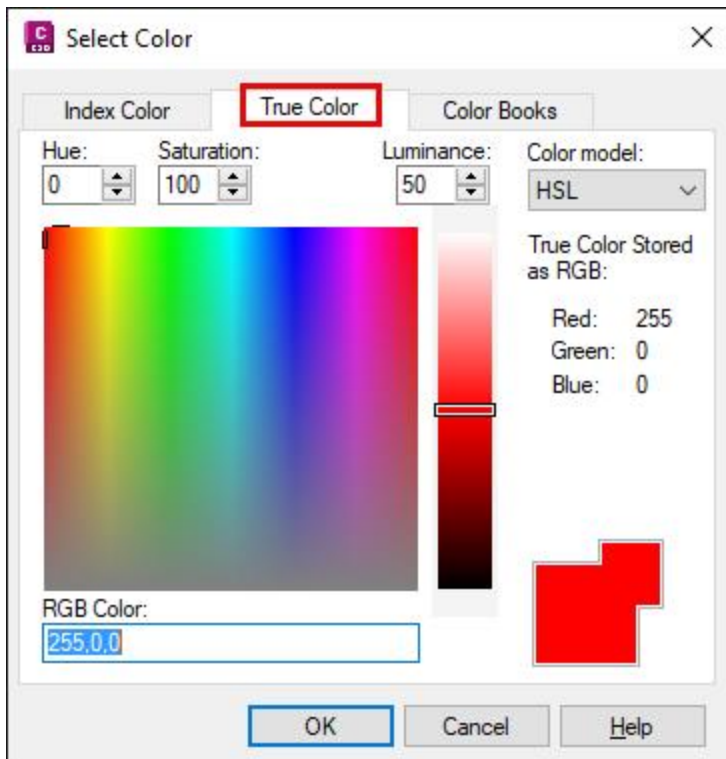
ACI	Color	Plot Color
248		
249		
250		
251		
252		
253		
254		

Black

In the WisDOT CTB configuration black is every color not listed above.

Color

All true colors will print in color.



Structures template linetypes

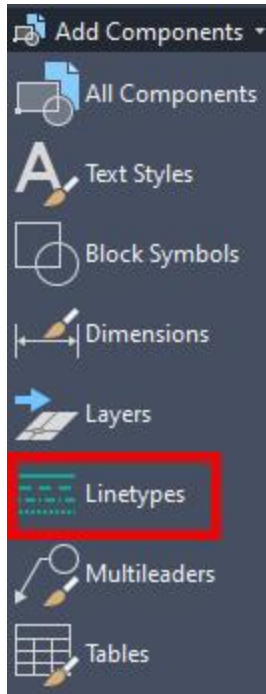
Last updated: 2024-05-01

Overview

Structures drawing templates

The WisDOT Structures Civil 3D customizations require custom AutoCAD linetypes. WisDOT Structures custom linetypes are embedded in the two structures start templates. For more information, see the WisDOT linetypes page.

WisDOT Roadway linetypes can be imported as needed using the custom tool to add the linetype component group.



Resource files

The WisDOT structures linetypes rely on the following component files:

- AutoCAD linetype files located in **C:\WisDOT\Std\C3D20xx\Components\Linetype**
 - **wisdot.lin**
- AutoCAD shape files located in **C:\WisDOT\Std\C3D2024\Components\Support**
 - **BOS.shx**
 - **dgnlstyle-ewdotudls.shx**

Linetype list

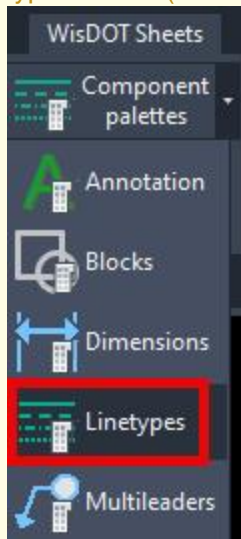
The following linetypes are available in structures templates. All linetypes in structures templates are Annotative Linetypes. (Linetypes automatically scale according to annotation scale.) For more information about annotative linetypes see Linetype scale explained.

Linetype	Description	Shape File
Brkln	Break line	BOS.shx
Echnl	Water Channel	
Egr	Guard rail	dgnlstyle-ewdotudls.shx

Linetype	Description	Shape File
Eripr	Riprap	dgnlstyle-ewdotudls.shx
Eshtplg	Sheet Piling	dgnlstyle-ewdotudls.shx
Grnd	Ground line	BOS.shx
Wisdot1	Dot	
Wisdot2	Short dash	
Wisdot3	Long dash	
Wisdot4	Dash/dot	
Wisdot5	Skip dash	
Wisdot6	Dash/dot/dot	
Wisdot7	Long/short dash	

**Tip:**

The Linetypes Component Palette can be used to quickly make any of the roadway or WisDOT linetypes current (including all linetypes listed above except **Brkln** and **Grnd**) linetypes.



Be aware that any palettes noting that object properties are preset will also change the active layer to the appropriate roadway layer.


Note: Object Properties for all linetypes on this palette are preset

Structures template textstyles

Last updated: 2024-05-01

Overview

The WisDOT Structures Civil 3D customizations require custom AutoCAD textstyles. WisDOT Structures custom textstyles are embedded in the two structures start templates . For more information about WisDOT Roadway textstyles, see the WisDOT textstyles page.

 **Tip:** Use the "Quick annotations" on page 109 to quickly apply the correct text style, layer, and start the **MTEXT** command.

Textstyle list

Text Style Name	Name on Palette	Font Name	Font Style	Annotative	Description
Annotative	General Text	Calibri	Regular	True	Annotative textstyle which should be used for most text
Title	Title Text	Calibri	Bold	True	For drawing and detail titles (text should be underlined)
Subtitle	Subtitle Text	Calibri	Bold	True	For drawing and detail subtitles (text should be underlined)
Legend	NA	Calibri	Regular	False	Default style
Standard	NA	Calibri	Regular	False	Default style


The two AutoCAD textstyles (Legend and Standard) are default textstyles used in the Basic and Standard Civil 3D Styles settings. These textstyles exist in the WisDOT structures drawing templates for DWG compatibility and are not typically used for WisDOT structures plan production.

Structures template dimension styles

Last updated: 2024-05-01


Overview

The WisDOT Structures Civil 3D customizations require custom AutoCAD dimension styles. WisDOT Structures custom dimension styles are embedded in the two structures start templates. For more information, see the WisDOT dimension styles page.

 **Tip:** Use the Palettes #pal to quickly apply the correct dimension style, layer, and start a dimension command.

Dimension style list

- **Annotative:** This dimension style should generally be used for all dimensions in structures plans. It uses an architectural unit format with a precision of 1/8"
- **Decimal:** This dimension should be used for sketches only, not final plans. This style uses a decimal unit format with a precision of 0.001'
- **Standard:** This is a non-annotative copy of the **Annotative** dimension style.

 **Info:** The dimension styles in the two structures start templates differ by a scale factor of 12 to account for the different base units in the two templates.

Structures template multileader styles

Last updated: 2024-05-01

Overview

The WisDOT Structures Civil 3D customizations require custom AutoCAD multileader styles. WisDOT Structures custom multileader styles are embedded in the two structures start templates. For more information, see the WisDOT multileader styles page.

 **Tip:** Use the "Quick annotations" on page 109 to quickly apply the correct multileader style, layer, and start the **MLEADER** command.

Multileader style list

Multileader Style	Arrowhead	Content
Standard	Open 30	Text
Dot	Dot blank	Text
Swirl	Integral	Text
Keynote	Open 30	Bubble Note Block

Structures template annotation scales

Last updated: 2024-05-03

Overview

The WisDOT Structures Civil 3D customizations require custom AutoCAD annotation scales. WisDOT Structures custom annotation scales are embedded in the two structures start templates. For more information on using annotation scales, see the Annotative scale page. For more information about finding the best annotation scale, see the [Structures sheet layouts and viewports #anno](#) page.

Annotative scale list

Each structures start templates contains common Annotative Scales listed below. Additional scales can be added as needed.

The "Viewport Decimal" in the tables below corresponds to the arbitrary scale displayed when a viewport is manually zoomed. Use the values in the table to select the closest annotation scale. For more information

Structures drawing templates

see the [Structures sheet layouts and viewports #anno](#) page.



Details (architectural-inches) template

Name	1 Paper Unit = [X] Drawing Units	Viewport Decimal
1.00	12	0.08333
1.50	18	0.0556
2.00	24	0.0417
2.50	30	0.0333
3.00	36	0.0278
4.00	48	0.0208
5.00	60	0.0167
6.00	72	0.0139
8.00	96	0.0104
10.0	120	0.0083

Layout (decimal-feet) template

Name	1 Paper Unit = [X] Drawing Units	Viewport Decimal
1.00	1	1.0000
2.00	2	0.5000
3.00	3	0.3333
4.00	4	0.2500
5.00	5	0.2000
6.00	6	0.1667
8.00	8	0.1250
10.0	10	0.1000
12.0	12	0.0833

Name	1 Paper Unit = [X] Drawing Units	Viewport Decimal
16.0	16	0.0625
20.0	20	0.0500

Default annotation scales

The annotation scales listed below are default annotation scales used in the Basic and Standard Civil 3D Styles settings. These annotation scales exist in the WisDOT structures drawing templates for DWG compatibility and are not typically used for WisDOT structures plan production.

- 1 IN:1 FT
- 1" = 1'
- 1:1

Adding custom annotation scales

1. **Status bar > Annotation Scale (flyout) > Custom...**

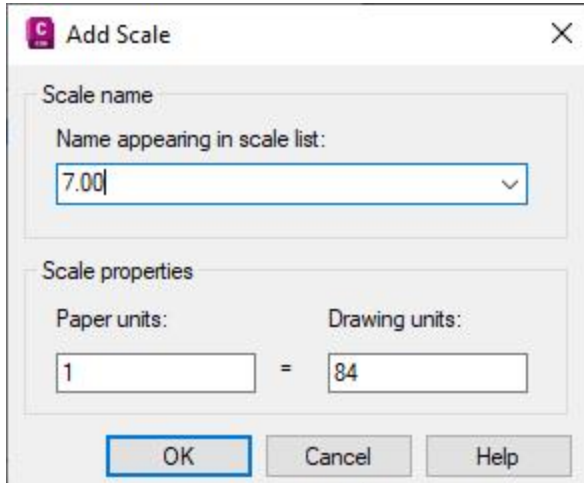
Alternatively: **SCALELISTEDIT**



Requirement: The annotation scale flyout is only available in **Model Space** or inside **unlocked viewports**.

2. **Add...**

3. Fill out the Add Scale dialog



The screenshot shows the 'Add Scale' dialog box. It has a title bar with a close button. The 'Scale name' section contains a text box with '7.00' and a dropdown arrow. Below it, the 'Scale properties' section has two input fields: 'Paper units' with '1' and 'Drawing units' with '84', separated by an equals sign. At the bottom are three buttons: 'OK', 'Cancel', and 'Help'.

- A. Enter a **Scale Name**. The convention for structures drawings is to use the scale as the name with two decimal points. For example, a scale of 1"=7' would be named **7.00**.
- B. Keep the **Paper Units** set to 1.
- C. Set the **Drawing Units**
 - I. For **Details (Architectural-Inches)** drawings, the drawing units should be set to 12 times the scale. For example, a scale of 1"=7' would have drawing units of **84**.
 - II. For **Layout (Decimal-Feet)** drawings, the drawing units should be set equal to the scale. For example, a scale of 1"=7' would have drawing units of **7**.

 **Info:** For more information, see the [Create a custom annotative scale page](#).

Annotative object scale

The "Structures profile" on page 85 turns off the **ANNOAUTOSCALE** system variable. This means changing the annotation scale will not add that annotation scale to all annotative objects in the drawing. To change or remove annotative scales on an annotative object, use the Fix Annotation Scales tool on the structures tool palette.

Structures file naming conventions

Last updated: 2024-05-03

WisDOT only: This section is for **Bureau of Structures** staff only.

The Bureau of Structures is using the following naming convention when creating plan drawings:

Drawing files should be named **YEAR-PG-STRUCTID_NAME.dwg** where:

- **YEAR** = project year
- **PG** = page number. Use leading zeros. Use 2 leading zeros if plan set has 100+ sheets. If there are multiple sheets in one drawing, use the first sheet number. Generally similar sheets or sheets with similar details should be drawn in one file (For example, abutments & abutment details, piers, super-structure plans, etc.)
- **STRUCTID** = structure ID formatted with leading zeros and no dashes. For example, structure B-1-23 would be **B01023**
- **NAME** = sheet name as shown in the table below

File Name	Sheet Name
GP	General Plan
QUAN	Cross Section and Quantities
SOILS	Subsurface Exploration
ABUT	Abutment
PIER	Pier
GIR	Girder Details
DIA	Diaphragm Details
SUP	Superstructure
BRG	Bearing Details
EXP	Expansion Joint Details
FRAME	Framing Plan
MODJT	Modular Joint
APPSLAB	Structural Approach Slab
PPT	Parapet
FENCE	Fence Details
AESTH	Aesthetics
ALTJT	Alternate Const. Jt.



Info: The list above is general. Every drawing type is not listed. Use common sense when naming drawings not listed above.


Example

Using the example of structure **B-1-23** designed in **2024**, drawings would be named:

- 2024-01-B01023_GP.dwg
- 2024-02-B01023_QUAN.dwg
- 2024-03-B01023_SOILS.dwg
- 2024-04-B01023_ABUT.dwg
- 2024-08-B01023_PIER.dwg
- 2024-10-B01023_SUPER.dwg
- 2024-12-B01023_APPSLAB.dwg
- 2024-14-B01023_PPT.dwg

Structures palette

Last updated: 2024-05-08

 **Prerequisite:** You must be using the WisDOT Civil 3D Standards to use the WisDOT Structures tool palette. Also make sure your WisDOT Civil 3D standards are up to date. Details of each update can be found in the "What's New" section of the Civil 3D version info page. (Updates specific to the Structures profile are separated as "Structure resource files" in the updates details)

Overview


The WisDOT Structures tool palette provides content used in the creation of structures plans, including bridges, culverts, retaining walls, sign structures, and miscellaneous structures. Specifically, the palette contains links to the following components:


- Structures Drawing Templates
- Custom Tools
 - Purge Non-Structures Styles
 - Import Structures Layers
 - Fix Annotation Scales
 - Convert DGN Drawing
 - Check Drawing Type
 - Paste Table Tool
 - Breakline
- Quick Annotations
- Structures Blocks

Usage

WisDOT Sheets tab > Sheet Creation panel > 08 Structure

The palette can also be loaded from the command line: **DOTSHEETS-08**.

 **Info:** This will load the WisDOT Structures profile. See the Structures Profile page for more information about how the structures profile differs from the roadway profile.

 **Requirement:** Your tool palette must not be hidden. Show the tool palette using the Palettes ON/OFF tool.

Palettes #pal

The structures tool palette contains 12 palettes with the following components:

- Templates
 - Drawing and Sheet Templates
 - [Structures Custom Tools](#)
 - Purge Non-Structures Styles
 - Import Structures Layers
 - Fix Annotation Scales
 - Convert DGN Drawing
 - Check Drawing Type
 - [Paste Table Tool](#)

- Anno
 - Quick Annotations
 - Annotation Blocks #anno
 - Paste Table Tool
 - Breakline Tool
- Gen Plans
 - General Plans Blocks #gp
- CS & Quan
 - Cross Section and Quantities Blocks #quan
- Substr.
 - Substructure Blocks #substr
- Rebar
 - Rebar Blocks #rebar
- Super
 - [Superstructure Blocks #super](#)
- Barriers
 - Barrier Blocks #barrier
- Steel
 - Steel Blocks #steel
- Culvert
 - Culvert Blocks #culvert
- Wall
 - Retaining Wall Blocks #wall
- Misc
 - Miscellaneous Blocks #misc

Structures custom tools

Last updated: 2024-05-01

The Structures Palette provides the following tools. With the exception of the Breakline tool, they are all available in the **Templates** palette. The Paste Table and Breakline tools are available in the **Annotation** palette.

- **Purge Non-Structures Styles**
Removes all unused drawing components except for standard structures layers, text styles, dimension styles, and multileader styles.
- **Import Structures Layers**
Adds the standard Structures Layers to the current drawing.
- **Fix Annotation Scales**
Removes all object scales from an annotative object except the currently active annotation scale
- **Convert DGN Drawing**
Converts MicroStation drawings to Civil 3D and converts annotations to the standard structures styles.
- **Check Drawing Type**
Checks the current drawing settings to see which Structures Template was used to start the file.
- **Paste Table Tool**
Reads clipboard data from a spreadsheet and populates a selected table with the contents.
- **Breakline**
Starts the BREAKLINE command with the correct size settings for the active annotation scale.

Quick annotations

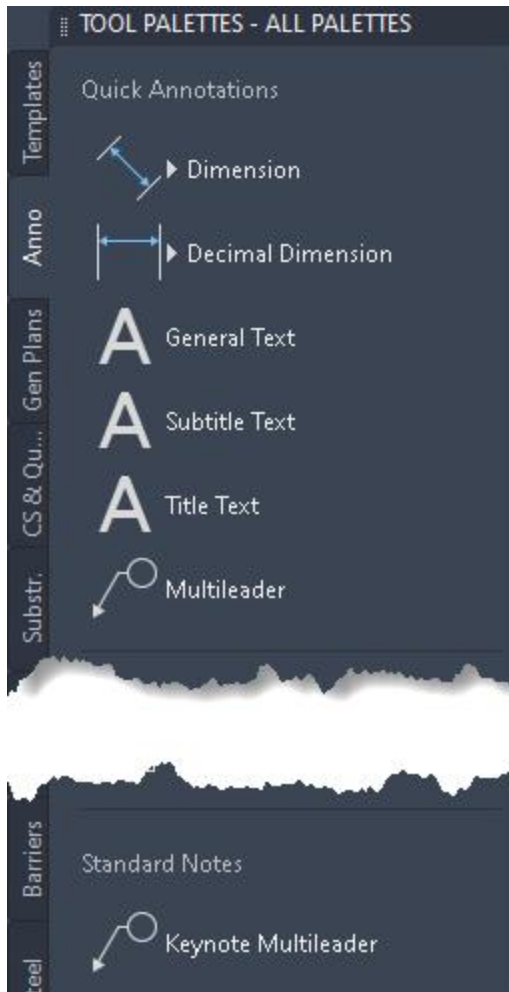
Last updated: 2024-04-29

Overview

Quick annotations start an annotation tool with the correct style and layer for the annotation. For more information about annotating drawings, see the Annotation page.


Usage

Structures Tool Palette > Anno palette > [Click one of the buttons shown below]



Quick Annotation	Command	Style	Layer
Dimension	Dimension*	Annotative	B_ANNO_DIM
Decimal Dimension	Dimension*	Decimal	B_ANNO_DESIGN_NOTES
General Text	Mtext	Annotative	B_ANNO_TEXT
Subtitle Text	Mtext	Subtitle	B_ANNO_TEXT_TITLE
Title Text	Mtext	Title	B_ANNO_TEXT_TITLE

Quick Annotation	Command	Style	Layer
Multileader	Mleader	Standard	B_ANNO_DIM
Keynote Multileader	Mleader	Keynote	B_ANNO_DIM

 **Info:** The dimension quick annotation buttons have an arrow next to the icon choose the specific dimension tool to use.

Structures blocks

Last updated: 2024-09-10

Overview

WisDOT provides dozens of custom blocks for structures plans. Many of the blocks are dynamic, meaning they have grips or drop-down menus to dynamically alter the block. Many blocks also have attributes - text that can be edited using the attribute editor or in the properties menu. For more information about blocks, see the Inserting blocks and Blocks and external references pages.

For more information about what was changed for each block, see the **What's New** sections of the Civil 3D version info page for each date.

Unless otherwise noted, the blocks are all available for easy use in the structures Palettes #pal.

Block scale

Structures blocks are drawn to different scales based on their intended use. These scales are listed next to the block descriptions in the next sections. Use the table below to scale a block correctly for your intended use.

Scale Key	Intended Use	Sheet Layout Scale	Decimal Model Space Scale	Architectural Model Space Scale
A	Architectural template model space	1/12	1/12 * Anno Scale	1 * Anno Scale
D	Decimal template model space or any sheet layout	1	1 * Anno Scale	12 * Anno Scale
A1	Architectural template model space	NA	1/12	1
D1	Decimal template model space	NA	1	12
1	Anywhere	1	1	1

Resource files

The WisDOT blocks component files consist of AutoCAD drawings. The files are located in: **C:\WisDOT\Std\C3D20xx\Components\Blocks** and subfolders. All structures blocks are located in **structures.dwg**. More information about non-structures blocks can be found on the WisDOT blocks page.

In addition, structures sheet border blocks are stored in the Structure Sheet Templates #sheet .

Sheet border blocks #template

The following blocks are stored in the Sheet Templates #sheet . They are automatically inserted when creating a new sheet layout from the structures template tool palette.

Name on Palette	Block Name	Description	Scale Key	Dynamic	Attributes	Last Updated
Sheet 1	SHT1	General Plans Sheet Border	D		✓	2023-09-08
Sheet 2	SHT2	Details Sheet Border	D		✓	2024-07-17
Sheet 1 (Consultant)	SHT1C	General Plans Consultant Sheet Border	D		✓	2023-09-08
Sheet 2 (Consultant)	SHT2C	Details Consultant Sheet Border	D		✓	2024-07-17
Sheet 4 (Geotech)	GT_LEGEND	Legend for geotech sheet borders	D			
NA	SHT_OUTLINE	8 sheet border outline	D			
NA	Logo	BOS Logo for sheet border	D			

Annotation blocks #anno

The following blocks are available within the "Annotation blocks #anno" above palette. The annotation blocks contain symbols and general annotation details for use on most drawings. Most of these blocks are

made for details/architectural templates, and will need to be scaled up by 12 for a layout/decimal template or if used in a sheet layout. The **Table Template** block is the only block which should be placed in either model space or paper space at scale 1. After it is placed, choose the annotation scale from the dynamic dropdown options.

Name on Palette	Block Name	Description	Scale Key	Dynamic	Attributes	Last Updated
Table Template	TABLE	Blank table template	1	✓		2024-07-11
Keynote Multileader	NOTE_LEADER	Used in keynote multileader	A			
Note Callout	NOTE_CALL	Keynote symbol to be used with Standard Bubble Notes block	A	✓	✓	2022-02-15
Standard Bubble Notes	NOTE_BUBBLE	Standard notes for structure details. To be used with Keynote multileader or Note Callout symbol	A	✓	✓	
Symbols	SYMBOL-S	Standard symbols	A	✓		
Numbered Symbols	SYMBOL_NUMBER	Standard symbols with numbers for girders, wings, etc.	A	✓	✓	2022-05-20
Revision Symbols	REVISION	Symbols to show revisions in drawing	D	✓	✓	2024-07-11
Swirl	_Integral	Swirl symbol used in optional leader arrowhead	A			

Name on Palette	Block Name	Description	Scale Key	Dynamic	Attributes	Last Updated
Masked Arrow	ARROW_MASK	Place over leader/dimension arrowhead to mask intersecting elements	A	✓		
Section Mark	SECTION	Arrows to mark section detail	A	✓	✓	
Station Mark	STAMARK	Used to mark significant stations along alignment	D	✓		
Weld Symbol	WELD	Used to annotate welds	A	✓	✓	
Caution Symbol	CAUTION	Used to mark overhead lines or other dangers	A			

General plans blocks #gp

The blocks on the [General Plans Palette](#) are for use on the first (general plan) sheet of a structure plan set. Some of the blocks are specific to grade separation or stream crossing bridges. Additional general plans blocks needed for culverts or retaining walls are on their own palettes.

Name on Palette	Block Name	Description	Scale Key	Dynamic	Attributes	Last Updated
Design Data	DESIGN_DATA	Standard notes shown on the right side of the general plans	D	✓		2022-02-15

Name on Palette	Block Name	Description	Scale Key	Dynamics	Attributes	Last Updated
Design Contacts	DESIGN_CONTACTS	Standard design contacts note for Bureau of Structures and consultants	D	✓	✓	2024-01-31
Sheet List	SHEET_LIST	List of drawings table	D			2024-07-17
North Arrow	NARR	Standard Wisconsin north arrow	D			2024-01-31
Waterway Flow	FLOW	Detail direction and name of waterway	D	✓	✓	
Lane Arrows	LANE_ARROWS	Detail direction of traffic	D1	✓		2022-02-15
Wing Note	WING_NOTE	Wing number key + Thrie Beam	D	✓		
Station Mark	STAMARK	Used to mark significant stations along alignment	D	✓		
Bench Mark	BENCH_MARK	Table for bench marks	D			2024-07-17
Cross Slope	CROSS_SLOPE	Detail roadway slope	A	✓	✓	
Waterline Symbol	WATERLINE	Symbol to detail top of	D			

Name on Palette	Block Name	Description	Scale Key	Dynamic	Attributes	Last Updated
		water elevation				
Fill Detail at Wings	ABUT_FILL_WING	Typical fill section at wing tip	D	✓		
Riprap Toe Detail	RIPRAP_TOE	Typical riprap toe details	D	✓		2022-02-15
Elevation Scale	ELEVATION_SCALE	Symbol to show absolute elevation	D1		✓	

Cross section and quantities blocks #quan

The blocks on the [CS & Quan Palette](#) are for use on the cross section and quantities sheet. Some of the blocks are specific to grade separation or stream crossing bridges. Additional general note blocks needed for culverts or retaining walls are on their own palettes. With the exception of the **Cross Slope** block, all blocks in this table are intended to be placed directly on the sheet layout at a scale of 1.0.

Name on Palette	Block Name	Description	Scale Key	Dynamic	Attributes	Last Updated
Cross Slope	CROSS_SLOPE	Detail roadway slope	A	✓	✓	
Table	QUAN	Bid items and quantities table	D	✓		
New Bridges	GEN_NOTES	Standard notes for new bridges	D			
Overlays	OVERLAY	Standard notes for	D	✓		

Name on Palette	Block Name	Description	Scale Key	Dynamic	Attributes	Last Updated
		overlays and rehabs				
Profile Grade Line	PGL	Simple detail of PGL	D	✓	✓	
Sub-structure Callout for PGL	PGL_SUB	Detail sub-structure along PGL	D	✓	✓	
Abutment Backfill Diagram	ABUT_BACKFILL	Detail backfill behind standard abutments	D	✓		
Abutment Backfill Details	ABUT_FILL	Section through backfill at abutments, retaining walls, and box culverts	D	✓		2023-05-03
Rodent Screen Detail	RODENT	Detail for rodent shield in Pipe Underdrain	D			2022-11-02
Bench Mark	BENCH_MARK	Table for bench marks	D			2024-01-31

Substructure blocks #substr

The blocks on the [Substr. Palette](#) are for use on bridge abutment and pier sheets. For piling plan blocks, see the Steel palette.

Name on Palette	Block Name	Description	Scale Key	Dynamic	Attributes	Last Updated
Standard Bubble Notes	NOTE_BUBBLE	Standard notes for structure details. To be used with Keynote multileader or Note Callout symbol	A	✓	✓	
Rocker Bearing	ROCKER	Steel rocker bearing elevation	A			
Beam Seat	BEAM_SEAT	Adjustable beam seat elevation	A	✓		
Beveled Keyway	BEVELLED_KEYWAY	Section through beveled keyway in standard concrete joints	A	✓		
Pile Details	PILE_DETAILS	Standard details for common pile types	A	✓		2022-05-2
Pile Elevations	PILE_ELEV	Elevation of common substructure supports. To be used with A1 Abutment Section	A	✓		
Batter	BATTER_	Arrow to	A			2024-03-2

Name on Palette	Block Name	Description	Scale Key	Dynamic	Attributes	Last Updated
Arrow	ARROW	detail pile batter				
A1 Abutment Section	A1_ABUT	Section through standard A1 abutment	A1	✓	✓	2022-05-2
Slope Paving	SLOPE_PAVING	Section through slope paving (or MSE wall) in front of abutment	A1	✓		
Rodent Screen Detail	RODENT	Detail for rodent shield in Pipe Underdrain	D			2022-11-0
6 in Drain	DRAIN_6IN	Section through pipe underdrain	A	✓		
Eyebolt	EYEBOLT	Eyebolt detail for abutments with MSE walls	A			
Pier Column	PIER_COLUMN	Section through standard rectangular pier column for grade separations	A1	✓	✓	
Rustication	RUSTICATION_DETAIL	Rustication detail for	A	✓		

Name on Palette	Block Name	Description	Scale Key	Dynamic	Attributes	Last Updated
Detail		pier columns				
Bevel	PIER_BEVEL	Detail for bevel at top of column with sloped pier cap	A			
Precast Option	PIER_OPTION	Standard note for precast pier options	A		✓	

Rebar blocks #rebar

The blocks on the [Rebar Palette](#) are for detailing reinforcement. Bar detailing blocks are intended to be used in plan details or design sketches. The remaining blocks are for the bill of bars and bar bend details.

Name on Palette	Block Name	Description	Scale Key	Dynamic	Attributes	Last Updated
Rebar Section	DOT	Rebar Schematic - Dot	A			
Deck Bar Callout	BAR_ANNO	Callout for rebar, usually used in super-structure plan	A	✓	✓	
Stirrup	BAR_STIRRUP	Rebar stirrup detail	A	✓		2024-01-3
U-Bar	BAR_U	U-bar stirrup detail	A	✓		2024-01-3

Name on Palette	Block Name	Description	Scale Key	Dynamic	Attributes	Last Updated
Rotated Stirrup a& U-Bar	BAR_STIRRUP2	Rotated stirrup detail	A	✓		2024-01-3
L Bar	BAR_L	Bent bar detail	A	✓		2024-01-3
Development Lap	BAR_LAP	Development lap between two bars	A	✓		2024-01-3
Hooked Bar	BAR_HOOKED	Hooked bar detail	A	✓		2024-01-3
Parapet Bars	BAR_PPT	Rebar detail for standard parapets	A	✓		
Rebar Sketch	BAR_SIZES	Rebar plan design sketch	A	✓		2023-01-2
Bill of Bars	BILL_OF_BARS	Bill of bars table	A	✓		2024-07-1
Bundling Detail	BAR_BUNDLE	Standard detail for bundled bars	A			
All Bar Bends	BAR_BENDS	Large block with all types of bar bends	A			2024-03-2
L Bar	BAR_BEND_L	Simple bent bar detail	A		✓	2024-03-2
Stirrups	BAR_BEND_STIRRUP	Stirrup bar bend detail	A	✓	✓	2024-03-2
U Bar	BAR_BEND_U	U-bar stirrup bend detail	A	✓	✓	2024-03-2

Name on Palette	Block Name	Description	Scale Key	Dynamic	Attributes	Last Updated
Spiral	BAR_BEND_SPIRAL	Spiral bar bend detail	A		✓	2024-03-2
Z Bar	BAR_BEND_Z	Z bar bend detail	A		✓	2024-03-2
Hook	BAR_BEND_HOOK	Hooked bar bend detail	A		✓	2024-03-2
Double Hook	BAR_BEND_HOOK2	Hooked bar bend detail	A		✓	2024-03-2
Hairpin	BAR_BEND_HAIRPIN	Hooked hairpin bar bend detail	A		✓	2024-03-2
Hooked Hairpin	BAR_BEND_HAIRPIN2	Hairpin bar bend detail	A		✓	2024-03-2
135 Bend	BAR_BEND_135	135 degree bar bend detail	A		✓	2024-03-2
Hat	BAR_BEND_HAT	Hat bar bend detail	A		✓	2024-03-2
Abut Diaphragm	BAR_BEND_DIAPHRAGM	Abutment diaphragm stirrup bar bend detail	A		✓	2024-03-2
32SS Bars	BAR_BEND_32SS	Bar bend details for 32SS concrete parapet	A		✓	2024-03-2

Name on Palette	Block Name	Description	Scale Key	Dynamic	Attributes	Last Updated
36SS Bars	BAR_BEND_36SS	Bar bend details for 36SS concrete parapet	A		✓	2024-03-2
42SS Bars	BAR_BEND_42SS	Bar bend details for 42SS concrete parapet	A		✓	2024-03-2
56SS Bars	BAR_BEND_56SS	Bar bend details for 56SS concrete parapet	A		✓	2024-03-2

Superstructure blocks #super

The blocks on the [Super Palette](#) are for detailing bridge superstructures. Steel shapes required to detail girders or diaphragms are on the Steel palette.

Name on Palette	Block Name	Description	Scale Key	Dynamic	Attributes	Last Updated
Prestressed Shapes	PS_GIRD	Prestressed girder sections	A1	✓		
Prestressed Girder Plan	PS_GIRD_PLAN	Prestressed girder Plan	A1	✓		2024-03-2
Haunch Details	HAUNCH	Section through prestressed girder haunch	A	✓	✓	2024-03-2
Shear Con-	GIR_STUD	Section	A			

Name on Palette	Block Name	Description	Scale Key	Dynamic	Attributes	Last Updated
Section Detail		through steel girder haunch				
Transportation Note	TRANSGIRD	Note for transporting prestressed girder	A			
Section Thru Slab	SLAB_SECTION	Section through concrete slab structure	A		✓	2024-03-2
Section Thru Slab with Paving Notch	SLAB_SECTION_NOTCH	Section through concrete slab structure with paving notch	A		✓	2024-03-2
Deck Section	DECK_SECTION	Rebar detail in deck	A	✓	✓	2023-01-2
Joint Detail	DECK_JT	Deck joint detail	A			
Median Details	MEDIAN	Detail for new sloped and curved medians, and curb repair	A	✓		
Polymer Overlay Transition	DECK_POLYMER_TRANS	Polymer overlay transition	A	✓		2023-09-0
Floor Drain	DRAIN_FLOOR	Plan view of deck drain	A1	✓		

Name on Palette	Block Name	Description	Scale Key	Dynamic	Attributes	Last Updated
Strip Seal Elevation	STRIP_SEAL	Elevation of joint strip seal	A1	✓		
V-Groove Note	DECK_VGROOVE	Note and symbol for drip groove under edge of deck	A	✓		
Deck Bar Callout	BAR_ANNO	Callout for rebar, usually used in superstructure plan	A	✓	✓	
TOD Elevation Table	TOD	Table for up to 3 span girder bridges	D	✓		2024-01-3
Deflection Diagram	DEFLECTION	Deflection diagram for up to 6 span girder bridges	D			2024-01-3
Tangent Offset Table	TANOFF	Table for offsets to tangent of alignment	D			2024-01-3

Barrier blocks #barrier

The blocks on the [Super Palette](#) are for detailing standard traffic barriers, fences, and lighting.

Name on Palette	Block Name	Description	Scale Key	Dynamic	Attributes	Last Updated
Barriers	BARRIERS	Sections through standard barriers	A1	✓		2023-05-0
Parapet Transition	PPT_TRANSITION	Plan view of parapet end transition for SS parapets	D1	✓		2024-01-3
Beam-guard Anchor Assembly Detail	BEAMGUARD_ASSEMBLY	Anchor assembly for concrete parapets	A			2023-09-0
Fence and Railing	FENCE_CHAIN_LINK	Section for standard fences and railings not meant to stop traffic	A1	✓		
Light	LIGHT	Light post elevation	D1			2024-01-3

Steel blocks #steel

The blocks on the [Steel Palette](#) include piles, structural steel shapes, bolts, and other steel details.

Name on Palette	Block Name	Description	Scale Key	Dynamic	Attributes	Last Updated
CIP Piles	CIP_SHAPES	Plan view of CIP Piles	A1	✓		
HP Piles	HP_SHAPES	Plan view of HP Piles	A1	✓		2022-02-15

Name on Palette	Block Name	Description	Scale Key	Dynamic	Attributes	Last Updated
Sheet Pile	SHEET_PILE	Single sheet pile pattern, for when the Eshtplg line-type can't be used	A1			2023-05-03
Pile Elevations	PILE_ELEV	Elevation of common sub-structure supports. To be used with A1 Abutment Section	A	✓		
Angle	ANGLE	Steel angle (L) shapes	A1	✓		
Channel	CHANNEL	Steel channel (C) shapes	A1	✓		
HSS	HSS	Steel tube (HSS) shapes	A1	✓		
MC Channel	MC_CHANNEL	Steel channel (MC) shapes	A1	✓		
Pipe	PIPE	Steel pipes	A1	✓		
WF Beam	WF_BEAM	Steel wide flange beam (WF) shapes	A1	✓		
Bolt Plan	BOLT_PLAN	Plan view of steel bolt	A1	✓		
Bolt Elevation	BOLT	Elevation of bolt with nut and washer	A1	✓		

Name on Palette	Block Name	Description	Scale Key	Dynamic	Attributes	Last Updated
Anchor Rod	ANCHOR_ROD	Elevation of anchor rod	A1	✓		
Washer	WASHER	Plan view of washer	A1	✓		
Girder Stud	STUD	Elevation of stud for steel girders	A1	✓		
Rocker Bearing	ROCKER	Steel rocker bearing elevation	A			
Strip Seal Elevation	STRIP_SEAL	Elevation of joint strip seal	A1	✓		
Weld Symbol	WELD	Used to annotate welds	A	✓	✓	

Culvert blocks #culvert

The [Culvert Palette](#) includes blocks specific to concrete box culverts.

Name on Palette	Block Name	Description	Scale Key	Dynamic	Attributes	Last Updated
Design Data and General Notes	CULDATA	Standard notes shown on the right side of the general plans	D			2023-09-08
Backfill Note	CULBFNOTE	Standard note for backfill behind	D			2024-01-31

Name on Palette	Block Name	Description	Scale Key	Dynamic	Attributes	Last Updated
		wings				
Backfill Details	CULBF	Backfill details for box culverts	D	✓		2023-05-03
Misc. Notes	CULNOTE	Standard notes about culvert joints and breaker run undercut	D			2024-01-31
Header Bars	CULBAR	Bar bend details for culvert header stirrups	A	✓	✓	
Header Detail	CULV_HEADER	Section through culvert header (and footer)	A	✓	✓	2024-03-20
Joint Detail	CULV_JT	Vertical joint between culvert barrel and apron	A	✓	✓	2024-07-17
Cut Off Wall Detail	CULV_CUTOFF	Section through apron wings and cutoff wall	A	✓	✓	2022-02-15
Inlet Nose Details	CULINLET	Inlet nose details for multi-cell culverts	A	✓		2023-01-25
Name Plate Detail	CULV_NAME_PLATE	Detail for name plate on culvert wing	A	✓		

Retaining wall blocks #wall

The [Wall Palette](#) includes blocks specific to mechanically stabilized earth (MSE) retaining walls.

Name on Palette	Block Name	Description	Scale Key	Dynami-c	Attrib-utes	Last Update-d
Design Data	WALL_DATA	Standard notes shown on the right side of the general plans	D			
General Notes and Data Table	WALL_NOTES	Retaining wall general notes and design/geometry data tables	D			2022-11-02
MSE Wall Typical Section	WALL_SECTION	Typical section thru MSE wall	D	✓		2024-09-11
Elevation Detail	WALL_EL	MSE panel wall elevation	A	✓		
Joint Detail	WALL_JT	Detail for joint in MSE wall coping	A	✓		
Name Plate	WALL_NAME_PLATE	Detail for name plate on MSE wall coping	A			
Coping Section	WALL_SECTION_COPING	Section thru standard MSE wall coping	A1			2024-09-11
Anchor Slab Section	WALL_SECTION_SLAB	Section thru standard MSE wall anchor slab	A1			2024-03-20

Miscellaneous blocks #misc

The [Misc. Palette](#) includes blocks for structural approach slabs, subsurface exploration sheets, and a viewport outline guide.


Name on Palette	Block Name	Description	Scale Key	Dynamic	Attributes	Last Updated
Typical Section	STRUCT_APPROACH	Section through structural approach slab	A	✓		2024-03-20
Gird	GT_GRID	Grid for subsurface exploration	D		✓	2024-01-31
Boring Table	GT_BORING_TABLE	Boring table for subsurface exploration	D			2024-07-17
Outline	VIEWPORT	Outline for structures sheet border	A			

Structures external references

Last updated: 2024-05-03

Overview

An external reference (Xref) inserts the entire contents of another drawing into the current drawing as a display-only object. For more information about Xrefs, see the External references or Blocks and external references pages.

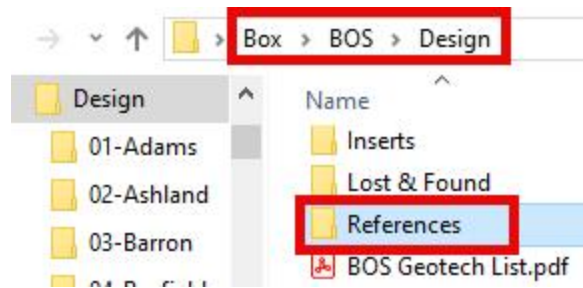
 **Requirement:** Almost all drawings with external references should be using a **struct-decimal-start** template. For more information see the Structures Drawing Templates page.

Bureau of structures reference file structure

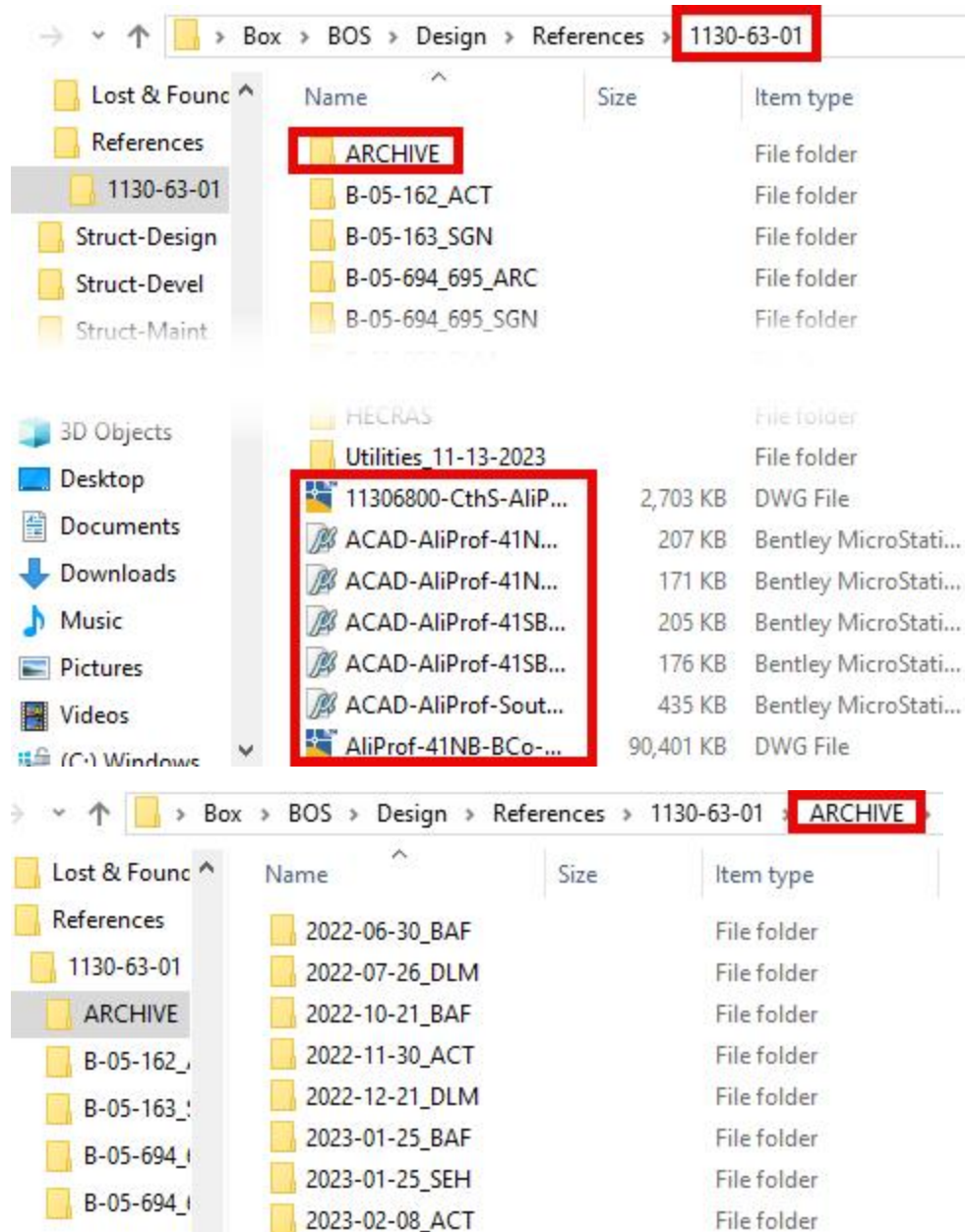
WisDOT only: This section is for **Bureau of Structures** staff only.

Bureau of Structures reference files are located in **C:\BoxDrv\Box\BOS\Design\References**

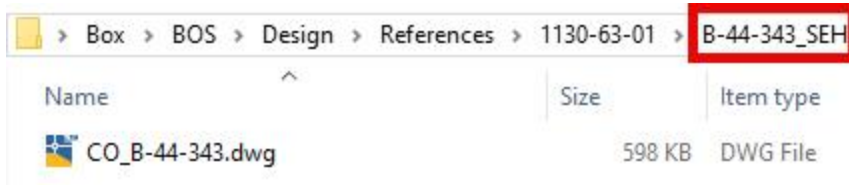
Structures external references




References are organized by Project ID so structures in the same project can share references. The latest version of each reference file should be placed in the root of the project folder. Previous versions of reference files should be placed in the Archive folder, organized by date received.



Each structure layout file is placed in its *own* folder within the project references folder. For more information, see the "Structures layout file" on page 143 page.



Attach an external reference

 **Requirement:** All Xrefs should be attached when UCS is set to **WCS**. For more information see the "Structures coordinate systems" on page 139 page.



Info:

- Rotation of view will not impact the proper insertion of the reference.
- References in LAYOUT & GEO templates are Global Coordinate Correct
- References in DETAIL templates are not globally correct (12x too small)
 - Because Structure Layout files are drawn in the LAYOUT & GEO template (aka 1 unit = 1 foot), scaling up by 12 is required for proper functionality within the DETAIL template.
 - For more information, see the Using References in a Details Template section below.

1. **Ribbon > WisDOT [***] tab > Manage panel > Xref Tools dropdown > Load Xref on Layer**

For more information, see Xref tools - Load Xref on Layer.

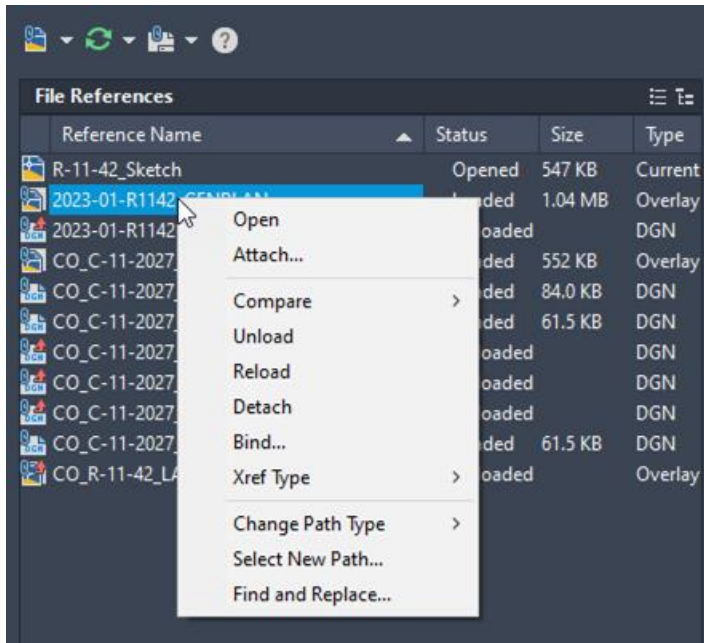
2. Select the reference file in the Select Reference File Dialog box and click **Open**



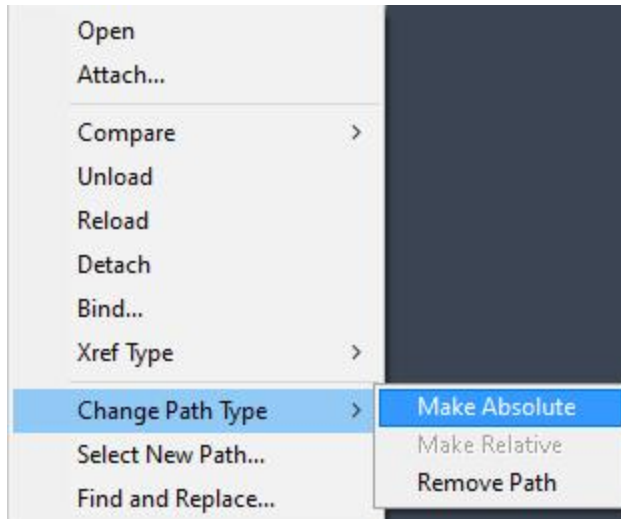
Info: By default, references are loaded with relative paths, which means the reference will break if the drawing is moved without the reference. See the "External references #palette" below section for more information about changing the path type.

External references #palette

1. To access the External References palette type **XREF**
Alternatively, **Ribbon > Insert tab > References panel > \ (flyout)**
2. The Xref palette will have the current drawing as the only reference if there are no references in the drawing.
3. If there are references in the drawing, **Right-Click** to pull up additional options.



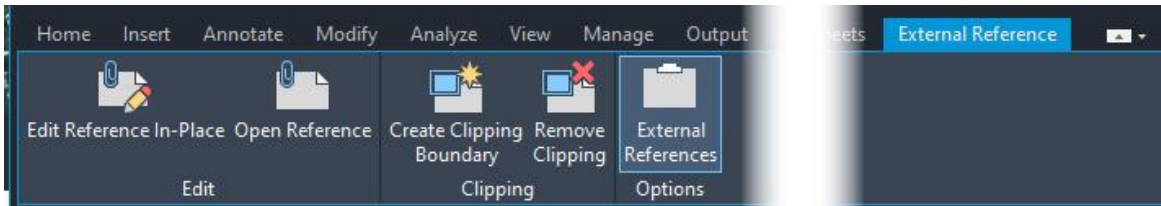
- **Unload** - removes the reference from the file so it is not visible and does not load when the file is opened, but is still listed in the Xref palette.
- **Detach** - removes the reference from your drawing and the Xref palette
- **Bind...** - inserts the Xref data into your drawing file, so it will be visible even if the Xref file is moved or deleted.
- **Change Path Type**
 - **Absolute** references will stay attached even if you move the drawing to a different location
 - **Relative** references will stay attached when you move the drawing and reference together



Warning: after binding a reference, it's not possible to reattach another copy of the reference. You will need to **PURGE** or **RENAME** the bound reference first.

Manipulating external references

1. Click on an external reference in the drawing to select it. The entire Xref highlights because it is all one entity.
2. The Contextual ribbon changes to the **External Reference** tab.



3. Xrefs scale, move, copy, rotate, etc. just like other objects using the standard commands.
4. External references can be edited using the **Edit Reference in Place** command.

Warning: Saving changes while editing a reference in place will save the referenced file.

Create clipping boundary

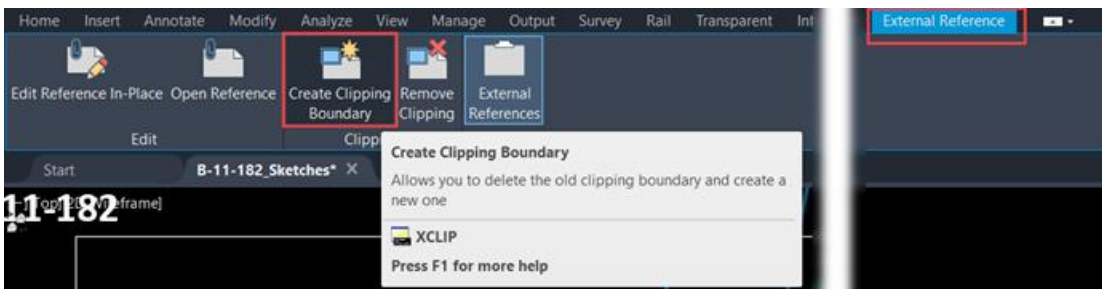
1. Xrefs can be clipped to clean up the drawing and reduce the linework shown within a the drawing.



Requirement:

- If the final drawing will be rotated, follow the steps in the Structures Coordinate Systems page first.
- The reference layer needs to be unlocked before it can be clipped. Xrefs attached with the Load Xref on Layer tool will be locked by default.

2. Create a closed shape to define the clipping boundary. This can be done using the command **RECTANG** or by creating a closed polyline (PLINE)
3. In Model space select the Xref drawing to be clipped
4. **Ribbon > External Reference tab > Clipping panel > Create Clipping Boundary**



5. Type in commandline **S** for Select polyline.

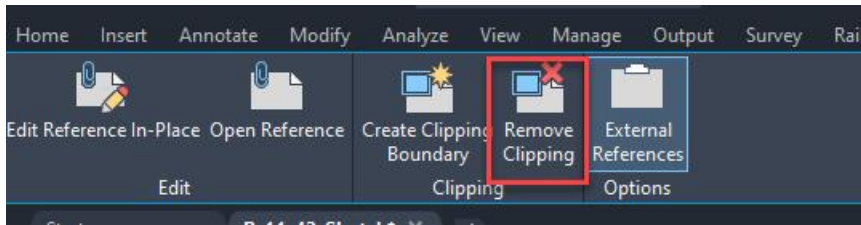


6. Select the shape created to define the clipping boundary.

Remove clipping boundary

1. In Model space select the clipped Xref drawing.
2. **Ribbon > External Reference tab > Clipping panel > Remove Clipping**

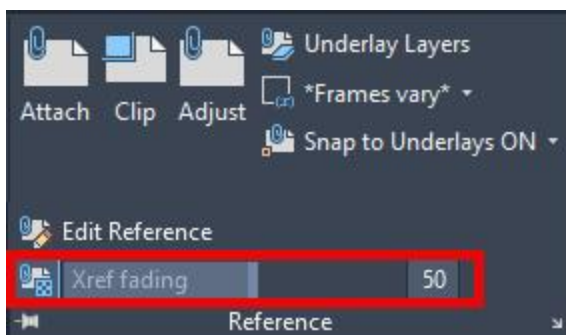
Structures external references



Xref fading

The `XDWGFADECTL` system variable controls the dimming for all DWG Xref objects. It can be set to 0 for no fading up to 90 for 90% faded.

1. **Ribbon > Insert tab > Reference panel pulldown > Xref fading**



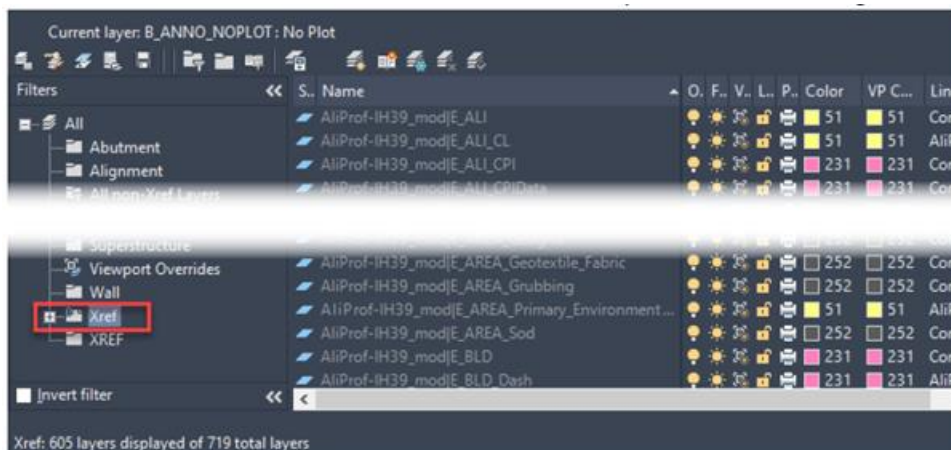
2. Use the slider to control the fading percent.

Info: The Xref fading controls how Xrefs appear in the drawing, but it **does not** change how they print.

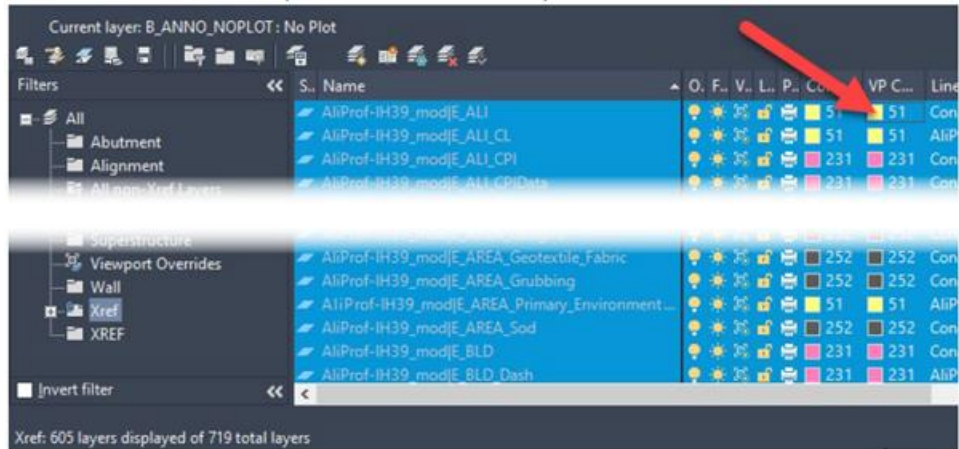
Xref ghosting

Xrefs come in "faded" by default, causing them to appear as dark gray in a viewport. This does NOT mean it will plot gray. Use the following steps to change the plot color of an Xref.

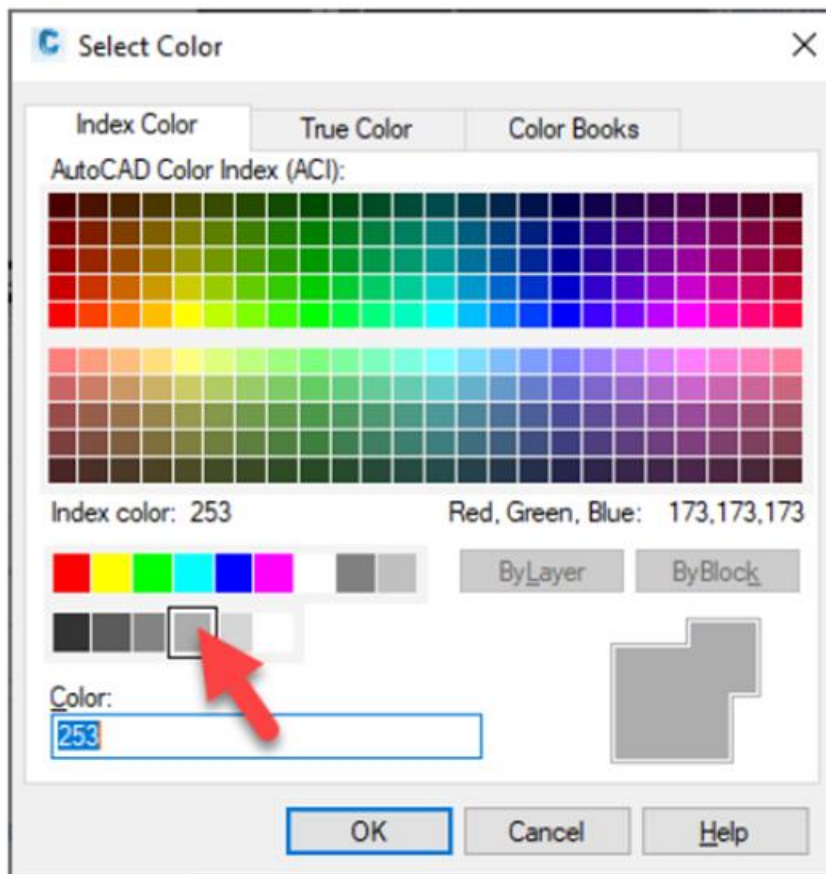
1. In a Sheet Layout, double click inside a viewport to enter it and make changes.
2. **Ribbon > Home tab > Layers panel > Layer Properties**
 - A. Select the Xref filter to choose all Xref layers, or select the specific Xref to change.



- B. Select all the layers in the layer list (Ctrl+A)
 C. Click on the VP Color option of one of the layers.



- D. Change the color to **253** or any other plot color that will print the desired shade of gray.



Info: For more information about plot colors, including information about different shades of gray, see the "Structures template plot colors" on page 97 page.

- E. **OK**
 3. Plot or **Print Preview** to view the changes.

Using references in a details template

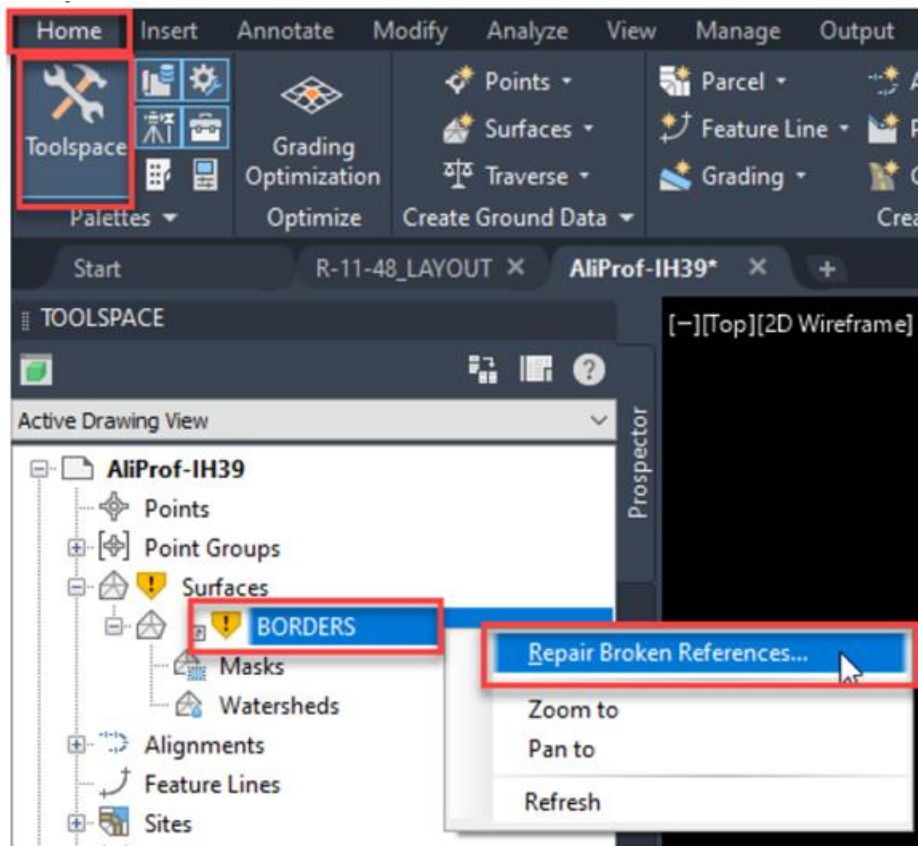
Structures external references

1. **ATTACH** a Structure Layout file as an Xref (and alignment or other references if desired).
2. **INSERT** North Arrow block near structure for reference.
3. Use the **COPY** command to duplicate the Xref.
4. Use the **SCALE** command to scale the Xref up by 12
5. Use the **MOVE** or **ROTATE** commands as needed to position the scaled up copy of the references where desired.

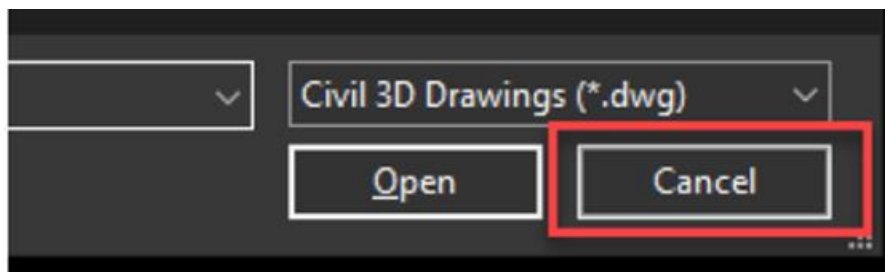
Xrefs with surfaces

When working with some files from roadway, they may contain surfaces with broken lines. Follow the steps below to remove them.

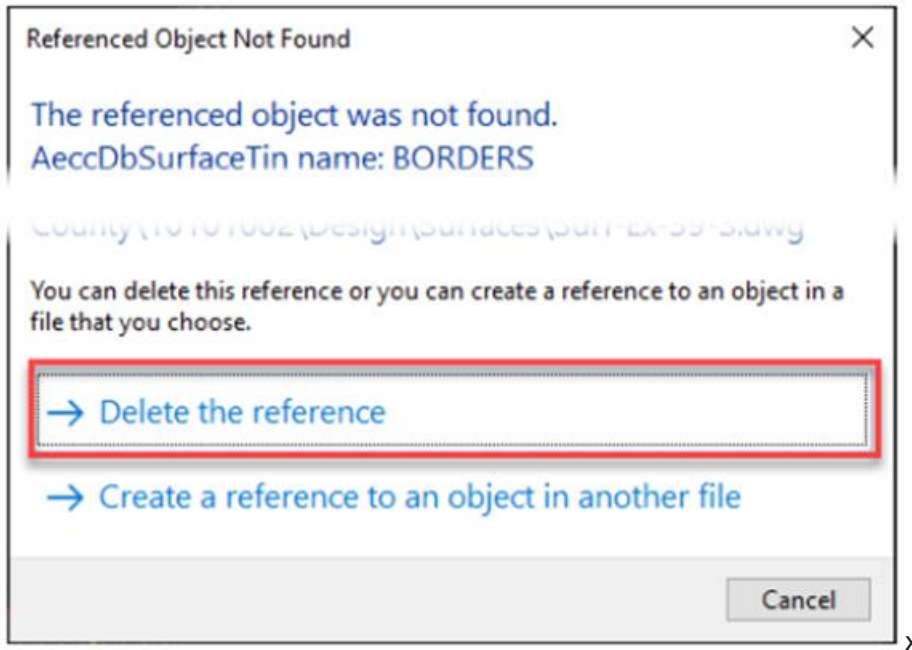
1. Open the roadway file.
2. **Ribbon > Home tab > Palettes Panel > Toolspace**
3. Drill down in the tree where the warning sign is, **Right-Click** on the surface, and choose **Repair Broken References...**



4. An Open dialog box will show up. **Cancel**



5. A warning window should pop up. **Delete the reference**



6. **Save and Exit.**

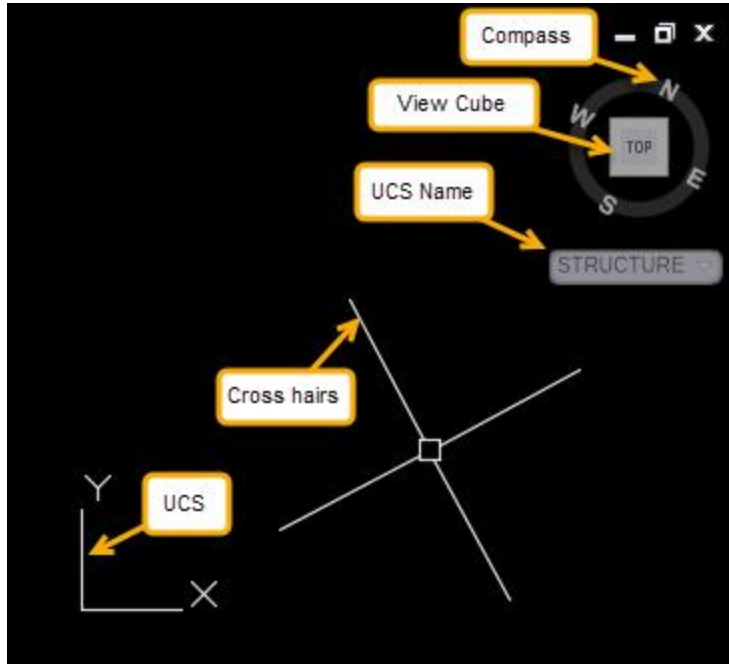
Structures coordinate systems

Last updated: 2024-05-01

Overview

When drawing a layout or geotechnical plan with coordinate-correct references and drawings, it is often necessary to use a rotated coordinate system.

View control user interface



- **Compass** - shows where global North is
- **View Cube** - Show Current UCS rotation relative to current view
- **UCS Name** - name of current UCS
 - **WCS** - World Coordinates (globally correct)
 - **Unnamed** - “unsaved” custom UCS
 - **STRUCTURE** - “saved” custom UCS
- **Crosshairs** - Show orientation of unrotated text/dimension relative to view
- **UCS** - show X & Y definition. Always correlates to View Cube

✓ **Requirement:** All coordinate-correct drawings should use a **struct-decimal-start** template. For more information see the Structures Drawing Templates page.

✗ **Warning:** Changing the UCS also changes the location of coordinate 0,0 with respect to the World Coordinate System (WCS). All XREFs should be attached when UCS is set to **WCS**.

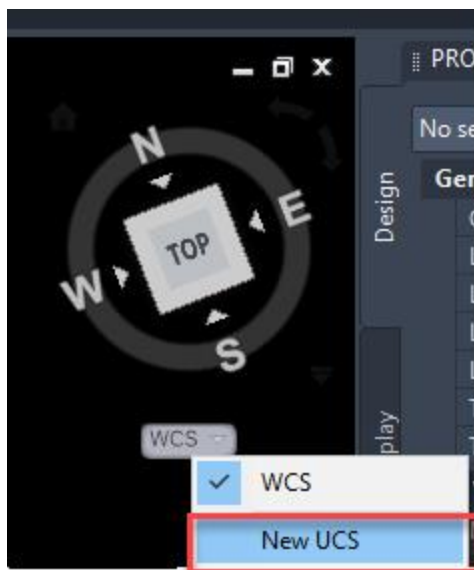
i **Info:** Rotation of view will not impact the proper insertion of the reference.

Create UCS for structure

1. Use the Rotate View tool to rotate the view to align with the structure.
2. Type **UCS** at the command line
 - A. Alternatively:
 - I. Below the **View Cube** click the **down** arrow next to **WCS**



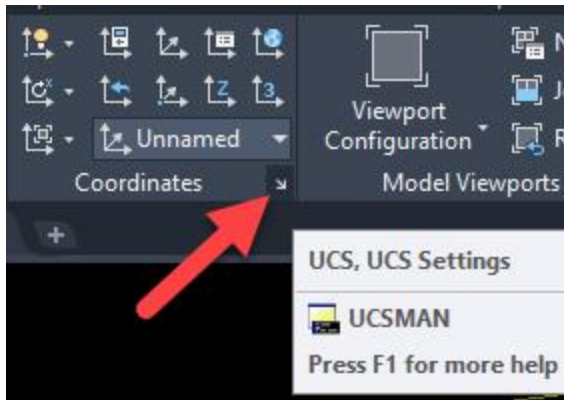
- II. Choose **New UCS**



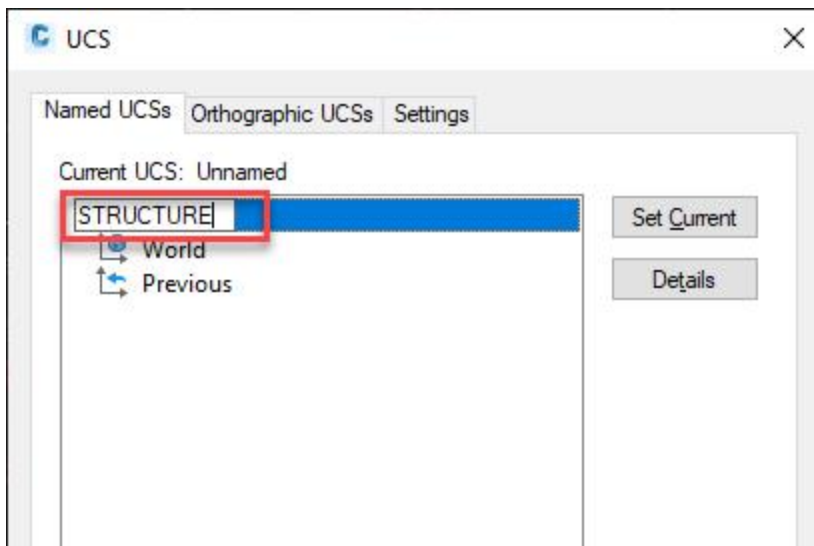
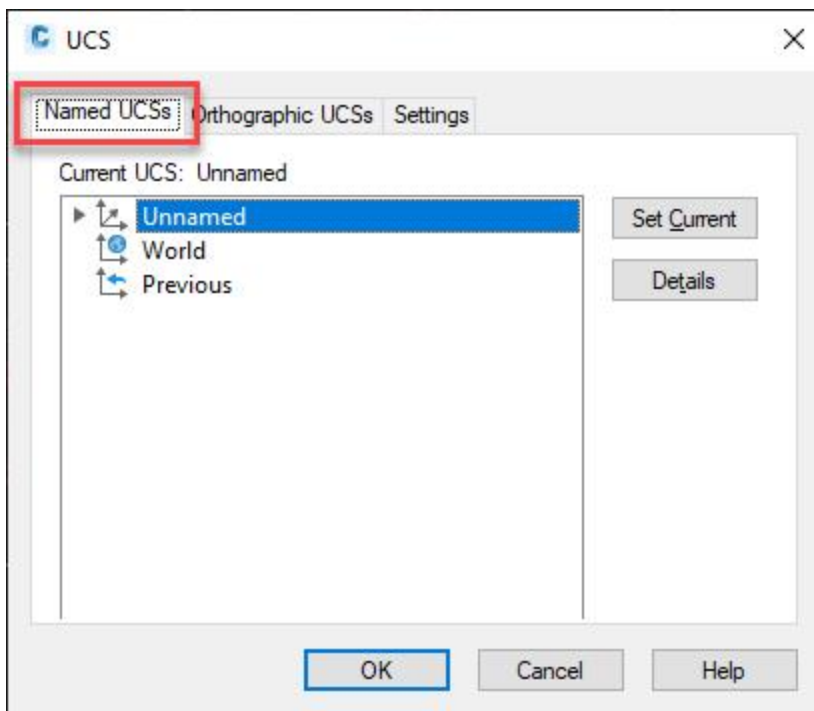
3. Create new UCS using the **View** option.




4. Open the UCS Manager with **Ribbon > View Tab > Coordinates panel > bottom right arrow** (or **USCMAN**):



5. In the **Named UCSs** tab, click on **Unnamed** and rename it to **STRUCTURE**.



6. 

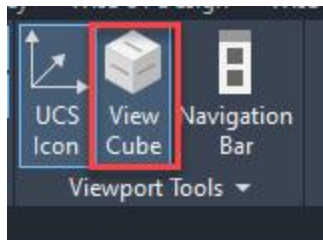
 **Requirement:** All dimensioning and annotating should be completed with the **STRUCTURE UCS** active.

Reset crosshairs orthogonal to view

1. Type the commandline **SNAPANG**
2. Type **0**

Toggle between UCSs


1. If it is not currently displayed, turn on the **View Cube**.
 - A. **Ribbon > View tab > Viewport Tools panel > View Cube**



2. UCS can be toggled at any point in time using the drop-down below the **View Cube**.



3. Match view rotation to the active UCS using the **UCS** command.

 **Warning: Known Bug:** If you are using a named view (not WCS) it will change to "Unnamed" when you go between paper space and model space. You can either ignore this or set the view back to your named view. The unnamed view is a copy of your named view, so it's OK to leave it.

Structures layout file

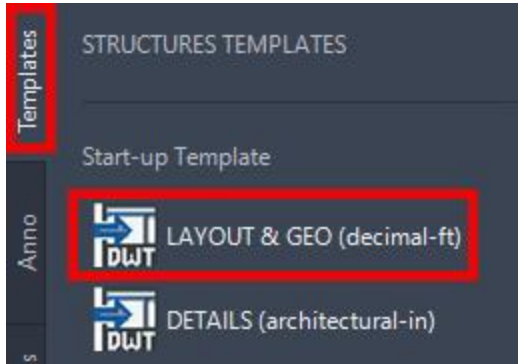
Last updated: 2024-05-03

Overview

Structures layout files are coordinate-correct plan drawings that outline the shape of the structure. They are used as reference drawings for roadway drawings and subsurface exploration sheets.

Creating a structures layout file

1. Open the Structures Palette .
2. Create a new file from the Layout and Geo template.
Templates Palette > LAYOUT & GEO (decimal-ft)



3. **SAVE** the file.
 - A. **Bureau of Structures** should save layout files to **C:\BoxDr-\vBOS\Design\References\Design_ID\X-XX-XXXX_ABC** folder. for more information about the Bureau of Structures reference folder structure, see "Structures external references" on page 131 page.
 - B. Use the naming convention **CO_X-XX-XXXX_LAYOUT.dwg** for the drawing filename.
4. Attach all needed files using the Load Xref on Layer tool. For more information, see the "Structures external references" on page 131 page.
5. Use the Rotate View tool to rotate the view.
6. Create a structure UCS by following the instructions on the "Structures coordinate systems" on page 139 page.
7. Draw the structure outline. It can be drawn all on one layer (e.g. **B_CONC**) or on multiple layers. For more information, see the "Structures template layers" on page 89 page.



Warning:

- No dimensioning or text should be placed in the layout file. This file will be sent to roadway and geotech, and can be used as a reference in other plan drawings or sketches.
- **Detach** all references before sending the layout file outside of the Bureau of Structures.

Structures sheet layouts and viewports

Last updated: 2024-05-03

Total video time: 04:15

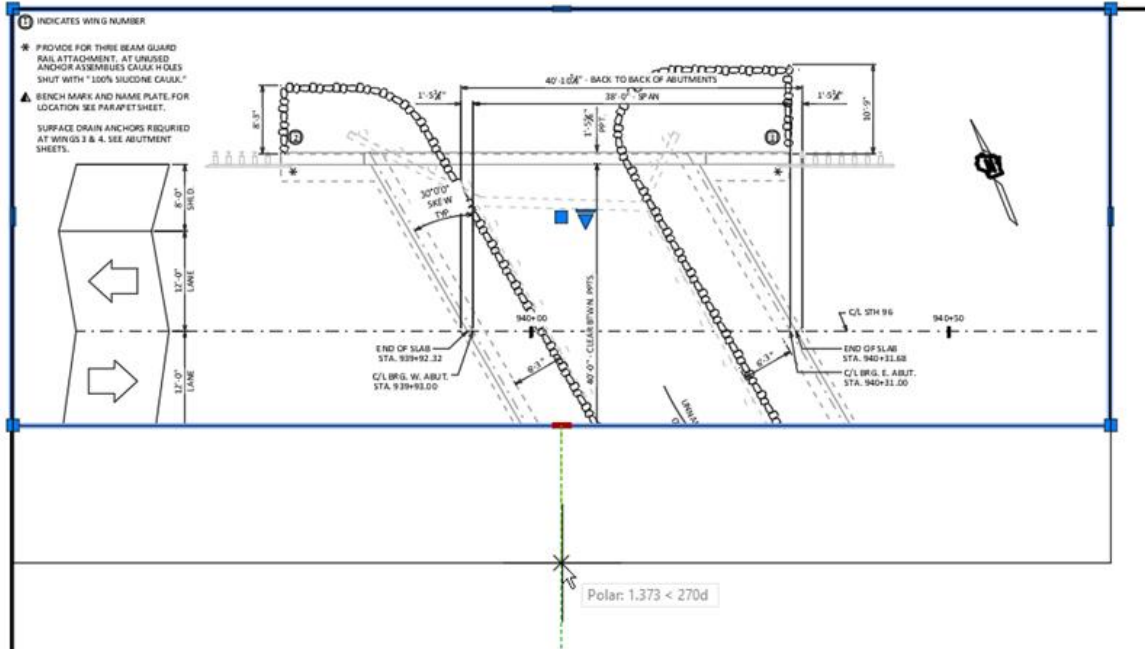
Overview

A sheet layout is a 2D working environment for creating drawing sheets. Layout viewports are objects that display views of model space. On each layout, you can create one or more layout viewports. For more information about structures sheet layouts, see the Structures Drawing Templates section of the Structures Drawing Templates page. For more information about viewports including a video tutorial, see the Model space viewports page.

Set up a viewport with the proper size

Requirement: Before creating or editing a viewport, you must create a sheet layout. See the Structures Drawing Templates section of the Structures Drawing Templates page for more information.

1. In the sheet layout paper space, resize the existing viewport to the intended size by selecting the viewport border and dragging the snap points to the desired locations.



Info: The default viewport provided with the structures sheet layout templates uses a polyline border instead of a rectangular border. This means that vertices can be easily added or removed to change the shape of the viewport. Tip: Viewports can be moved, scaled, and manipulated just like any other element.

2. Double click inside the viewport to activate it. Zoom Extents (ZE) to show all details in model space. Now zoom again with a window around the intended detail (ZW). The detail will be shown in the activated viewport. Double-click outside the viewport to deactivate it.

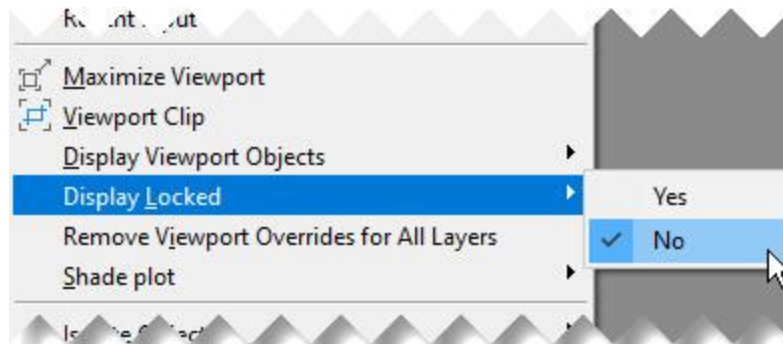


3. Once you have the correct zoom and viewport size, select the viewport and lock it to avoid any future unintentional changes using one of the methods below.

- **Status bar > Lock**



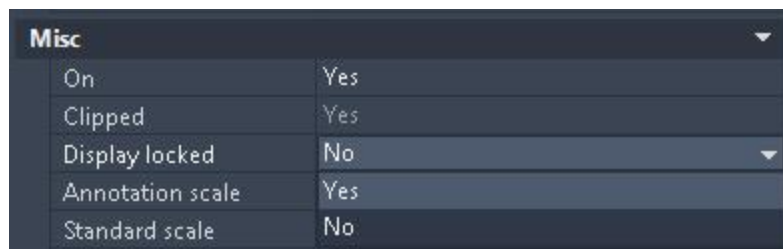
- **Right-click > Display Locked > No**




- Ribbon > Layout tab > Layout Viewports panel > Lock (flyout) > Lock



- Properties palette > Misc section > Display Locked > Yes



 **Tip:** The location/size/zoom of the viewport can be changed at any time. But the annotation scale might need to be updated accordingly as described in the following section.

Pick the best annotation scale for the viewport #anno

1. Select the viewport and read its current scale in the lower right corner of the window. The example in the image below has a scale of **0.318718**.



2. Use the tables on the "Structures template annotation scales" on page 103 page to find the closest annotation scale for the current viewport scale. **Requirement:** Be sure to use the correct table for your drawing template (i.e. Layout & Geo or Details templates)
 - A. For the current scale in the example above, the annotation scale is between **3.00** and **4.00**. We can try both scales to see which looks better, or create a custom scale between **3.00**

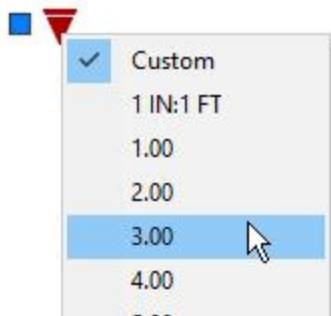
and 4.00. For this example we will use the scale 3.00.

Layout (Decimal-Feet) Template

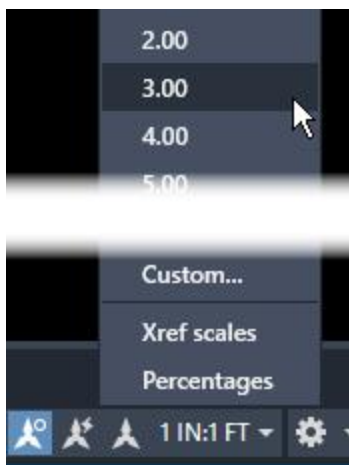
Name	1 paper Inch = [X] drawing Feet	Viewport Decimal
1.00	1	1.0000
2.00	2	0.5000
3.00	3	0.3333
4.00	4	0.2500

3. Change the viewport to use the annotation scale (3.00 in this example) by using the drop-down arrow next to the current viewport scale. You can also use the arrow in the center of the viewport to change the annotation scale.

 **Requirement:** Make sure the viewport is unlocked first.

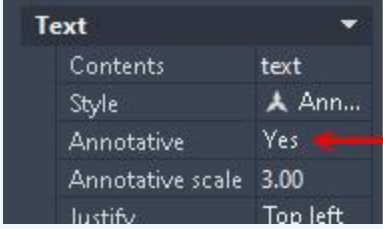


4. Switch to **Model Space (MODEL)** and make sure the annotation scale matches your viewport annotation scale. All annotations drawn going forward will use this scale.



5. If you already have annotation in the detail shown in the viewport, you can update the scale by selecting the details and using the Fix Annotation Scales tool.

Info: If the **Fix Annotation Scales** tool does not work, make sure the elements are set to **Annotative** in the properties palette.



Text	
Contents	text
Style	Ann...
Annotative	Yes
Annotative scale	3.00
Justify	Top left

Warning: The **Fix Annotation Scales** tool works only on annotative objects, not blocks or symbols. They will need to be resized or reinserted when the scale changes.

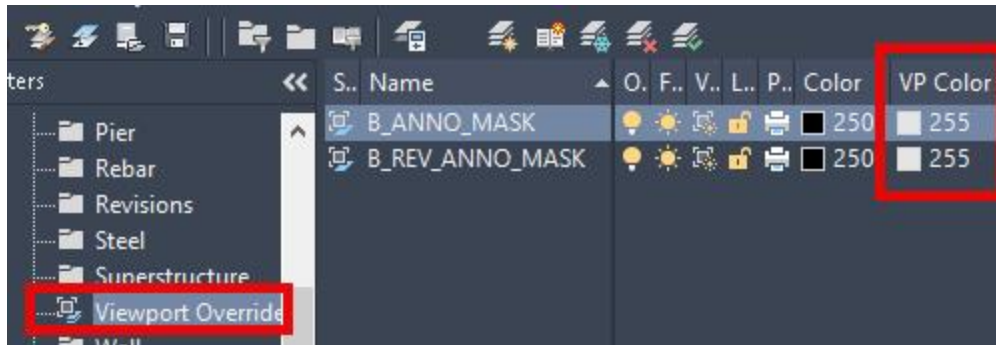
Tip: If there are no annotations visible in the viewport (or if some annotations are missing) toggle the Annotation Visibility button (**ANNOALLVISIBLE 1**). When the annotation visibility is set to **0** any annotative elements that don't match the viewport annotation scale will be hidden.



Set up multiple viewports with different scales on one sheet layout

Viewports can be copied and pasted to create more viewports with different scales on one layout sheet. The location, size, and zoom/annotation scale can be changed based on steps provided in the previous sections.

Info: Using **Insert View** from either the **Layout** or **Layout Tools** tabs on the ribbon to create a new viewport will not create the viewport overrides required for the two structures mask layers. Copying the viewport instead of creating a new viewport from scratch will also copy the viewport overrides. For more information, see the Sheet templates #sheet section of the Structures Drawing Templates page.




Maximize the viewport size

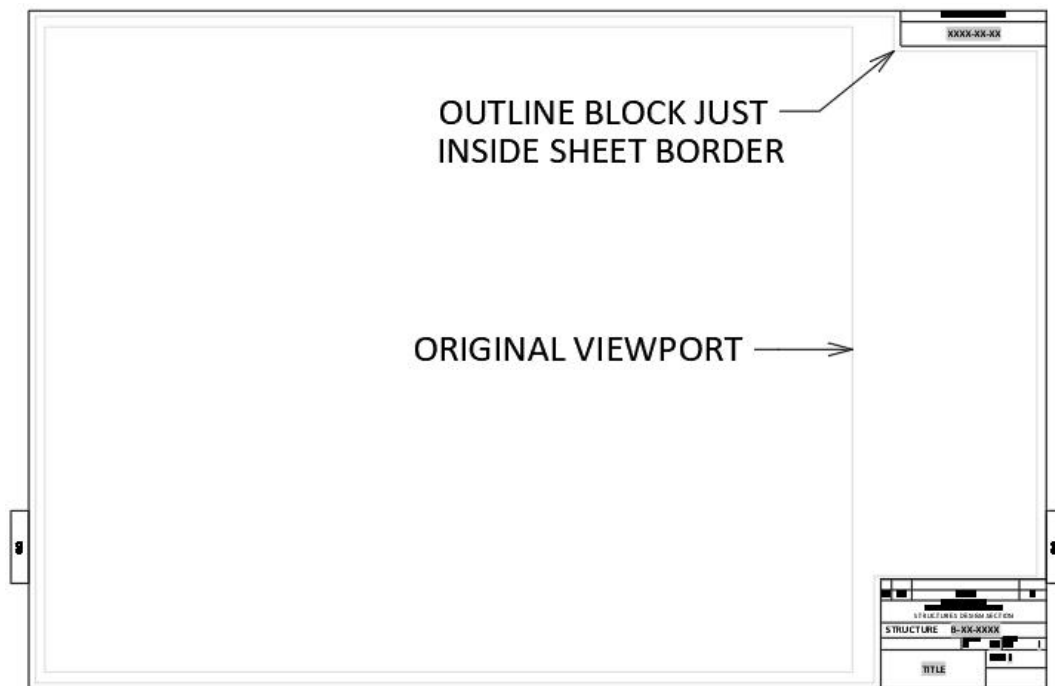
The Structures Palette provides a block to make a viewport that matches the available space in the structures sheet borders.

1. Open a sheet layout.
2. Insert the Outline block.
 - A. **Structures tool palette > Misc. palette > Viewport section > Outline**
 - B. Set the scale to 1/12 with **S_1/12**

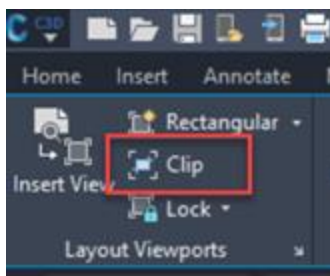
Specify insertion point or [Basepoint Scale Rotate]:
Specify scale factor for XYZ axes <1>: 1/12|

 **Tip:** Scale the outline block slightly smaller than 1/12 to be able to more easily select the viewport outline (instead of the sheet border it is on top of). For example, use a scale of 10/121 or 0.082 instead.

- C. Click the bottom left corner of the sheet border (or slightly inside the sheet border) to place the block.



3. Select the original viewport (not the outline block).
4. **Ribbon > Layout tab > Layout Viewports panel > Clip** Alternatively, **VPCLIP**



5. Select the outline block placed earlier to change the shape of the viewport.

Locate the viewports in model space

There are two ways to show the viewport extents in model space:

1. Trace the viewport outline and move it to model space with **CHSPACE**
 - A. Open a sheet layout with the viewport you want to locate in model space.
 - B. Use a **polyline** to trace the outline of the viewport.
 - C. **CHSPACE**
 - D. Select the polyline and **Enter**
 - E. If there are more than one viewport on the sheet layout, select the viewport you traced and **Enter**



Tip: If the viewport was maximized following the steps in the previous section, the viewport outline block can be placed again and moved to model space.

2. Draw where you want the viewport to be in Model space and then adjust the viewport.

[pln-prod-struct-sht-01.mp4](#) 04:15

- A. In model space, use a rectangle or polyline to draw a border around the detail you intend to put in a viewport. Tip: Alternatively, use the viewport outline block to define the border. The scale you need for the viewport outline block will match the annotation scale you need for the detail/viewport.
- B. Open the sheet layout that should contain the detail.
- C. Using the existing viewport or a new, copied viewport:
 - I. Double click inside the viewport to enter it.
 - II. **ZE** to fit all details in the viewport.



Requirement: Make sure the viewport is unlocked before changing the scale.

- III. Set the annotative scale for the viewport as described in an earlier section. **PAN** and/or Resize the viewport boundary until the correct detail is shown, and then lock the viewport to prevent accidental changes.
- IV. Manipulate the viewport outline so it matches the boundary drawn earlier.
- V. Move the viewport to the desired location in the sheet layout.

Rotating view in viewport

Use the Sheet Tools - Align Viewport sheet tool to rotate the viewport.



Requirement: The model space coordinate system needs to be set to WCS before using this tool. For more information see the "Structures coordinate systems" on page 139 page.

Structures sheet sets

Last updated: 2024-05-03

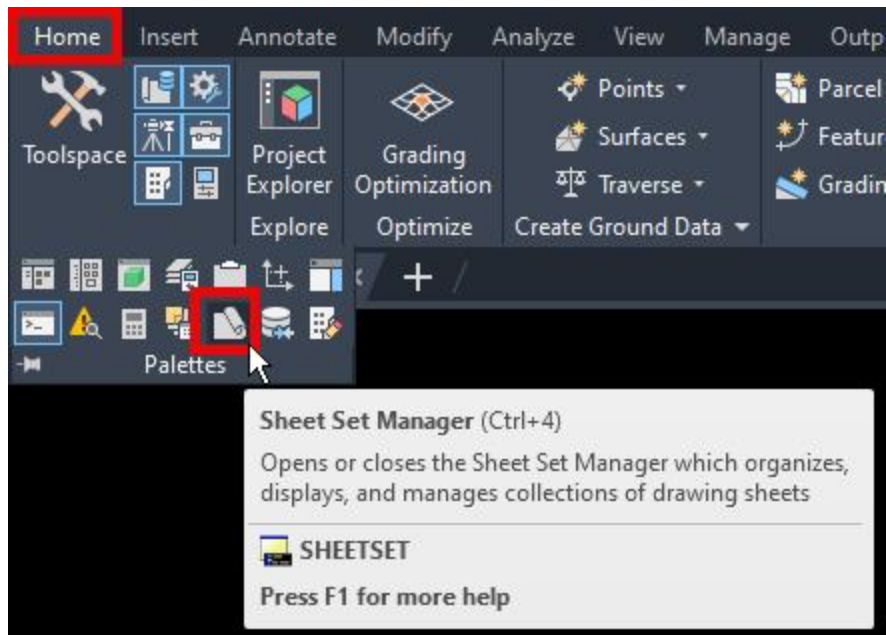
Sheet sets organize sheet layouts and allow common sheet border fields like the structure and project IDs to be updated in one place. They also allow you to quickly rename, reorder, and renumber sheets within the sheet set as well as creating a dynamic sheet list. The Sheet Set Manager also allows you to quickly open and plot sheets within the set or the entire set. For more information about using sheet sets including video tutorials, see the roadway Sheet sets page.

Create new sheet set

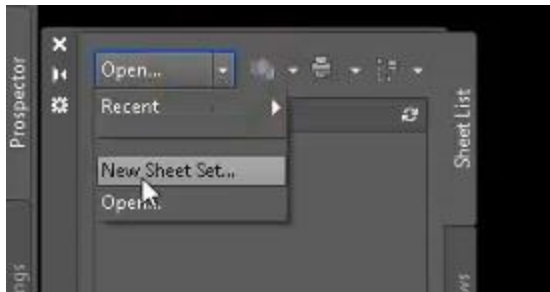


Prerequisite: You must be using a **2024 or later** version of the [WisDOT Civil 3D Standards](#) to use the structures sheet set template.

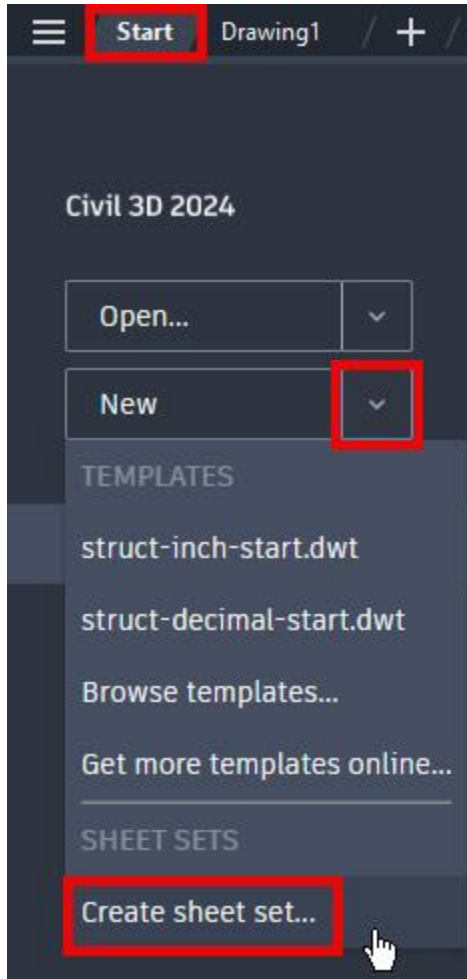
1. Open the **Sheet Set Manager**:
SSM OR Home tab > Palettes > Sheet Set Manager



2. Click **New Sheet Set...** from the drop down menu on the sheet set manager.




- A. Alternatively: from the **Start** page click **Create sheet set...** from the **New** drop down menu.



3. **Begin:** Check **An example sheet set** and click **Next >**
4. **Sheet Set Example:** Select **StructuresSheetData** and click **Next >**
5. **Sheet Set Details:** Name the sheet set and add an optional description. Choose where to save the sheet set. (Probably in the same folder as the project drawings) **The name of the sheet set corresponds to the default name of the plotted plan set pdf.** Click **Sheet Set Properties**

- A. Fill out the **Sheet Set Custom Properties**

 **Tip:** These properties can be edited later if they aren't known now (like the total number of sheets property).

Sheet Set Custom Properties	
County	COUNTY
Design Checked By	XXX
Design ID	
Designed By	XXX
Municipality	NAME
Municipality Type	TOWN/CITY/VILLAGE
Project ID	XXXX-XX-XX
Structure Description	XXXXX OVER XXXXX
Structure ID	B-XX-XXXX
Total Sheets	##

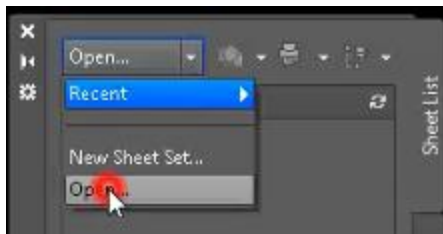
- B. If there is one drafter for all or most of the sheets, fill in the **Drawn By** property of the **Sheet Custom Properties**.

Sheet Custom Properties	
Drawn By	XXX
Plans Checked By	

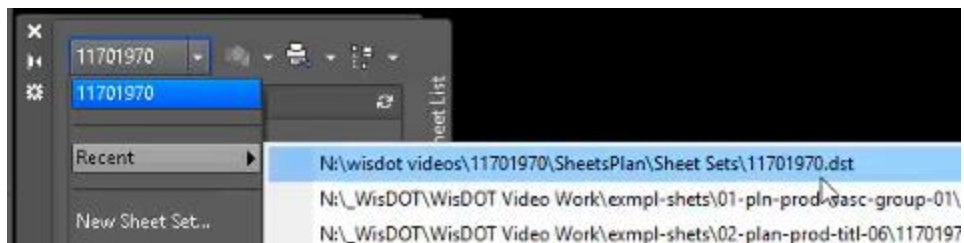
- C. Click **OK**
 D. Click **Next >**
 6. **Confirm:** Click **Finish**

Open existing sheet set


1. Open the **Sheet Set Manager**:
SSM OR Home tab > Palettes > Sheet Set Manager
2. Click **Open...** from the drop down menu on the sheet set manager.



- A. Alternatively use the **Recent** submenu.

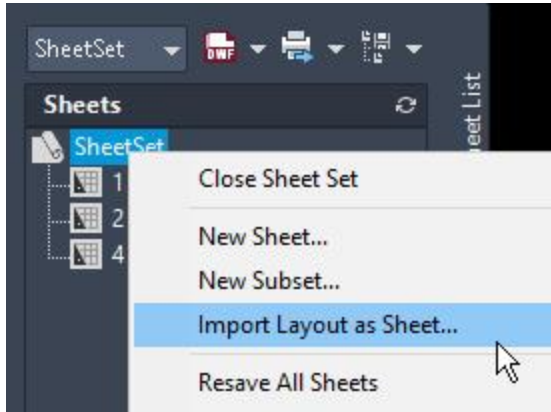


Add sheets to sheet set

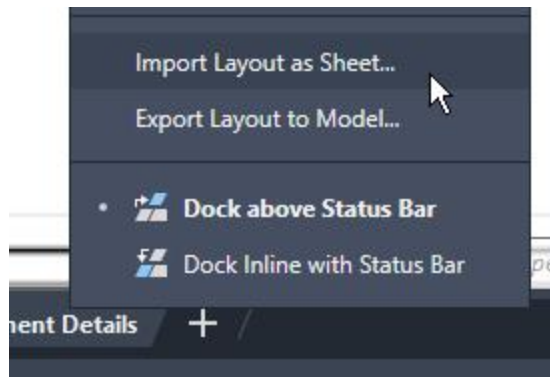
 **Requirement:**

- You must have a sheet set open in the sheet set manager to be able to import the layout.
- Save the drawing you want to import before attempting to import it.

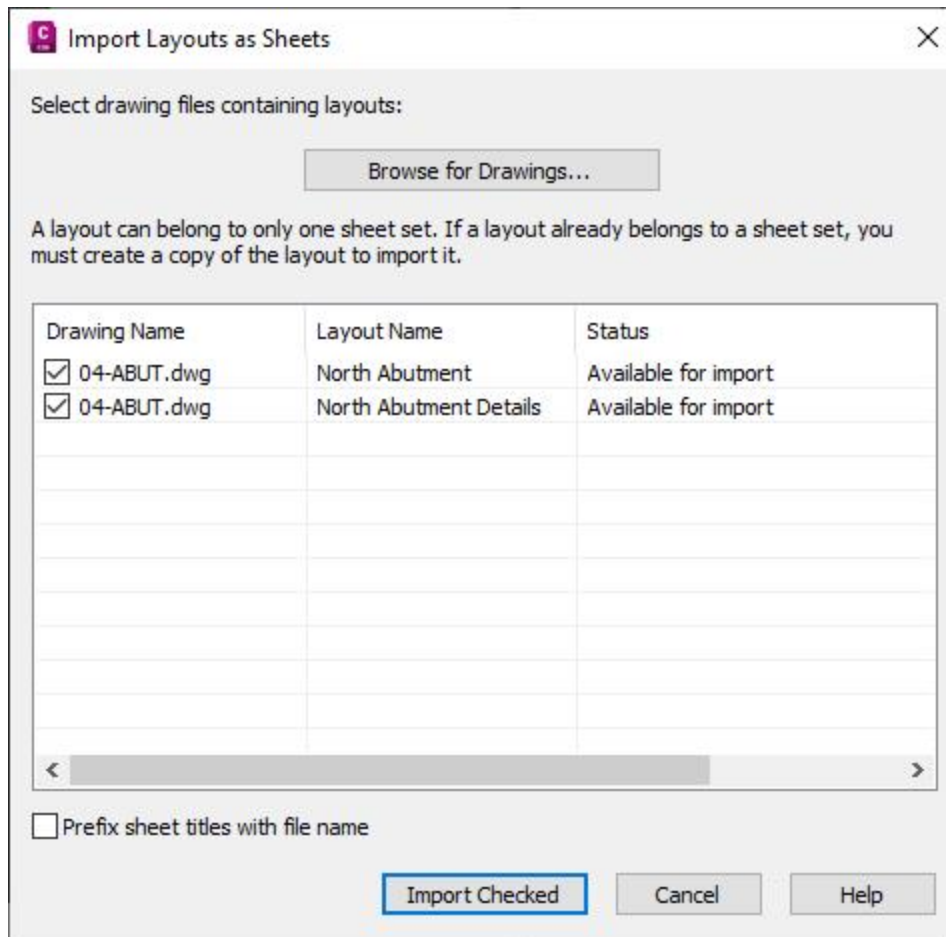
1. Right click on the sheet set and click **Import Layout as Sheet...**



2. Click **Browse for Drawings...** and **Open** the drawing you want to import.
 - A. **Alternatively:** right-click on the sheet layout you want to import and click **Import Layout as Sheet...**

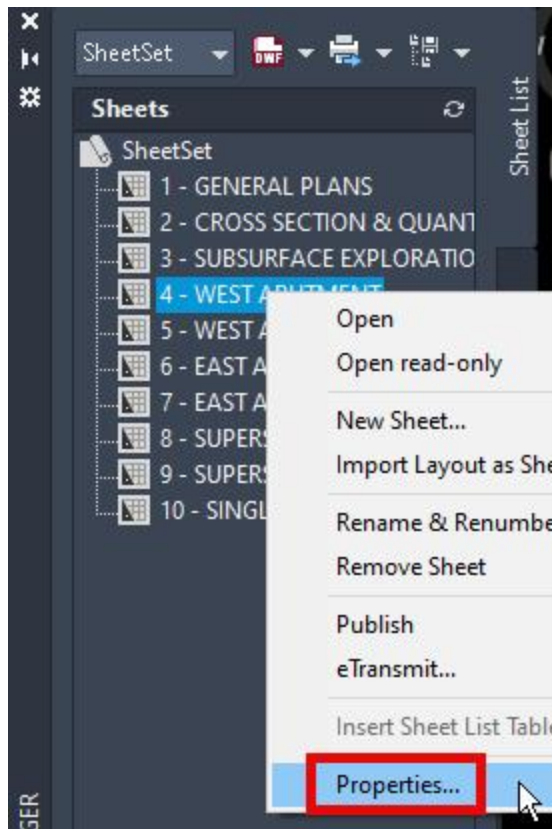


3. Check the sheet layouts you would like to import. Uncheck **Prefix sheet titles with file name**. Click **Import Checked**



4. Right-click on a new sheet in the sheet set manager and Click **Properties**

Structures sheet sets



5. Fill in the following properties:

- **Sheet title**
- **Sheet number**
- **Drawn By**

Optionally fill in **Plans Checked By**

Sheet	
Sheet title	WEST ABUTMENT
Sheet number	4
Description	
Include for Publish	Yes
Expected layout	WABUT(C:\Users\DITDFD\Desktop\test\ex...
Found layout	WABUT(C:\Users\DITDFD\Desktop\test\ex...
Sheet set	SheetSet
Sheet revision number	
Sheet revision date	
Sheet issue purpose	
Sheet category	

Sheet Custom Properties	
Drawn By	ABS
Plans Checked By	

Rename options

Rename layout to match:

Sheet title
 Prefix with sheet number

Rename drawing file to match:

Sheet title
 Prefix with sheet number

OK Cancel Help

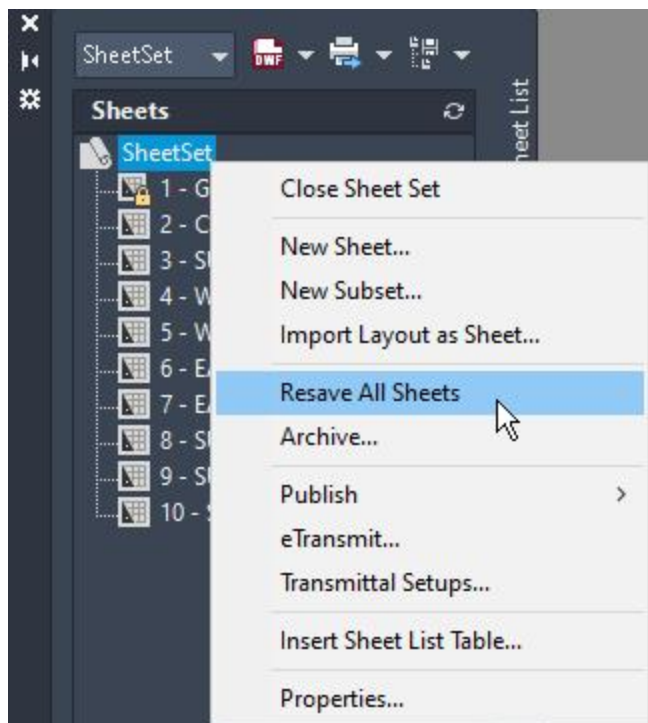
Info: Use all caps for the sheet title otherwise the title will not show up in caps in the sheet list.

- Optionally check **Rename layout to match Sheet title**
- Click **OK**
- Enter the command **REA** to update the sheet border with the sheet set properties.

Tip: If you don't need to change the drafter or checker initials, using the **Rename and Renumber** button in the right-click menu will allow you to quickly edit the sheet title, sheet number, and layout name. You can then move to the next or previous sheet with one click.

Sheet set manager basics


- Double-click any sheet to open it.
- Reorder sheets by dragging and dropping them within the sheet set manager.
- Right-Click** the sheet set in the sheet set manager (above the sheets) and click **Properties** to edit sheet set properties like the structure and project ID or total number of pages. After editing the sheet set properties, be sure to **Resave All Sheets** to write the changes to each sheet border.



- If a sheet border isn't updating, try using the command **REA**. If that doesn't work, follow the steps in the next section to relink the sheet border with the sheet set.

Redefine broken sheet border fields #fix

If your sheet border is set up correctly, the sheet border fields will be highlighted in gray. These fields are linked to the sheet set, and should not be edited manually.

NO.	DATE	REVISION	BY
 BUREAU OF STRUCTURES			
8			
ACCEPTED _____		_____	
CHIEF STRUCTURES DESIGN ENGINEER		DATE	
STRUCTURE B-5-468			
STH 96 OVER UNNAMED CREEK			
COUNTY		TOWN	
BROWN		NEW DENMARK	
DESIGN SPEC. AASHTO LRFD BRIDGE DESIGN SPECIFICATION			
DESIGNED BY	DESIGN CK'D	DRAWN BY	PLANS CK'D
JJS	ABS	ABS	
GENERAL PLANS			SHEET 1 OF 10
I.D. 4075-36-00A		DATE:	

Follow the steps below to fix sheet borders that are broken and no longer link to the sheet set.

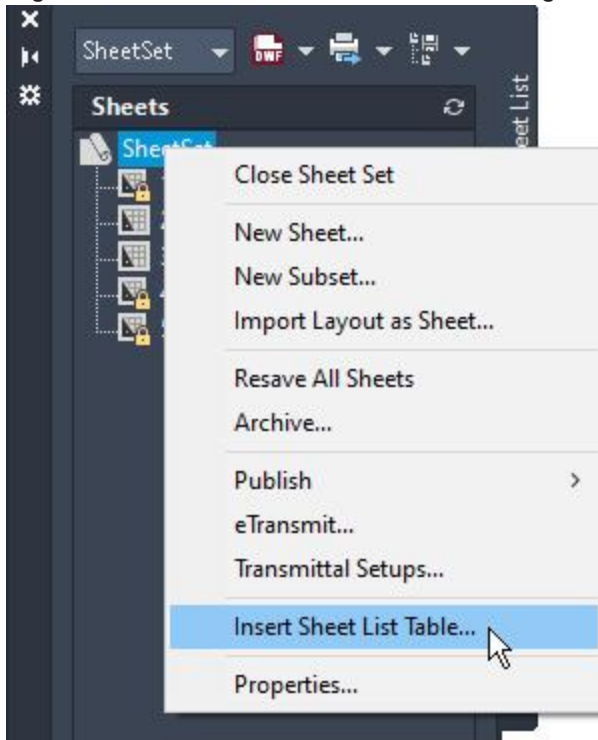
1. Open the drawing with broken sheet border fields.
2. Create a new sheet layout using the Structures Drawing Templates.
3. **Copy** (**Ctrl** + **C**) the sheet border from the new sheet layout.
4. Select the sheet border in each sheet with broken fields and **Del**.
5. **Paste** (**Ctrl** + **V**) the new sheet border into each sheet layout missing a border (Place the block at coordinates 0,0)
6. Right click the new empty sheet layout and **Delete** it.

Create list of drawings

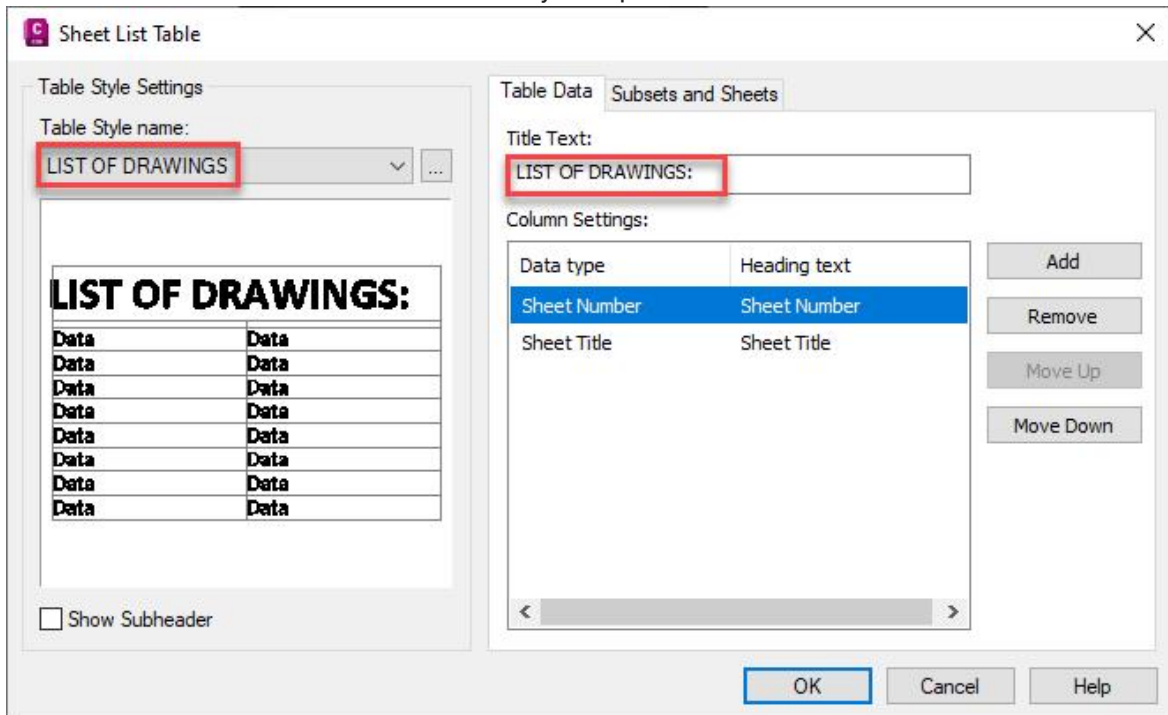
With a sheet set open in the Sheet Set Manager

Structures sheet sets

1. Open the sheet layout that will have the list of drawings.
2. Right-click the sheet set in the sheet set manager and click **Insert Sheet List Table...**



3. Select **LIST OF DRAWINGS** from the table style dropdown. Edit the Title Text.



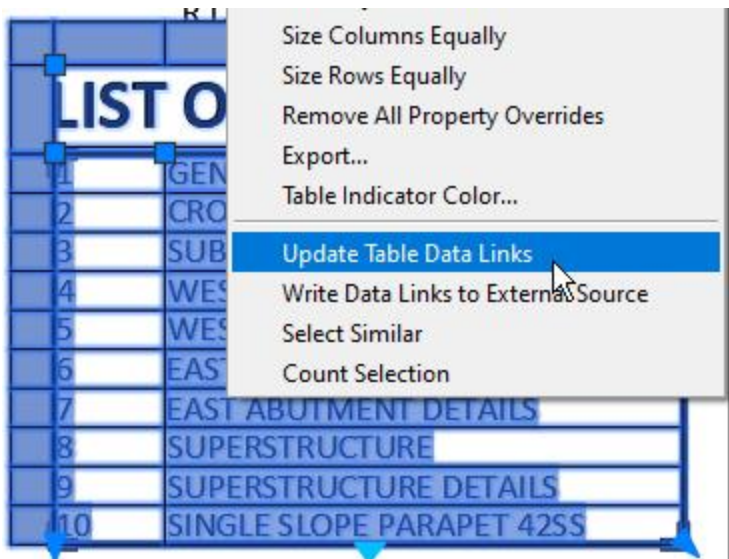
✓ Requirement: If the **LIST OF DRAWINGS** is not available from the table style list, place the **SHEET LIST** block (**Structures tool palette > Gen Plans > Sheet List**) somewhere in the drawing. Delete the block and try creating the sheet list table again.

4. Click **OK**.
5. Click to place the sheet list.

LIST OF DRAWINGS:	
1	GENERAL PLANS
2	CROSS SECTION & QUANTITIES
3	SUBSURFACE EXPLORATION
4	NORTH ABUTMENT
5	NORTH ABUTMENT DETAILS

Update list of drawings

To update a list of drawings, **Right-Click** the table and click **Update Table Data Links**



Plot #plot

With a sheet set open in the Sheet Set Manager

Right-Click Sheet Set > Publish > Publish to PDF

Save the PDF to plot.

Info: For more information about plot settings, see the "Structures plan plotting" on page 167 page.

Structures drafting etiquette

Last updated: 2024-05-01

The **Bureau of Structures** follows the drafting standards below when drafting structures plans.

[pln-prod-struct-drft.pdf](#)

[pln-prod-struct-drft.zip](#)

Structures insert sheets

Last updated: 2024-05-01

Total video time: 13:29

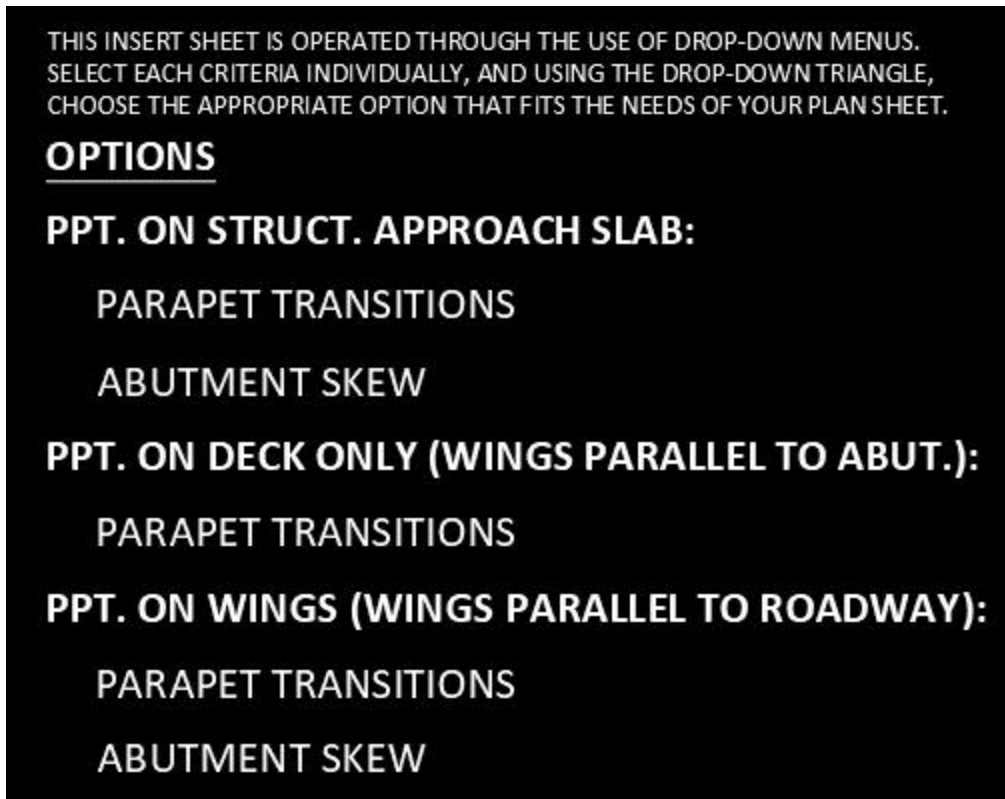
Download and modify insert sheets

Structures insert sheets can be downloaded from the [Bridge Manual Insert Sheets](#) page.

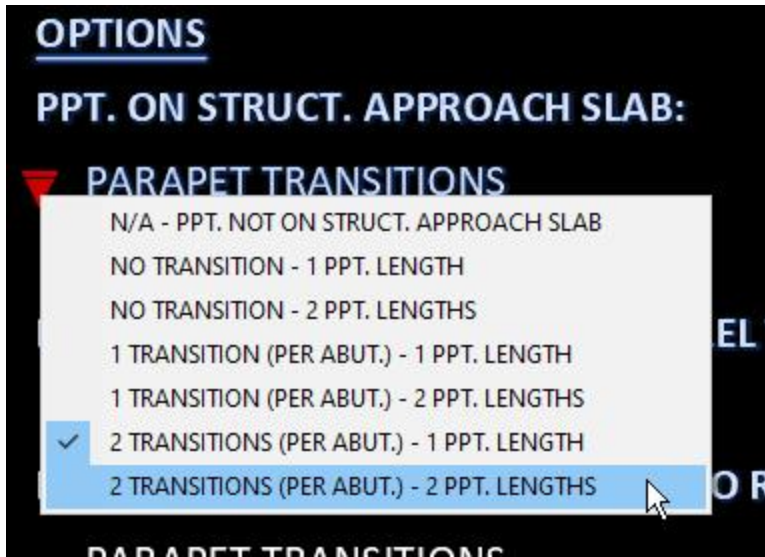
[pln-prod-struct-ins-01.mp4](#) 5:07

Each insert sheet consists of several dynamic blocks. These blocks have visibility states that can be selected to modify the insert sheet. They also may have attributes which can be modified with structure-specific information.

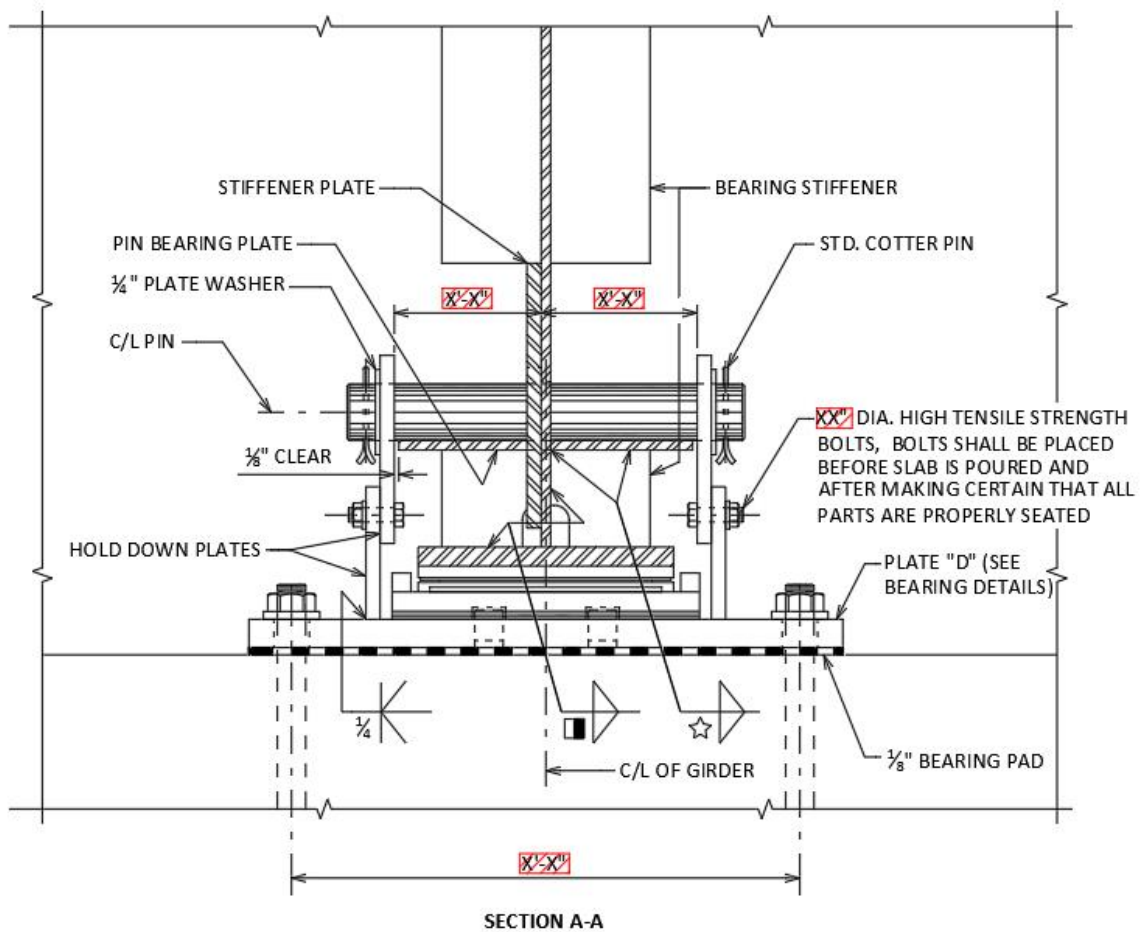
1. In **Model Space** each insert sheet has a list of sheet options to the right of the sheet.



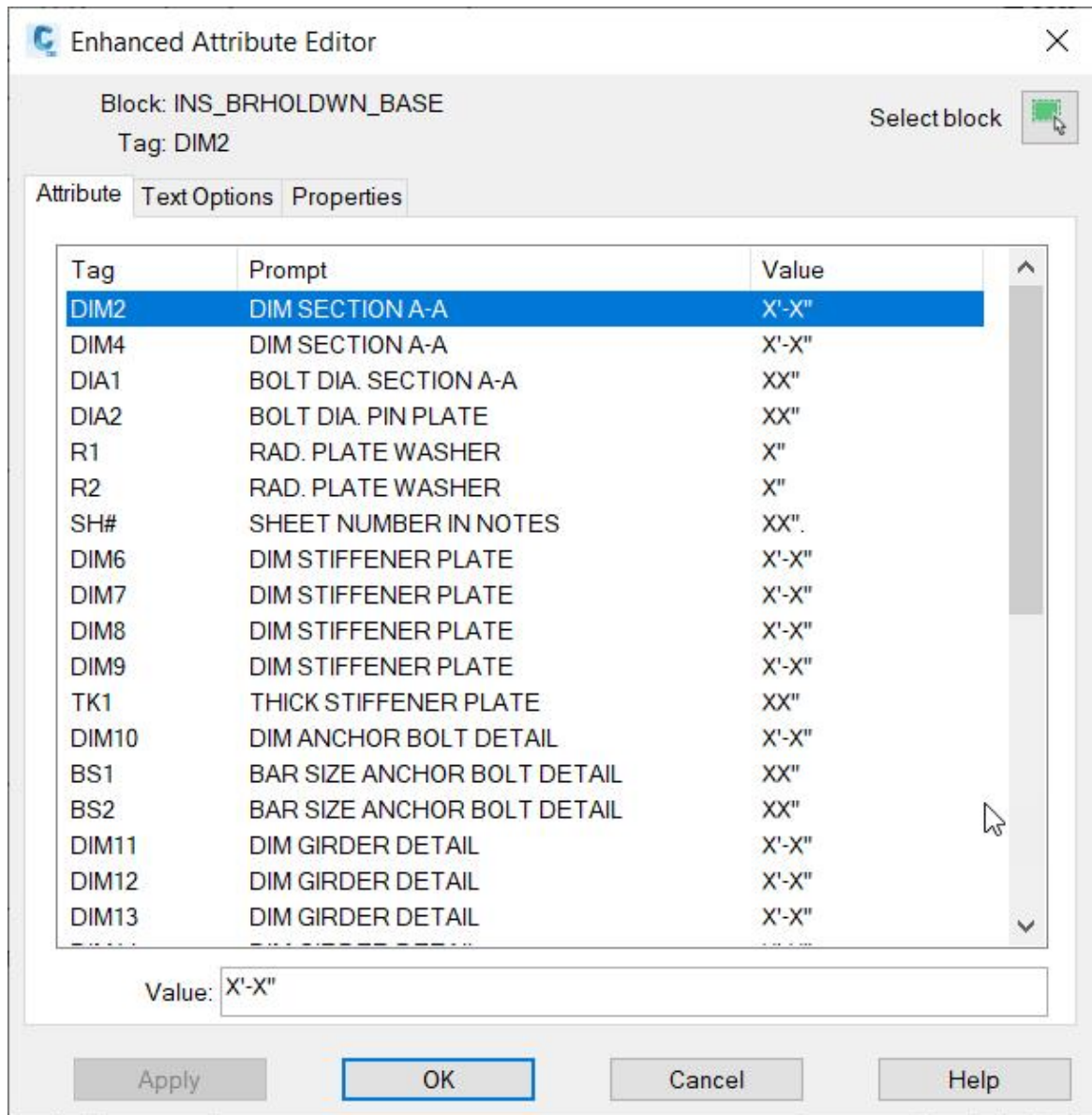
2. Click on each option to access the visibility state dropdown menu. Click on the dropdown menu and then select the option that matches your structure details.



3. Once each option is selected, open **Paper Space** - the only sheet layout in the drawing will be named **INSERT SHEET**
4. Any attributes that need to be edited will show up red. Double-click the attribute from inside the view-port to edit them.



5. The Enhanced Attribute Editor will open allowing you to edit the attributes highlighted in red.



- Tables with missing information are typically not stored as attributes. Double click the table to edit it. Some tables, like the the girder camber and deflection tables, are not dynamic tables and will need to be edited by adding text over the table linework.

BILL OF BARS

FOR DECK PARAPETS

BAR MARK	COAT	XX. ABUT.	XX. ABUT.	LENGTH	BENT	BAR SERIES	LOCATION
R501	X			4'-5"	X		PARAPET VERT.
R502	X			5'-8"	X		PARAPET VERT.
R503	X	24	24	2'-9"	X		PARAPET VERT.
R504	X	24	24	4'-4"	X		PARAPET VERT.
R505	X	12	12	5'-5"	X		PARAPET VERT.
R506	X	12	12	5'-6"	X		PARAPET VERT.
R507	X	2	2		X		PARAPET HORIZ.
R508	X	10	10				PARAPET HORIZ.
R509	X	10	10	4'-9"	X		PARAPET VERT.
R510	X	4	4		X		PARAPET HORIZ.
R5XX	X	10	10				PARAPET HORIZ.

7. Once all attributes have been edited, turn off the red designer notes by turning off (or freezing) the **B_ANNO_DESIGN_NOTES** layer.



Warning:

- The sheet layout included in our insert sheets use the **SHT2** sheet border for the Bureau of Structures. Consultants should replace the sheet border block with **SHT2C** to remove the Bureau of Structures logo and replace it with their own logo.
- The sheet layout included in our insert sheets are not set up to connect to the structures sheet set template. Replace the sheet border as explained on the "Structures sheet sets" on page 150 page.

Import insert sheet to existing drawing

It is also possible to import an insert sheet into an existing drawing instead of having separate files for each insert sheet. The following video demonstrates how to do this.

[pln-prod-struct-ins-02.mp4](#) 8:21

Structures drawing cleanup and closeout

Last updated: 2024-04-29


Overview


Before plotting the final plans, drawings should be cleaned and closed out. Going through this process will not only keep drawings running smoothly and help prevent corruption, but it will also ensure drawings will still work when opened in the future, even if all references are missing. Drawing cleanup/maintenance should be done regularly as you draft. It's a good idea to quickly run through the basic cleanup steps before each draft plot or before you save the drawing after large modifications or additions.

Drawing cleanup and maintenance

It's a good idea to keep drawings clean as you draft them. This will help keep the file size down and help Civil 3D run faster. It will also help prevent file corruption.

1. Delete sketches and details that won't be plotted.
2. Remove any unused references and linked OLEs.
 - A. **XREF** to open the list of referenced files. **Unload** references that aren't currently needed and **Detach** any references that won't be needed.
 - B. **OLELINKS** to open the list of linked OLEs. (This command may do nothing if there are no linked OLEs) In general, all linked OLEs should be unlinked with **Break Link**. Linked OLEs cause a known issue and have caused drawings to corrupt. OLEs can be replaced with built-in C3D tables using the Paste Table Tool .
3. Regularly use the Purge Non-Structures Styles tool. This tool should always be run before plotting the final plans, but it's a good idea to get in the habit of running this tool before you save the drawing every day.
4. Regularly use the Check Drawing Type tool to make sure the dimension styles and annotation scales are correct for the drawing type.
5. If you have a file that is particularly large or slow, follow the instructions on the Keeping drawings clean and working and the Things that can slow performance in Civil 3D/AutoCAD pages.
6. **Rule of thumb**: Most structures drawings should be under 1MB in size. If a file is larger than 5MB, look into cleaning up the file.

 **Warning:** Having too many drawings open at once will also slow performance. If you need many files open at once, consider combining them into one drawing with multiple sheet layouts instead.

 **Info:** The size of the drawing shown in File Explorer does not include the references. A small file with many large references can also be slow. Consider running the cleanup steps on reference files too.

Drawing closeout

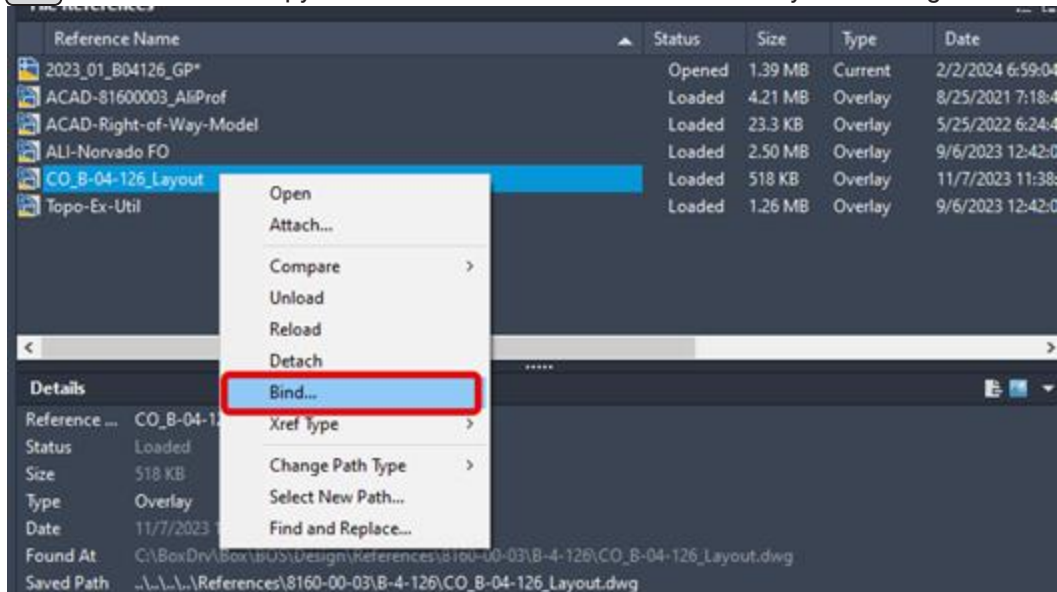
It is important to clean up your drawing and remove all references and links at the end of a project. This will ensure the drawing will still work correctly when it is needed in the future (an addendum or structure rehab, for example).

1. Remove all linked OLEs with **OLELINKS**.

Info:

- **OLELINKS** will do nothing if you have no linked OLEs.
- Linked OLEs should generally never be used. There is a Known issue with linked OLEs, and we've also found they can corrupt drawings.
- OLEs can be replaced with built-in C3D tables using the Paste Table Tool.

2. Use **XREF** to open the list of references and **Detach** all references. Before detaching any references that are plotted, use one of the following methods to import the reference linework:
 - A. Copy the linework directly. This works best for smaller references that don't have many details (like alignments).
 - B. **Bind** the reference to copy all linework in the reference to a block in your drawing.



Consider creating a clipping boundary of the reference before binding. If you create a small clipping boundary for a large reference, consider editing the bound reference block to remove unneeded linework outside of the plotted boundary.

3. Follow the steps in the Drawing Cleanup and Maintenance section above after removing linked OLEs and references.

Corrupted files

Refer to How to fix damaged or corrupt drawings for troubleshooting steps. If the file has references or linked OLEs, the **partialopen** command may be helpful as well. More information can be found on the Civil 3D Help page [To Partially Open a Drawing](#).

Structures plan plotting

Last updated: 2024-04-29

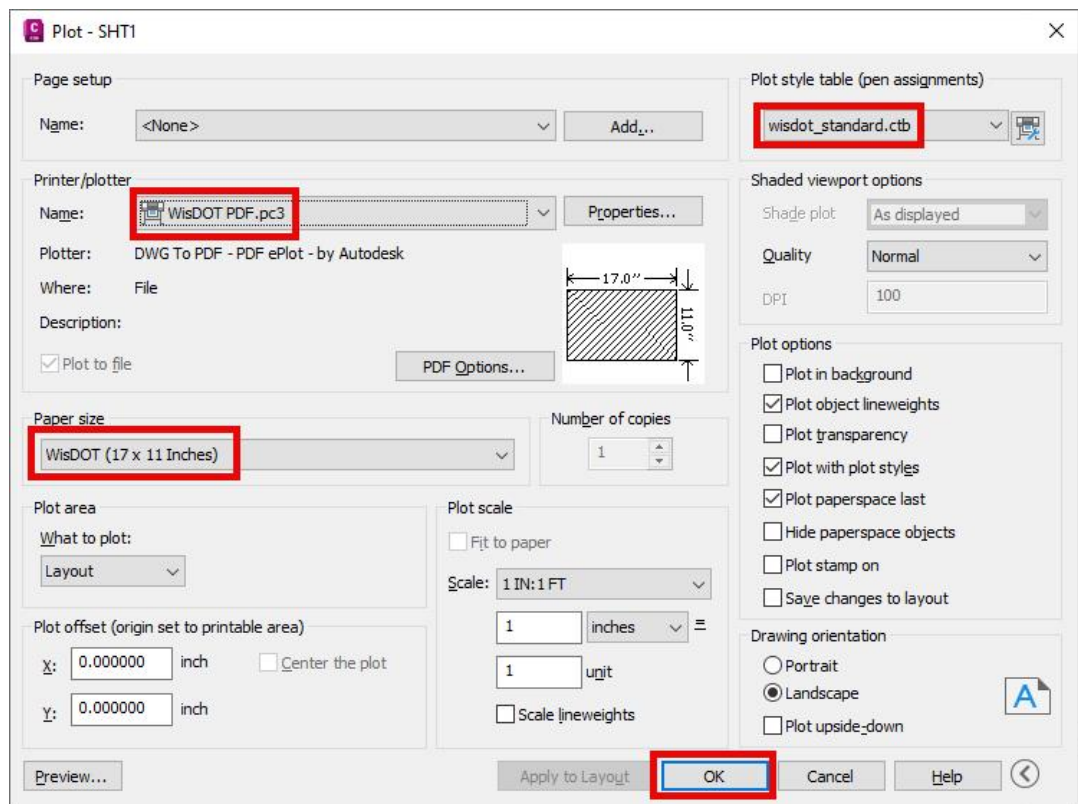
Info:

- For more information about plot settings, see the WisDOT plot standards and "Structures template plot colors" on page 97 pages.
- To plot all or part of a sheet set, see the "Structures sheet sets" on page 150 page.
- For more information about plotting, see the Plotting page.

Print a single sheet

With the "Structures sheet layouts and viewports" on page 144 to be plotted open in Civil 3D.

1. Open the plot dialog using any of the options below.
 - A. (Right-click) the sheet layout tab > (Plot)
 - B. Ribbon > Output tab > Plot panel > Plot
 - C. Quick Access Toolbar > Plot
 - D. C3D Menu > Print
 - E. PLOT
 - F. PRINT
2. Use the plot dialog page setup settings shown below. Importantly, make sure the following options are set for structures plans:
 - A. Printer/plotter name: WisDOT PDF.pc3 if plotting to PDF, physical printer otherwise.
 - B. Paper size: WisDOT (17 x 11 Inches)
 - C. Plot style table (pen assignments): wisdot_standard.ctb

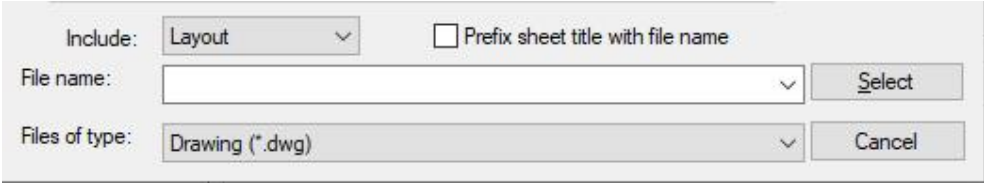


3. (OK)
4. If plotting to PDF, choose the location to save the file.

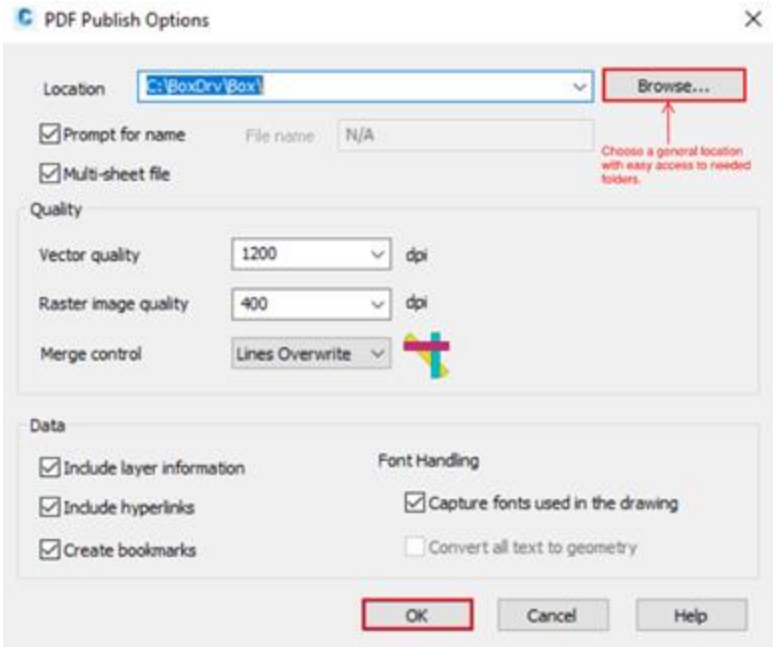
Print one or more sheets

1. Open the Publish Dialog using any of the options below
 - o Ribbon > Output tab > Plot panel > Publish
 - o C3D Menu > Publish
 - o PUBLISH
2. If a sheet list has been saved for this publish job, use the sheet list click (Load Sheet List...) to load it.
3. Otherwise:
 - A. Select any existing unwanted sheets from the sheet list and click (Remove Sheets) or press (Del). (Optionally, uncheck (Automatically load all open drawings) to skip this step in the future.)

- B. Click **Add Sheets**
 - I. Navigate to the drawings you want to plot and select them.
 - II. Make sure **Include** is set to **Layout**
 - III. Make sure **Prefix sheet title with file name** is correctly set according to your file names and sheet layout names. This will set how pages are titled in the PDF file.

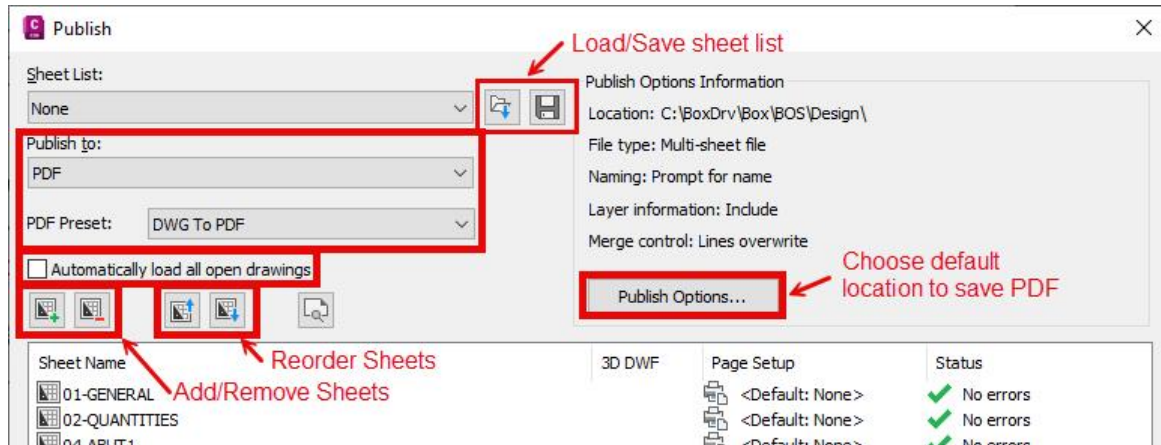


- IV. **Select**
 - C. Repeat until all sheets are added to the publish dialog.
 - D. Reorder sheets as needed.
- 4. Click **Publish Options...** to set the default location for publishing files. (This only needs to be done once)



- A. **OK**
- 5. Make sure the Publish dialog settings are set as shown below:

Structures plan plotting



6. Optionally, **Save Sheet List..** to save this publish job to republish later.
7. **Publish**
8. Choose the location to save the published file.

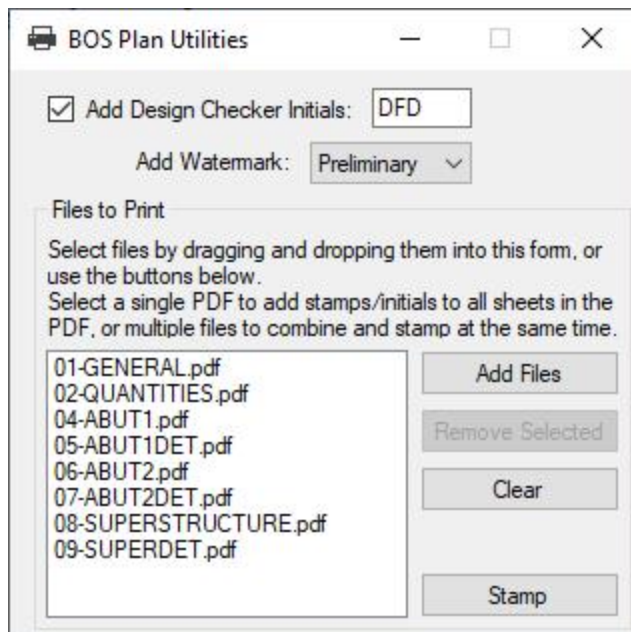
Publish collections manager

If you need to plot a large number of sheets, multiple plan sets at a time, or if you frequently need to replot drawings, look into using the Publish Collections Manager . This tool drastically decreases the time needed to plot drawings.

Plans watermark and initial stamper

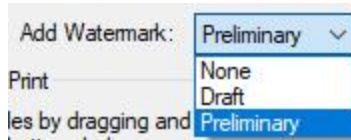
WisDOT only: This process is for **Bureau of Structures** staff only.

1. Open WiBS Computer Resources and click on the **Plans Initials Stamper** link from the Utilities panel.

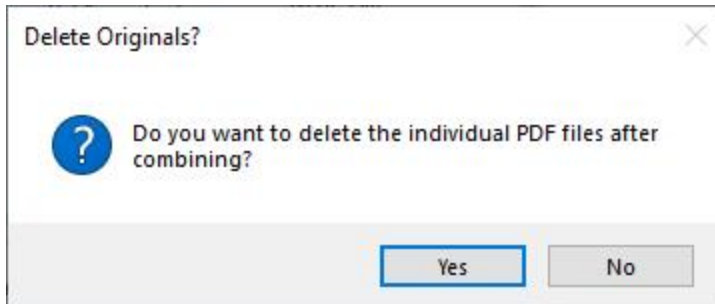


 **Tip:** Right-click the link in computer resources to create a desktop shortcut to this tool.

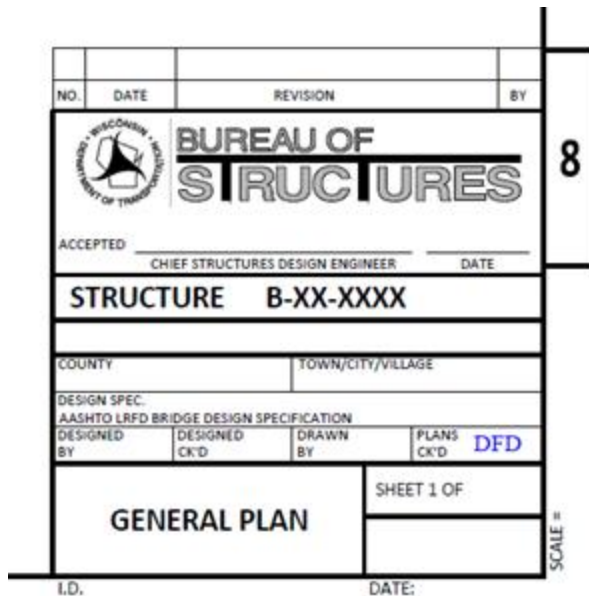
2. Check **Add Design Checker Initials** and input the plans checker initials.
3. Use the **Add Watermark** dropdown to choose the watermark



4. Add PDF files to stamp. If multiple files are added, they will be combined into a single PDF. Use either of the options below to add files:
 - A. Click **Add Files** and navigate to and select the files to add. Click **Open**.
 - B. Drag and drop the files from File Explorer
5. **Stamp**
6. If multiple files are stamped, the tool will ask if you want to delete the original files or not.



7. Once the initials have been added to the plans, they should look as shown in blue below.



Structures shortcut keys

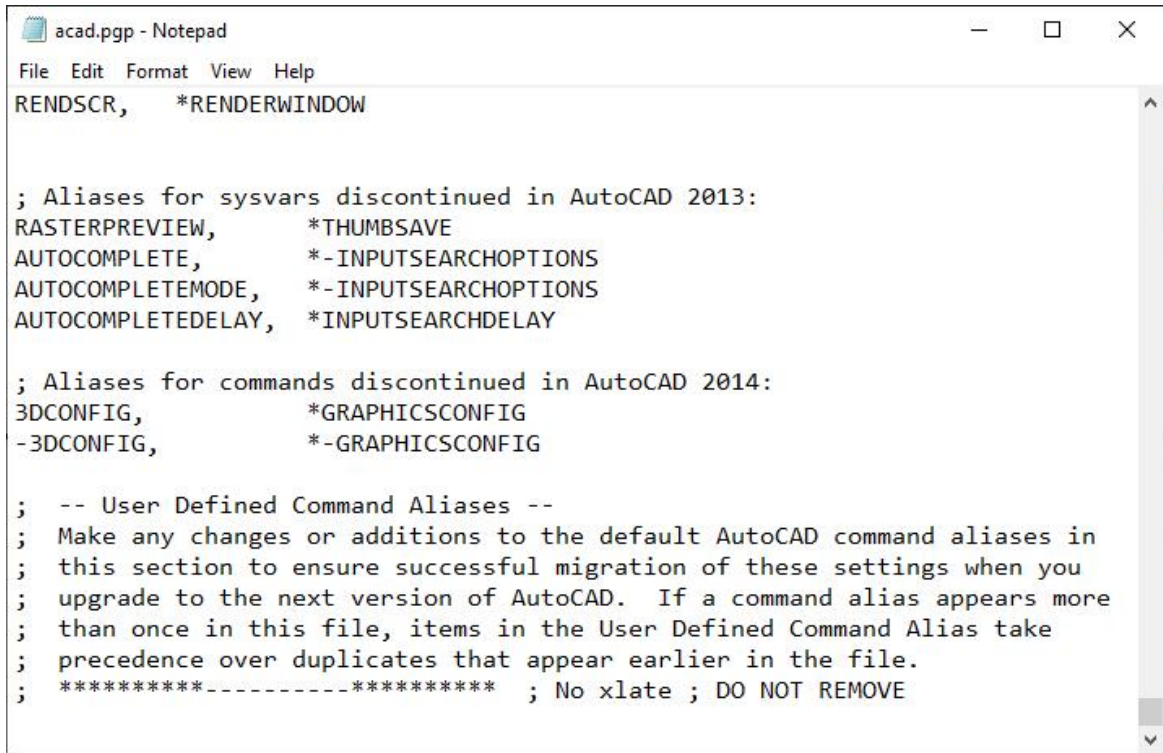
Last updated: 2024-04-29

Overview

[Command aliases](#) are abbreviations of command names. You can enter an alias at the Command prompt instead of entering the entire command name. It is recommended to create short, easy to use aliases of commonly used commands to increase drafting efficiency. For more information about default shortcuts, see the "Command shortcuts and hotkeys" on page 8 page.

Manage command aliases

1. **Ribbon > Manage tab > Customization panel > Edit Aliases (flyout) > Edit Aliases**
2. In the text editor, scroll to the bottom and add your new command aliases under the User Defined Command Aliases section.



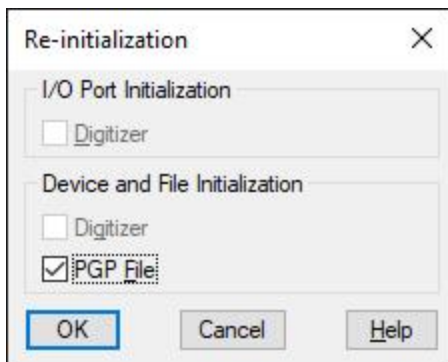
```
acad.pgp - Notepad
File Edit Format View Help
RENDSER, *RENDERWINDOW

; Aliases for sysvars discontinued in AutoCAD 2013:
RASTERPREVIEW, *THUMBSAVE
AUTOCOMPLETE, *-INPUTSEARCHOPTIONS
AUTOCOMPLETEMODE, *-INPUTSEARCHOPTIONS
AUTOCOMPLETEDELAY, *INPUTSEARCHDELAY

; Aliases for commands discontinued in AutoCAD 2014:
3DCONFIG, *GRAPHICSCONFIG
-3DCONFIG, *-GRAPHICSCONFIG

; -- User Defined Command Aliases --
; Make any changes or additions to the default AutoCAD command aliases in
; this section to ensure successful migration of these settings when you
; upgrade to the next version of AutoCAD. If a command alias appears more
; than once in this file, items in the User Defined Command Alias take
; precedence over duplicates that appear earlier in the file.
; *****-----***** ; No xlate ; DO NOT REMOVE
```

3. Save the PGP file.
4. **REINIT**
5. Check PGP File and click .



Suggested command aliases

The following command aliases are suggested for structures plan production. Feel free to copy some or all of them to your User Defined Command Aliases.

BU,	*BURST
C,	*COPY
CI,	*CIRCLE
D,	*DIMLINEAR
DA,	*DIMALIGNED
DR,	*DIMROTATED
E,	*EXTEND
EE,	*LENGTHEN
EX,	*EXPLODE
F,	*FILLET
M,	*MOVE
N,	*MLEADER
R,	*ROTATE
RE,	*RECTANG
REDR,	*REDRAW
SS,	*SELECTSIMILAR
T2,	*TXT2MTXT
TE,	*TEXTEDIT
UG,	*UNGROUP
W,	*WIPEOUT

```
*acad.pgp - Notepad
File Edit Format View Help
; -- User Defined Command Aliases --
; Make any changes or additions to the default AutoCAD command aliases in
; this section to ensure successful migration of these settings when you
; upgrade to the next version of AutoCAD.  If a command alias appears more
; than once in this file, items in the User Defined Command Alias take
; precedence over duplicates that appear earlier in the file.
; *****-----***** ; No xlate ; DO NOT REMOVE

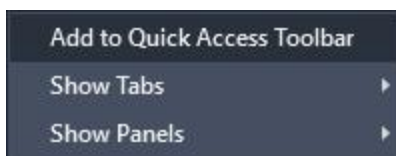
BU,      *BURST
C,       *COPY
CI,      *CIRCLE
D,       *DIMLINEAR
DA,      *DIMALIGNED
DR,      *DIMROTATED
E,       *EXTEND
EE,      *LENGTHEN
EX,      *EXPLODE
F,       *FILLET
M,       *MOVE
N,       *MLEADER
R,       *ROTATE
RE,      *RECTANG
REDR,    *REDRAW
SS,      *SELECTSIMILAR
T2,      *TXT2MTXT
TE,      *TEXTEDIT
UG,      *UNGROUP
W,       *WIPEOUT
```

Structures plan production tips and tricks

Last updated: 2024-04-29

User interface

- Quick Access Toolbar To add buttons to your quick access toolbar (in the far upper left corner next to the C3D menu) **right-click** any tool and click **Add to Quick Access Toolbar**.



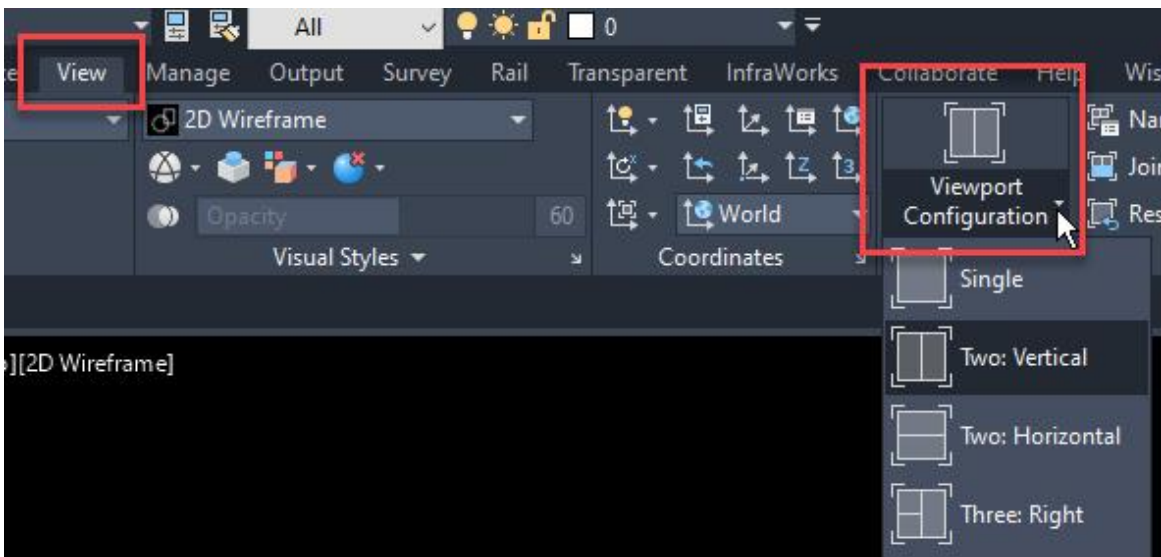
- User Palette
Create your own tool palette to organize tools as you like. Follow the instructions on the User Palette panel page.
- Open any standard toolbar and dock it wherever you like with **Ribbon > View tab > Toolbars** (far-right button).

- Selection Cycling If you have trouble selecting a specific object when many objects are on top of each other, toggle on the **SELECTIONCYCLING** variable using the **Ctrl** + **W** or by clicking the button in the Status Bar.



- Shortcut Keys

Be aware of the available "Command shortcuts and hotkeys" on page 8 and be sure to customize your own using "Structures shortcut keys" on page 171 .



- Multiple "viewports" can be shown at once in model space (these are different from sheet layout viewports)

Ribbon > View tab > Model Viewports panel > Viewport Configuration (flyout)

- "Adding a folder link to a Civil 3D dialog" on page 12

Copy and paste

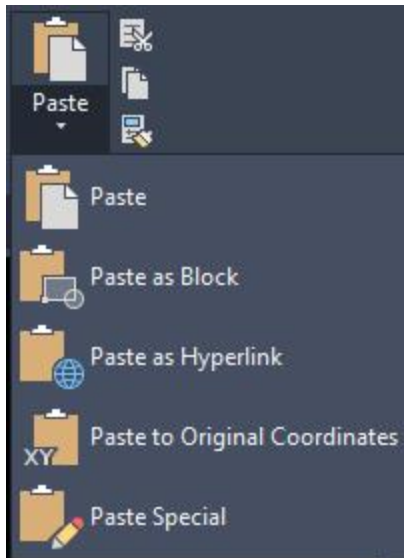
- **COPYCLIP** OR **Ctrl** + **C**
Copies selected objects.
- **COPYBASE** OR **Ctrl** + **Shift** + **C**
Copies selected objects about a base point.
- **PASTEORIG** (no shortcut)
Pastes at same coordinates as original drawing.
- **PASTECLIP** OR **Ctrl** + **V**
Pastes objects using the copied base point. If no base point was selected, the lower left corner of the copied objects will be used.
- **PASTEASBLOCK** OR **Ctrl** + **Shift** + **V**

Paste objects as a Block. AutoCAD will give it a default name - Select object and look in properties to find its default name. Use **RENAME** to change the block to a logical naming convention.

- **MATCHPROP** (no shortcut)

Copies object properties from one object to another.

In addition to the commands and shortcuts, all of the tools above are available in the **Ribbon > Home tab > Clipboard panel**

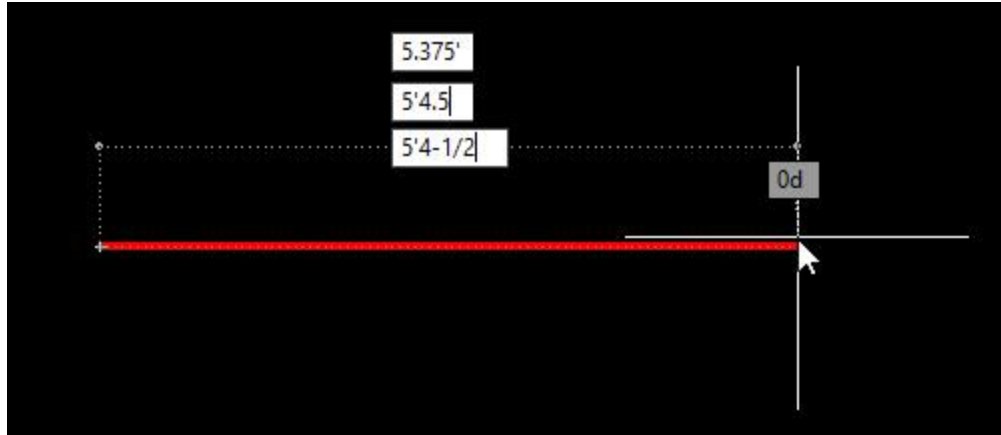


Basic linework/drafting

- To draw a utility line, use the Add individual component tool to add all roadway linetypes to your drawing.
 - After the utility line is drawn, use the Purge Non-Structures Styles tool to clean unused roadway linetypes.
- To check if an alignment is curved or tangent, attempt to draw a 3-point curve on it. If the curve can't be drawn, it is a tangent line.
- Drawing complex fractions

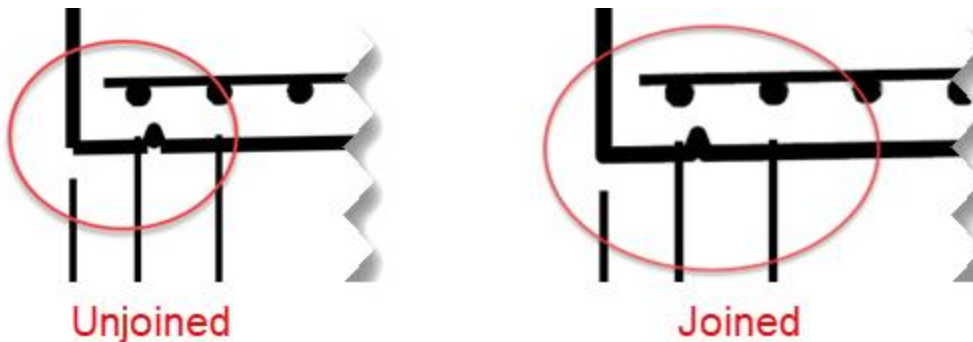
In a **Details/Architectural** template, there are several ways to specify the length of a line. For example, a 5'-4½" length can be entered as:

- **5.375'**
- **5'4-1/2**
- **5'4.5**



In a **Layout/Decimal** template, you can't use fractional inches. The same distance can only be entered as **5.375**.

- **FILLET** can be used to trim/extend two lines to a corner (radius = 0)
Alternately **TRIM** or **EXTEND** or a combination of two can be used.
- Notice while using **TRIM** or **EXTEND** in the command line there is a prompt for a "shift-select" to do the opposite command (i.e. in TRIM, shift-select will do extend)
- Simple lines or polylines can be joined together using the **JOIN** command. Joined lines will plot better at corners.

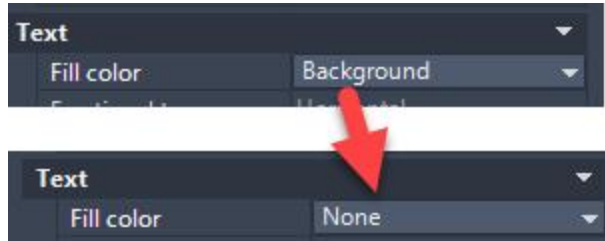


- Take advantage of Layers and their properties to quickly turn off, isolate, or lock objects.
 - Freeze layers you don't need (especially in references) to increase drawing performance. Layers can also be frozen within viewports so they won't print in that viewport.
 - Turn off layers if you need to clean up the view temporarily
 - Lock layers to prevent them from being accidentally changed.
 - Isolate layers to fade and lock all other layers. This is useful if you want to edit specific objects that are surrounded by other layers.
 - You can also isolate objects with the **right-click** menu. Using this menu will isolate the selected objects, regardless of layer. All other objects will disappear until the isolation is ended.



Editing dimension text

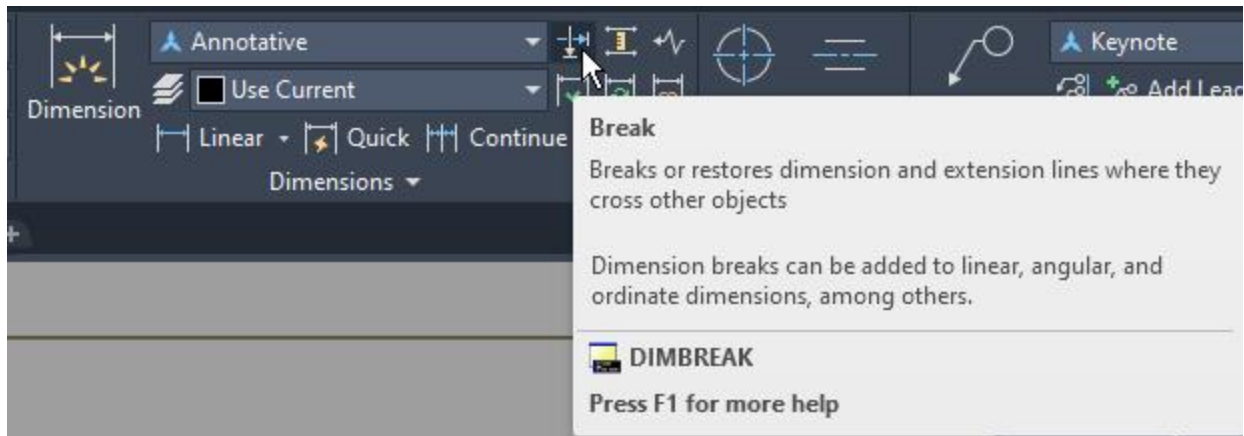
- Use `<>` as a stand in for the actual dimension length.
- Use `\X` to add a line of text below the dimension.
- If the dimension line is not showing up between two lines of dimension text (typically on angular dimensions) this is due to the background masking of the text. You can turn this off in the properties.



Intersecting dimensions

Use the `DIMBREAK` command to fix dimensions/multileaders that intersect.

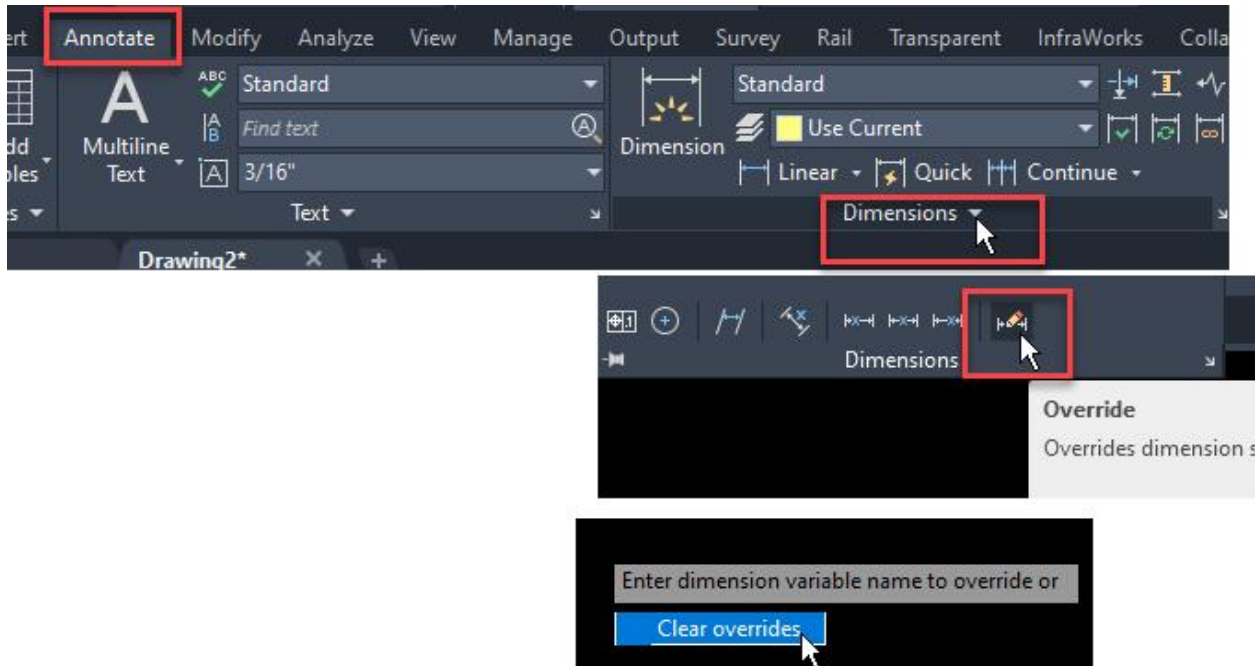
Ribbon > Annotate tab > Dimension panel > Break



Fix broken dimensions

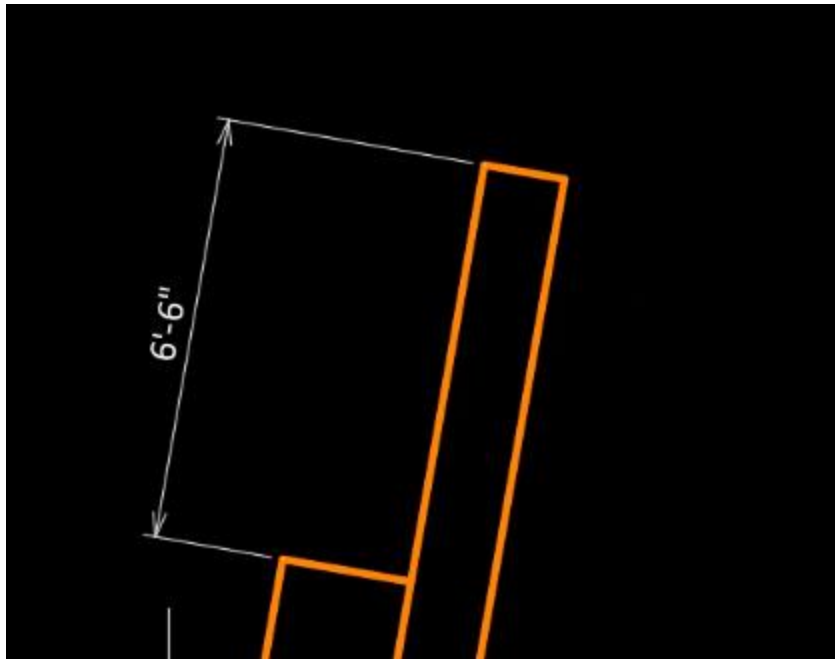
If a dimension doesn't look right, try removing the dimension overrides

Ribbon > Annotate tab > Dimensions panel (flyout) > Override



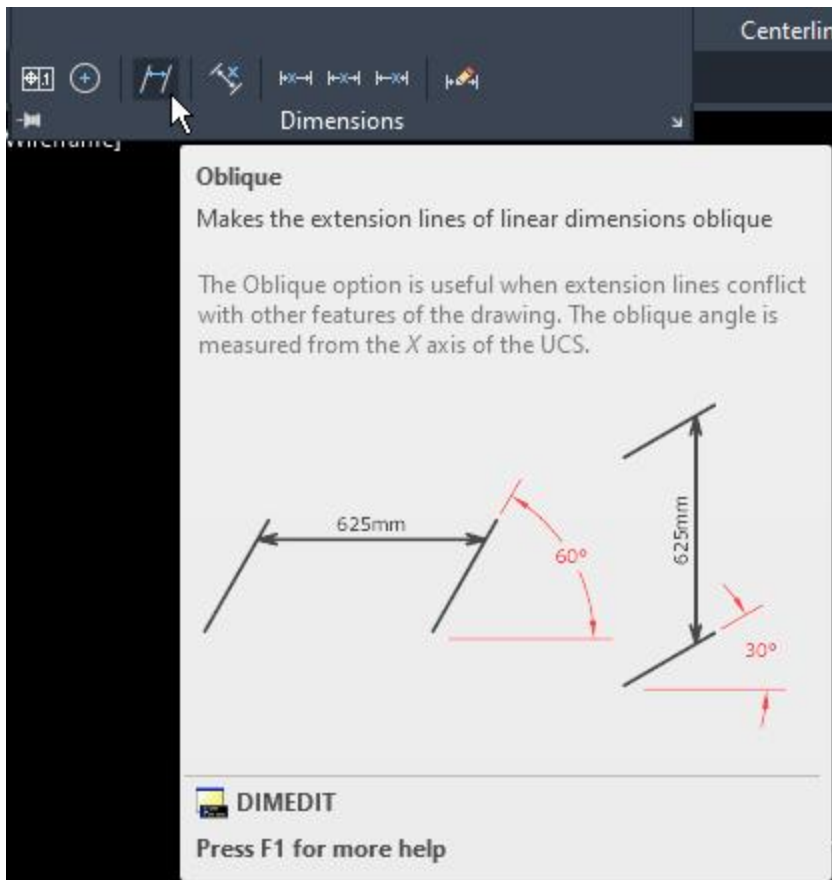
DIMROTATED

Be sure to use **DIMROTATED** when dimensioning legs that are not aligned (as shown in the image below)



Draw arbitrary/oblique dimensions

1. Draw a dimension.
2. **Ribbon > Annotate tab > Dimensions panel (flyout) > Oblique**
OR **DIMEDIT**

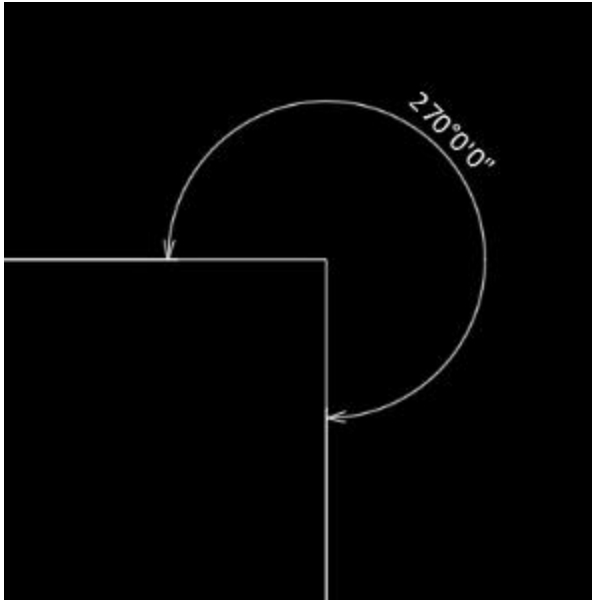


3. Select the dimension you want to modify and type an angle for the skew. Note the angles shown in red in the C3D help diagram.

Draw an angular dimension greater than 180

1. **Structures Tool Palettes > Anno palette > Quick Annotations > Dimension (flyout) > Angular Dimension**
OR **DIMANGULAR**
2. Instead of left-clicking on the two lines to define the angle, right click. Then click on the intersection point of the two angles.
3. Finally, click on the end points of the lines defining your angle, and click again to place the dimen-

sion.



Measure distance along arc

1. **Structures Tool Palettes > Anno palette > Quick Annotations > Dimension (flyout) > Angular Dimension**

OR **DIMARC**



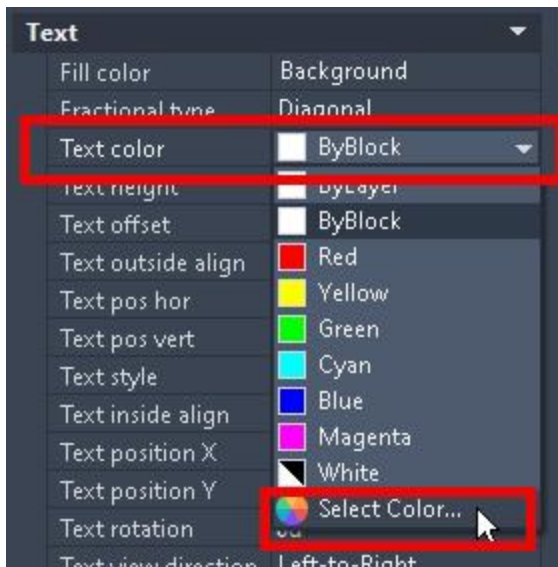
Tip: If you only want to measure instead of drawing a dimension for plan production, the **Decimal Dimension Quick Annotation** will measure in decimals of a foot instead of fractions of an inch.

2. **P** to measure a partial arc
3. Click start and end points

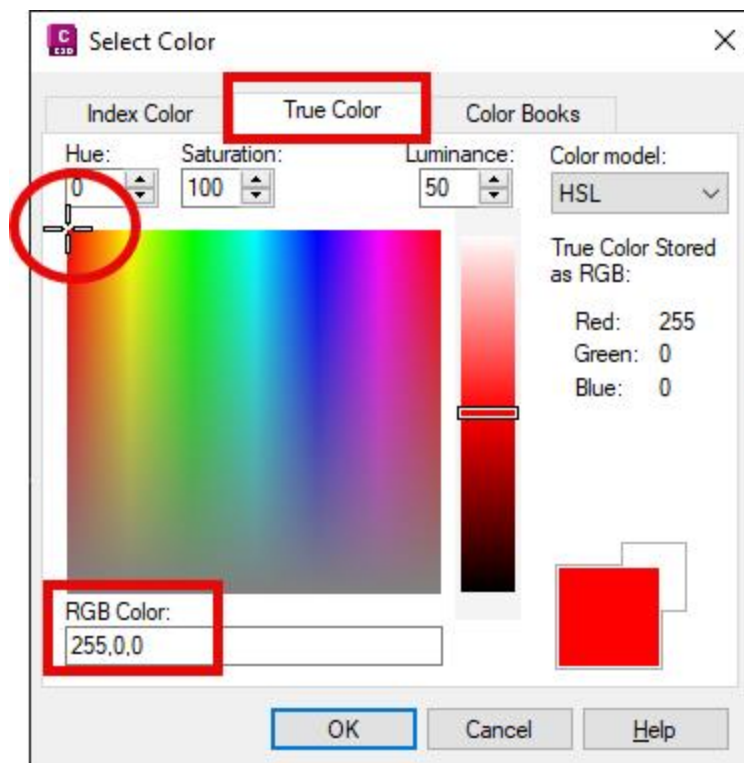
Dimension revisions

Sometimes it's necessary to change some or all of the **Dimension Text** red while leaving the dimension itself black.

1. Select the dimension that has revised text.
2. In the Properties Dialog, go to the **Text color** property in the **Text** section.



- A. **Select Color...**
- B. Click the **True Color** tab and select the color red by either dragging the cursor to the top left or top right of the color selector, or typing **255,0,0** in the RGB Color text field.

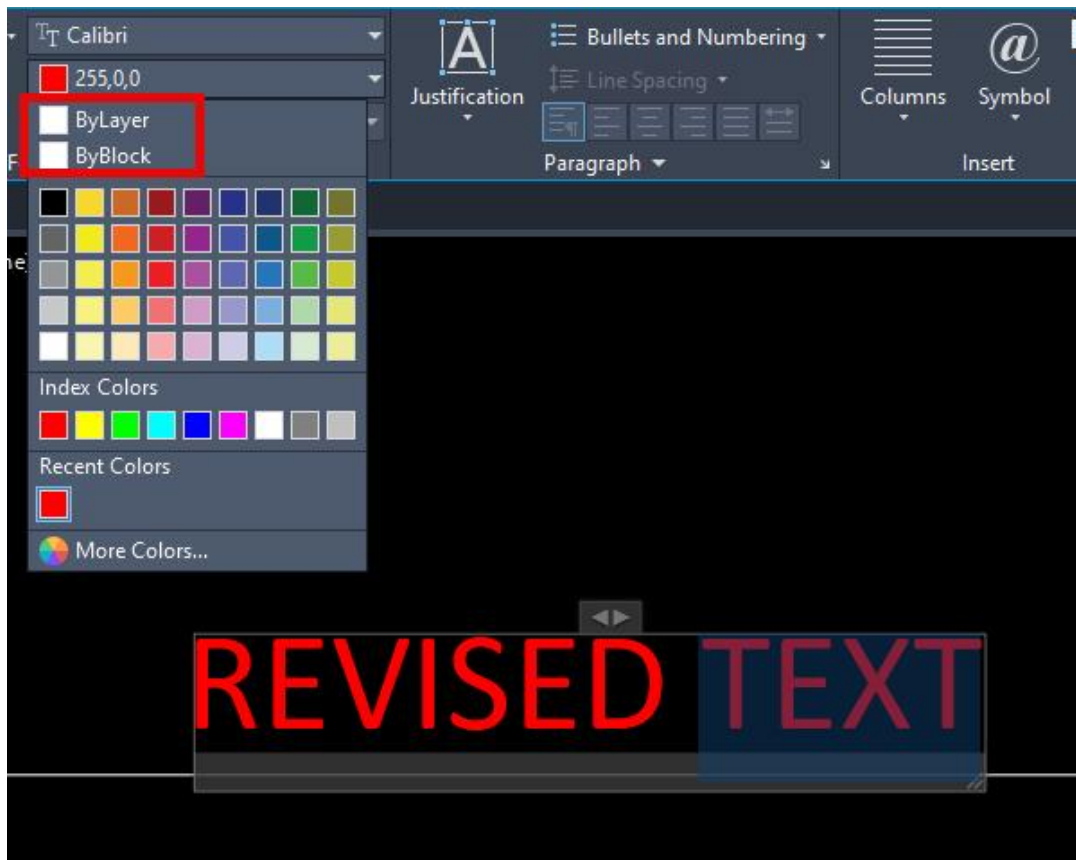


- C. **OK**
3. Now all the text in the dimension will be red (and plot red) while the dimension itself will plot according to the dimension's layer (black in this case).

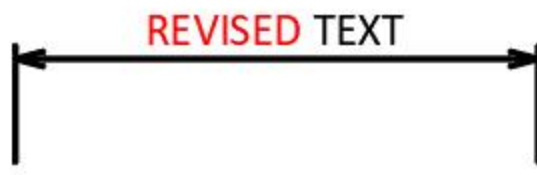


4. If there is text that *shouldn't* be red:

- A. Double-click the dimension text to edit it.
- B. Select the text that should be changed back to ByLayer. In this example we want "REVISED" to be red and "TEXT" to be black.
- C. **Text Editor > Formatting > Color > ByLayer**

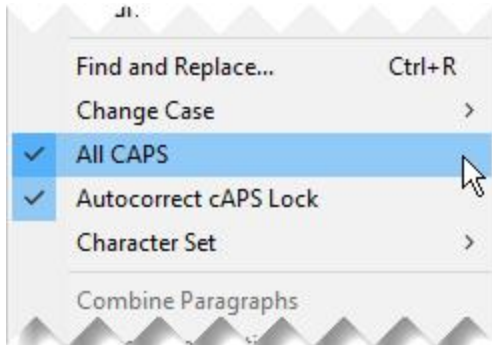


D. Now only the unselected text will plot red.

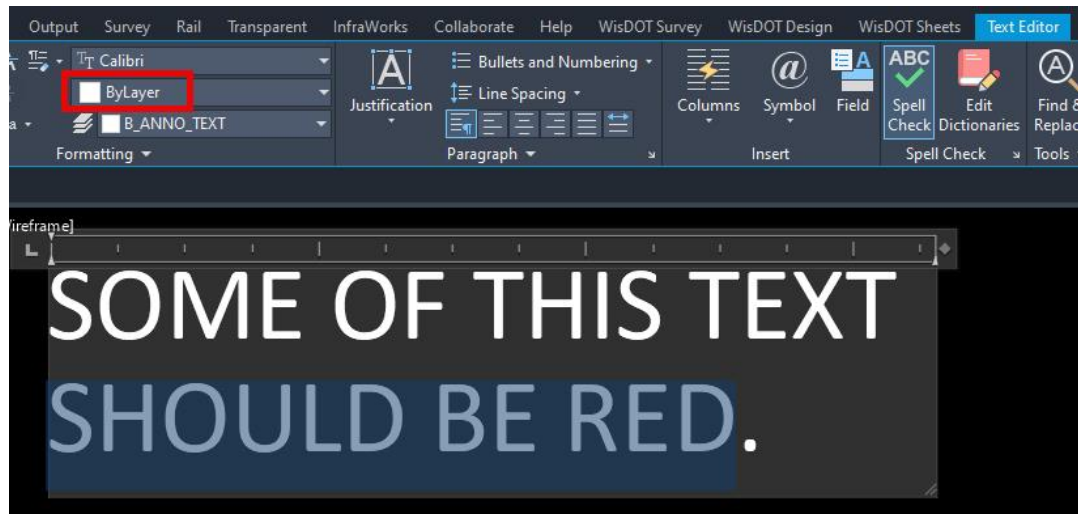


Text

- **TCASE** sets text case to fix lowercase text (this can also be done in the right-click menu)
- **Right-click** while editing text and turn on the **All CAPS** option to always type in caps. This option will stay turned on for all future annotating in every drawing.

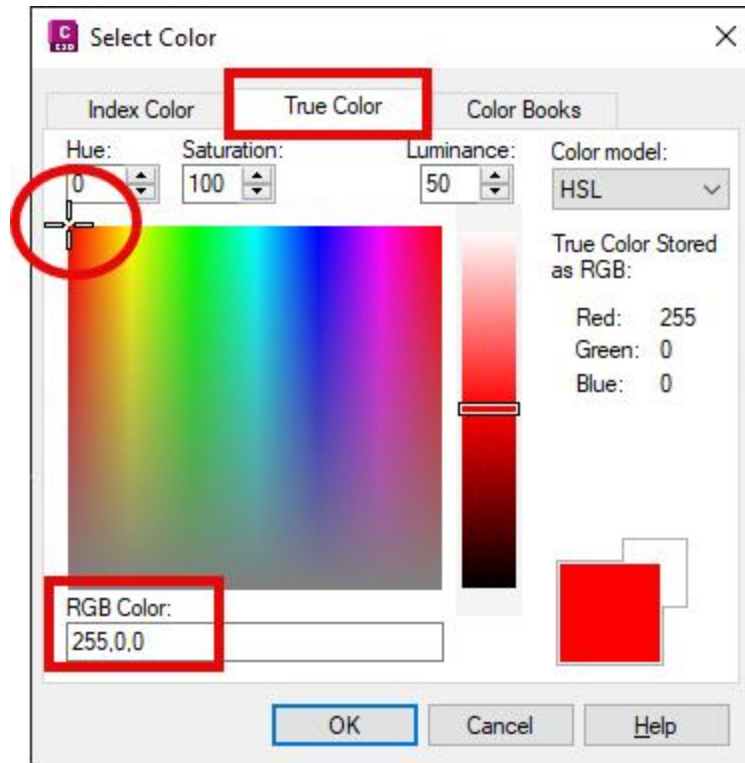


- **TXT2MTXT** converts a single line text to multiline. This is useful when correcting a file that was converted from MicroStation.
- Parts of text can be changed to plot red (or any color) by changing the font color to True Color.
 - A. Select the text that should be a different color.



- B. **Text Editor > Formatting > Color > More Colors...**
- C. Click the **True Color** tab and select the color red by either dragging the cursor to the top left

or top right of the color selector, or typing **255,0,0** in the RGB Color text field.



Info: Any text can be changed to plot red as described above except single line text and dimension text. Single line text must first be changed to multiline with **TEXT2MTXT**, and dimension text can be changed using the workaround described in the dimension section above.

Wipeout

Wipeouts are polygonal areas that mask underlying objects with the current background color. The area is bounded by a frame that can be turned on or off. The frame can also be set to be visible in Civil 3D and hidden for plotting.

1. **Ribbon > Annotate tab > Markup panel > Wipeout**
OR **WIPEOUT**
2. Click points to define the perimeter of the area to be masked.
Alternatively: **P** to click an existing polyline.
3. **Enter**

Scale a detail in one direction

Sometimes it's useful to scale a detail in one direction only, to exaggerate the vertical scale, for example.

1. Convert the detail into a block.
 - A. Select all linework. (Don't include any annotations)
 - B. **BLOCK**
 - C. Enter a name for the block
 - D. Under **Base point:** check **Specify On-screen** and click **Pick point** to define the block base point
 - E. Under **Objects** make sure **Convert to block** is ticked.
 - F. **OK**
2. Select the new block and edit the **Scale X** and/or **Scale Y** in the properties dialog.

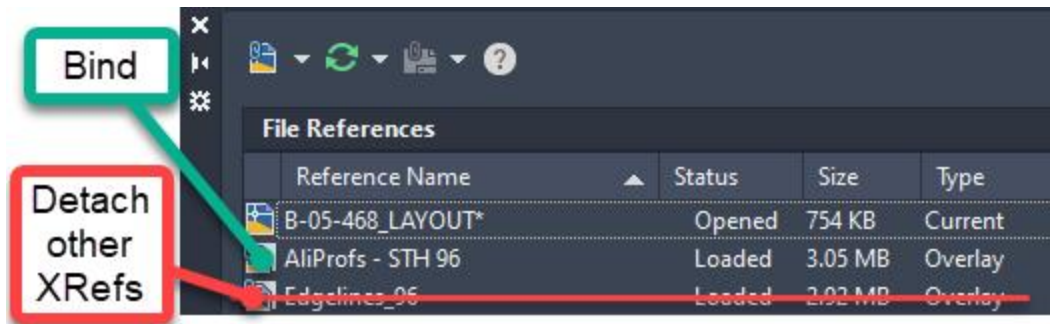
Structures file conversion

Last updated: 2024-04-29

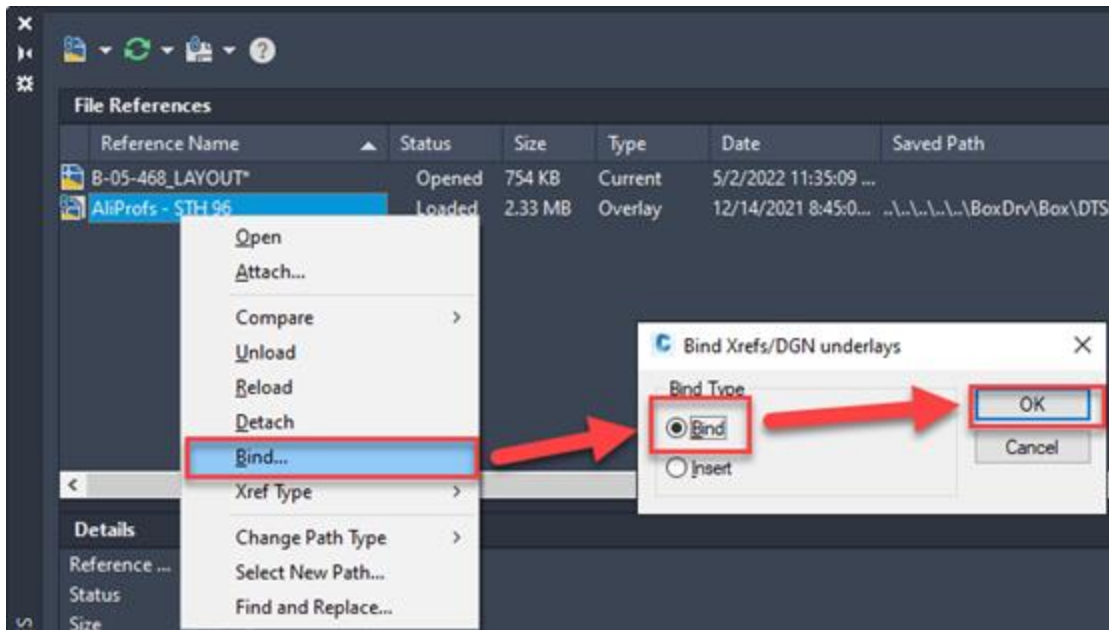
Convert DWG to DGN

Use the following steps to convert your C3D Structure Layout files to MicroStation DGN for coordination with our in-house Geotech.

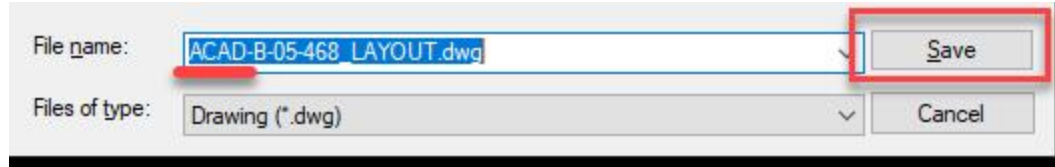
1. **Open** Structure Layout file
2. Reset the Coordinate System to WCS
3. Type **XREF** to access the references window
4. Highlight all files except the top file (which is your current file), right click and click **Detach**



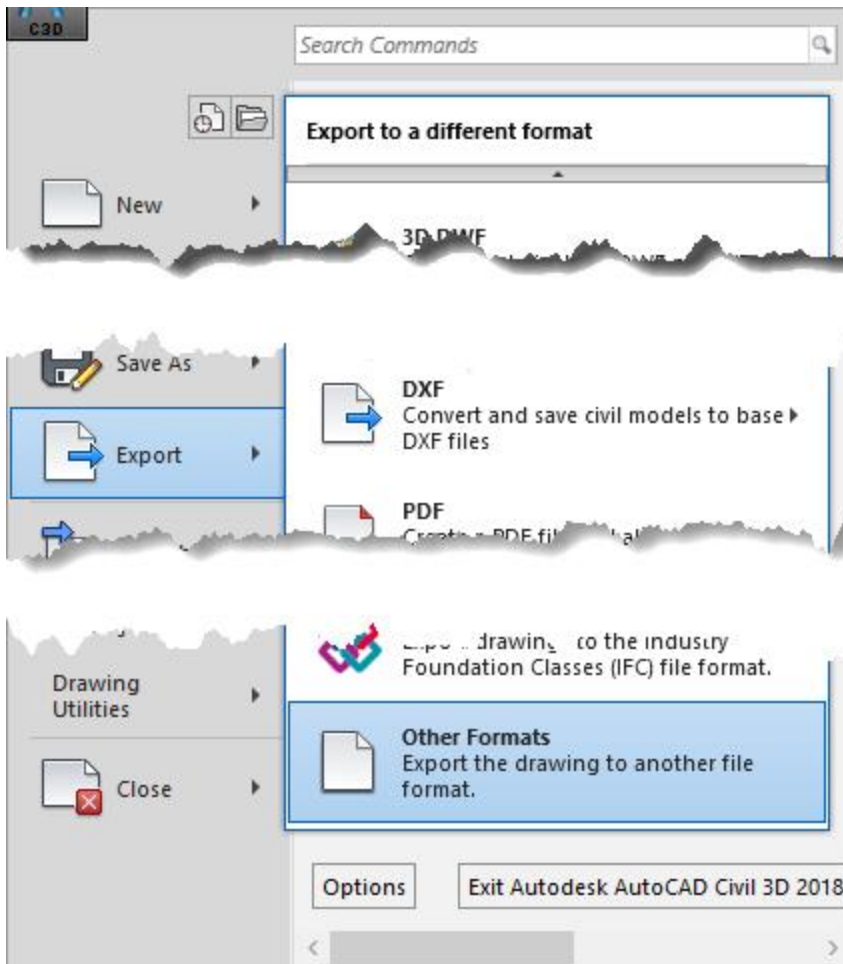
5. Right click on the Alignment file and choose **Bind... > Bind > OK**




6. In Model Space, select the alignment block and **EXPLODE**
7. **EXPORTTOAUTOCAD2010**
 - A. Save the file in the References folder that contains the Layout file. Notice the "ACAD-" prefix that gets added to the file name

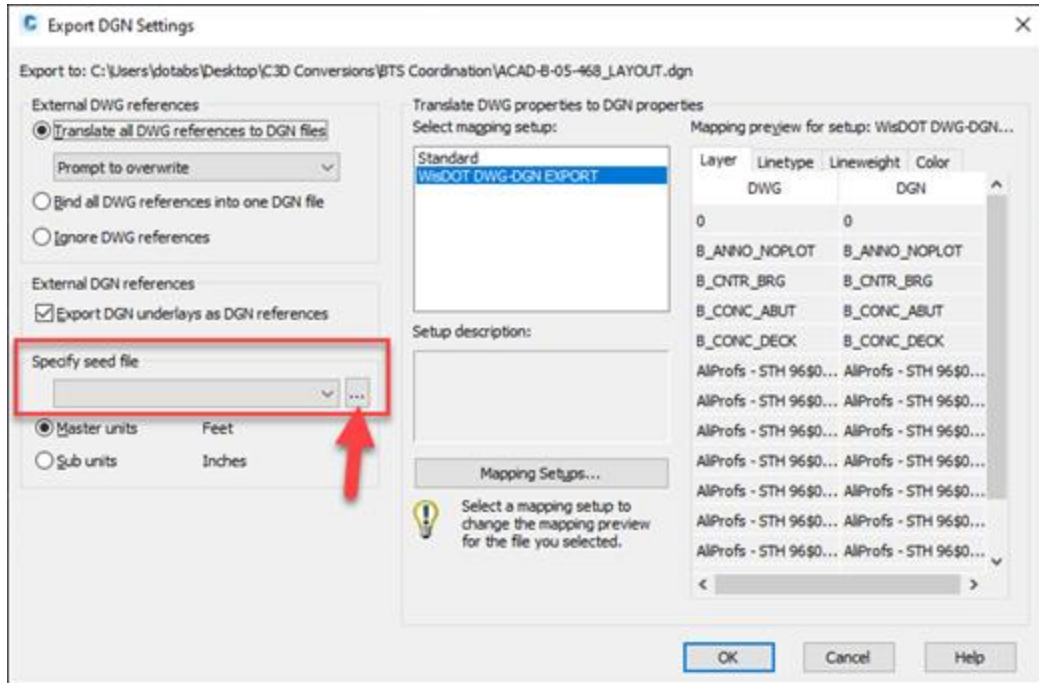


8. **Save**
9. **Open** the **ACAD-... .dwg** version of the file to be converted
10. **File > Export > Other Formats** (at the very bottom)

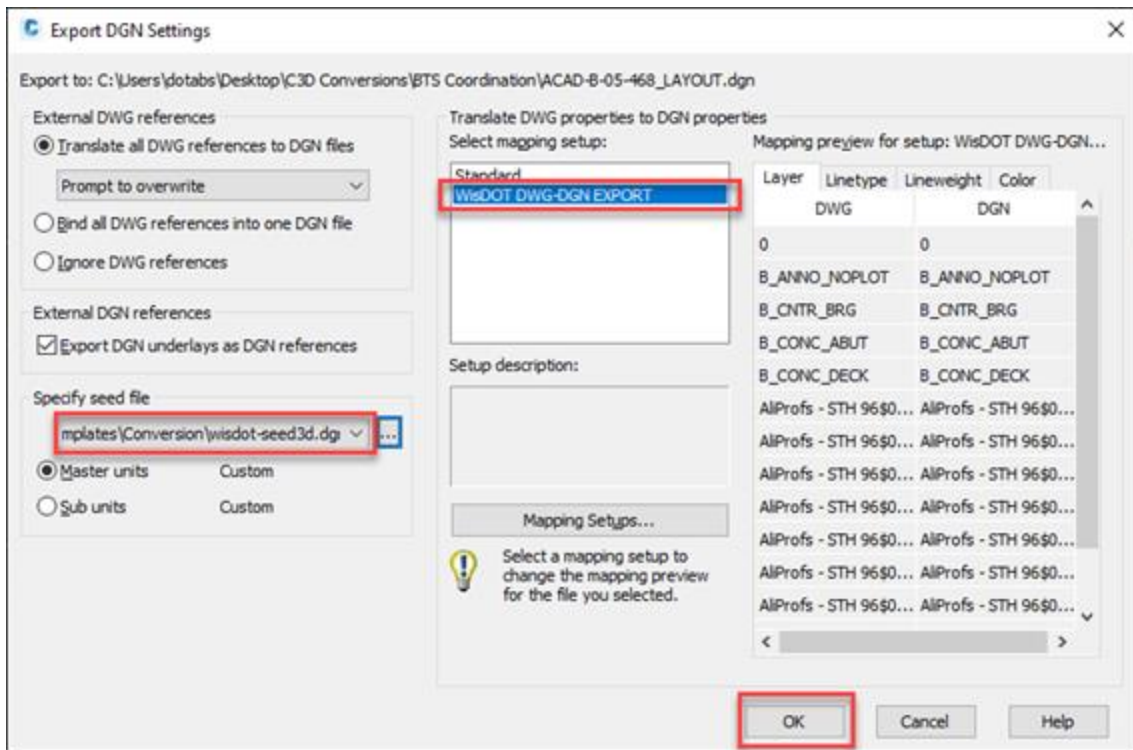


11. Save the file to the desired location as **V8 DGN (*.dgn)**
12. In the Export DGN Settings window, the seed file may need to be specified.
 - A. If so, click the  button and navigate to **C:\WisDOT\Std\C3D2022\Templates\Conversion**.

B. Select **wisdot-seed3d.dgn**



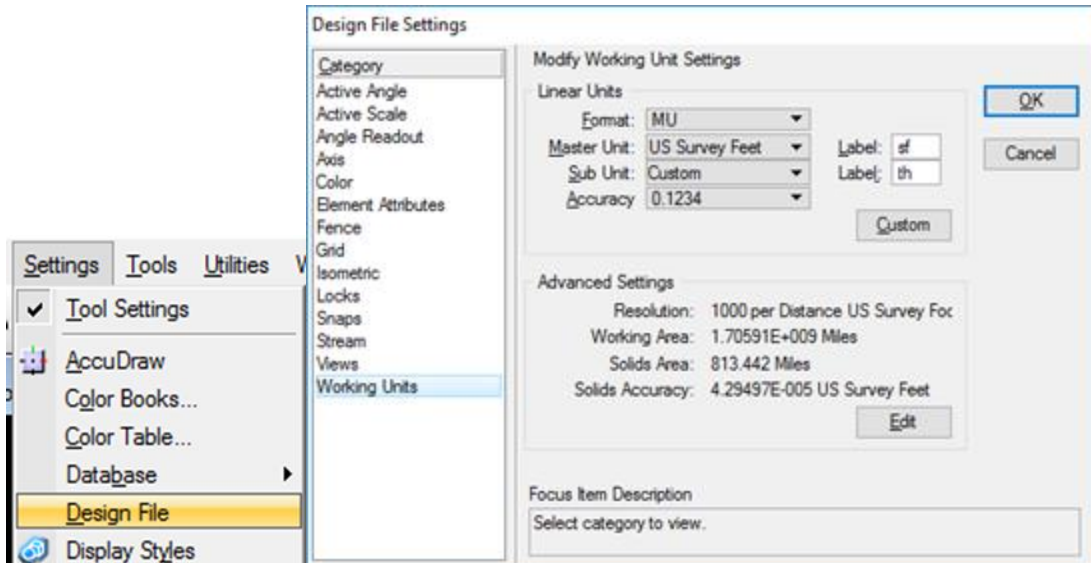
13. Choose **wisdot-seed3d.dgn** and the **WisDOT DWG-DGN EXPORT** options. **OK**



14. If the conversion was successful, the command bar will tell you so.



15. Open the file in MicroStation and confirm that 2 points on opposite corners of the file have the same coordinates as the C3D file. Also verify that the file converted into the proper units (US Survey Feet).



Convert DGN to DWG

To convert a MicroStation file, use the Convert DGN Drawing tool.

Structures plan production example

Last updated: 2024-05-03

Overview

This example will cover the basic steps needed to complete structures plans sheets listed below.

Exercise files: [pln-prod-struct-xmpl.zip](#)

Getting started



Requirement:

- Open Civil 3D using the **Civil 3D 20XX WisDOT-BOS** desktop shortcut. This will open Civil 3D with the "Structures profile" on page 85, which is required for drafting structures plans. If the shortcut is missing from your desktop, follow the instructions on the "Structures profile" on page 85 page.





- Before starting structures plans, make sure you have collected all necessary reference files, and that you have a layout file created according to the "Structures layout file" on page 143 page.

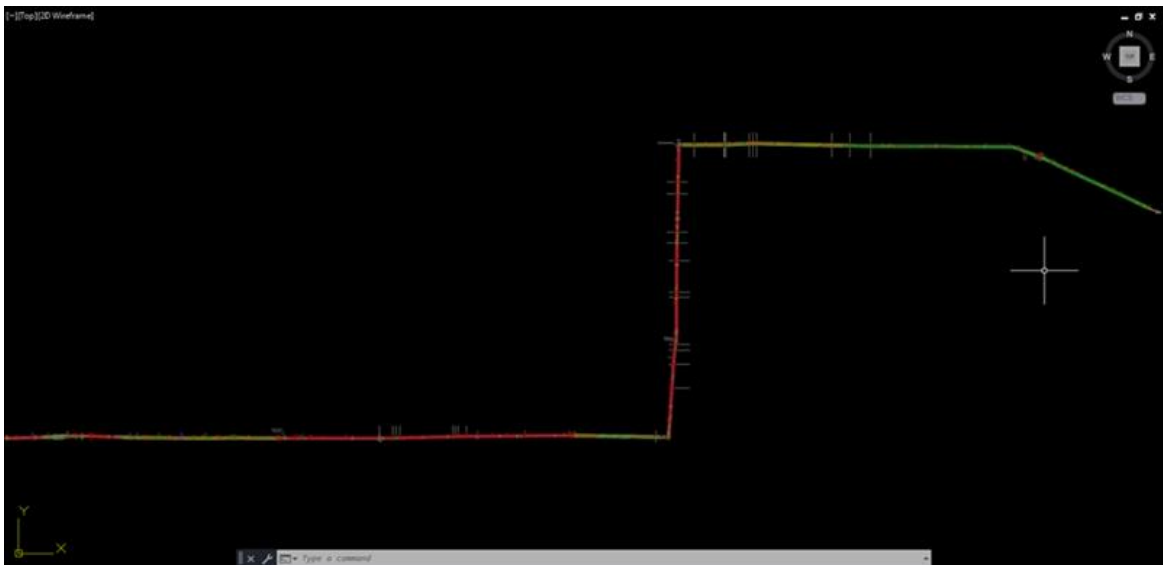
Structures sheet set

Follow the instructions on the "Structures sheet sets" on page 150 page to create a new sheet set. An example sheet set is provided with the example files: **SheetSet.dst**.

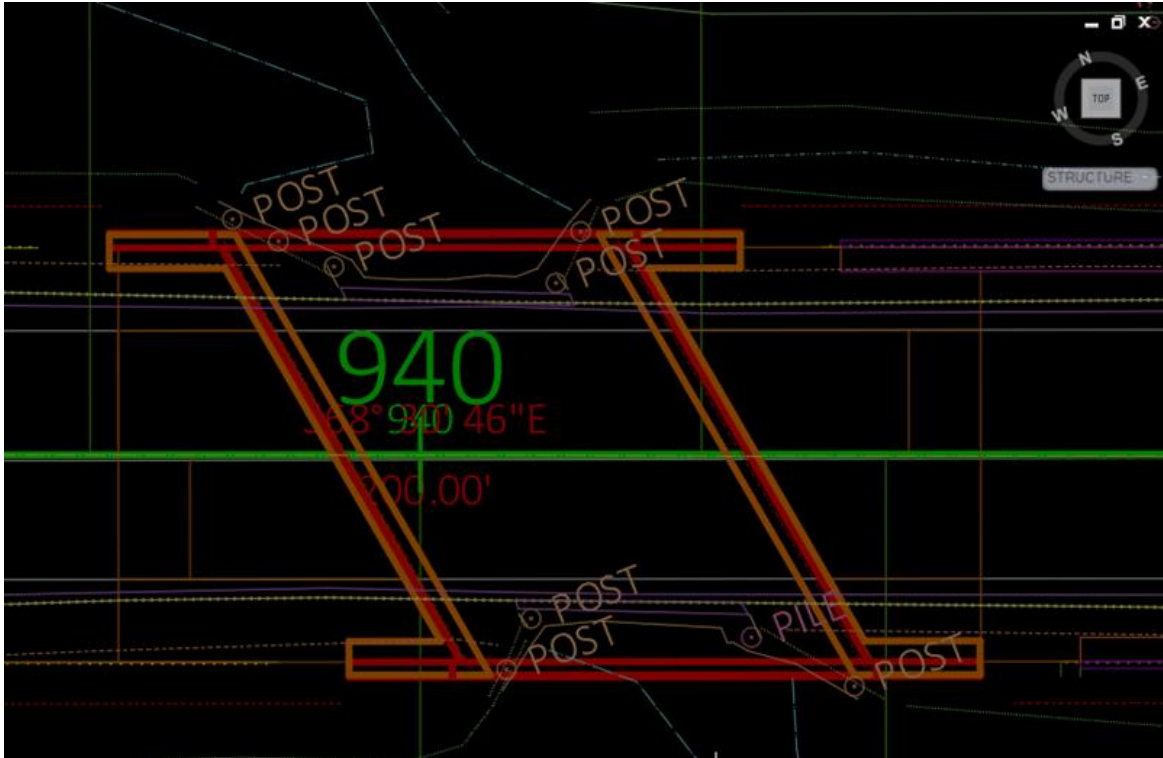
General plans sheet

File setup

1. Start a new drawing file with the Structures Drawing Templates .
2. Save the new file to the structure **CAD** folder. The drawing should be named **YEAR-01-STRUCTID_GP.dwg**, or for this example **2021-01-B05486_GP.dwg**
3. Attach all needed references. For more information, see "Structures external references" on page 131. After referencing the example reference files, the drawing should look like this:



4. Rotate the view so the structure alignment is horizontal and set up a UCS for the structure by following the steps on the "Structures coordinate systems" on page 139 page. The drawing should now look like this:



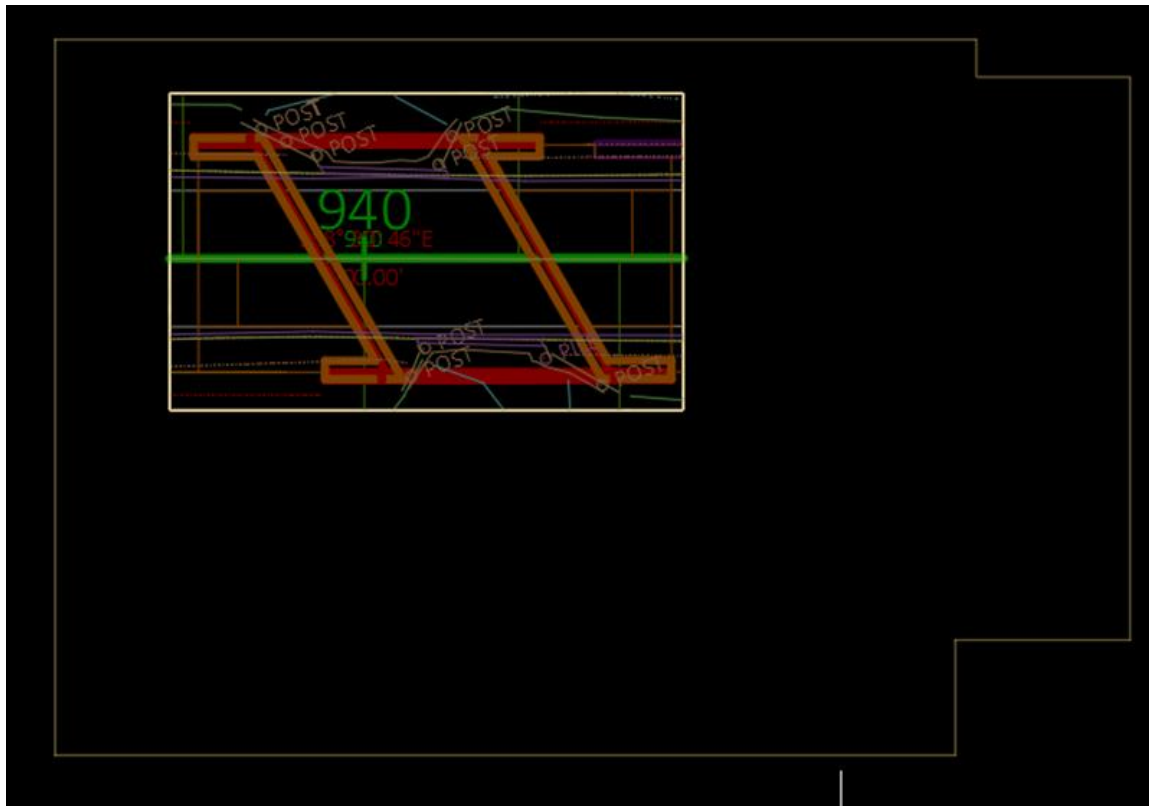
i Info: Culverts, retaining walls, and other ancillary structures tend to be aligned along the structure, not the roadway.

Structure plan setup

1. Reference in the "Structures layout file" on page 143 , or manually draw the outline of the structure plan. Be sure to use appropriate "Structures template layers" on page 89.
2. Draw a boundary around the structure plan and use that boundary to clip all references "Structures external references" on page 131.
3. Determine the best annotation scale for the structure plan by inserting a Viewport Outline block (**Structures tool palette > Misc. palette > Viewport section > Outline**) with a scale of 1/12. **SCALE** the outline as needed to fit the plan in the upper left corner of the outline. The scale needed for the outline will be equal to your annotation scale for the plan. Set the active annotation scale.

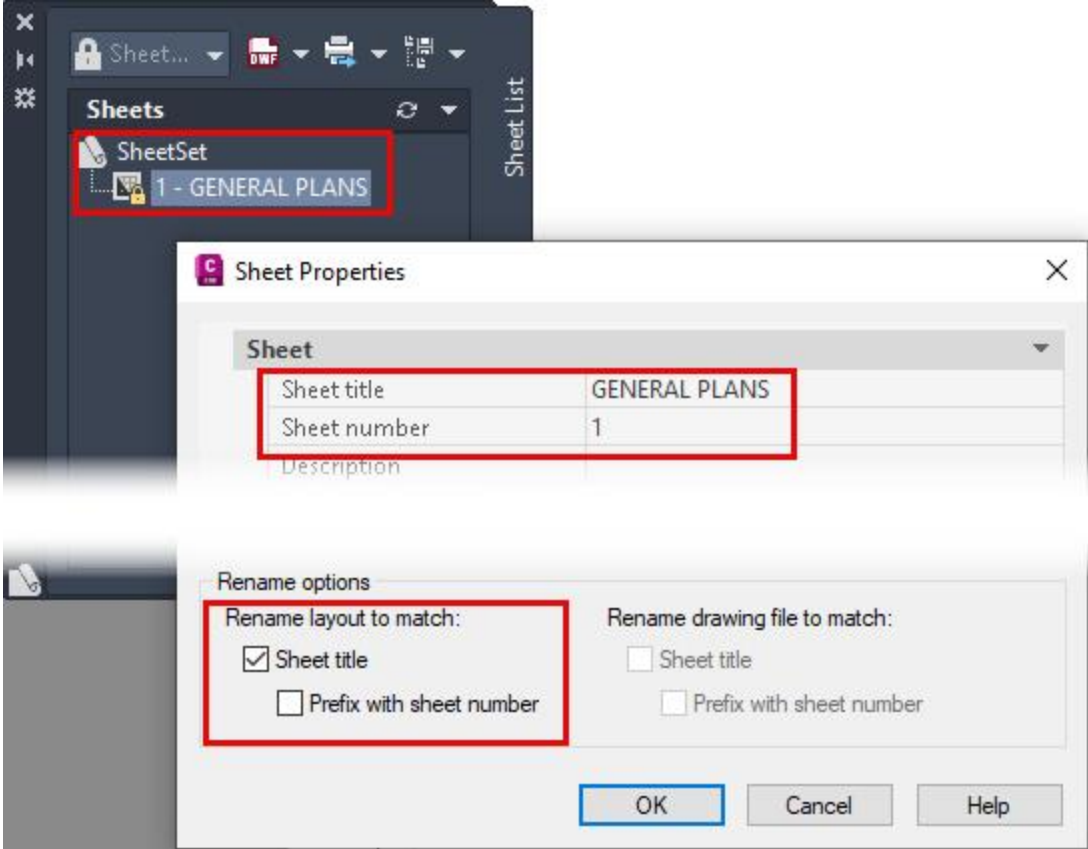
For the example structure, a scale of 12.0 works best. The plan view looks like the image below inside the viewport outline block.

Structures plan production example



Sheet layout setup

1. Create a front sheet layout using the structures sheet templates. For more information see the Structures Drawing Templates page.
2. **SAVE** the drawing so the new layout can be added to the sheet set.
3. **Right-click** the new sheet layout and **Import Layout as Sheet...** to add the sheet to your sheet set.




Requirement: You must have your sheet set open in the sheet set manager (**SSM**) first.

Info: For more information about how to add sheet layouts to a sheet set, see the "Structures sheet sets" on page 150 page.

- 4. After completing the sheet properties in the sheet set manager, **REA** to update the sheet border.

Structures plan production example

NO.	DATE	REVISION	BY
		BUREAU OF STRUCTURES	
ACCEPTED _____		DATE _____	
CHIEF STRUCTURES DESIGN ENGINEER			
STRUCTURE B-05-468			
STH 96 OVER UNNAMED CREEK			
COUNTY	BROWN	TOWN	NEW DENMARK
DESIGN SPEC. AASHTO LRFD BRIDGE DESIGN SPECIFICATION			
DESIGNED BY	JJS	DESIGN CK'D	ABS
DRAWN BY	ABS	PLANS CK'D	
GENERAL PLANS		SHEET 1 OF 10	
I.D. 4075-36-00A		DATE: _____	

8

5. Open the "General plans blocks #gp" on page 114. With the sheet layout open, place the **Design Data**, **Design Contacts** and **Sheet List** blocks at scale 1. Edit the design data and design contact blocks as needed.
 - Culverts and retaining walls have their own design data blocks on their respective palettes.
 - The Sheet list block can be edited directly, or it can be deleted and created with the sheet set instead. For more information see the "Structures sheet sets" on page 150 section of the sheet set

page.

DESIGN DATA	STATE PROJECT NUMBER 4075-39-72																																																		
<p>LIVE LOAD: DESIGN LOADING: HL-93 INVENTORY RATING: RF = OPERATING RATING: RF = WISCONSIN STANDARD PERMIT VEHICLE (WIS-SPV): XXX(KIPS) STRUCTURE IS DESIGNED FOR A FUTURE WEARING SURFACE OF 2.0 POUNDS PER SQUARE FOOT.</p>																																																			
<p>MATERIAL PROPERTIES</p> <p>CONCRETE MASONRY: SUPERSTRUCTURE & STRUCTURAL APPROACH SLAB: $f'_c = 4,000$ PSI ALL OTHER: $f'_c = 3,500$ PSI</p> <p>BAR STEEL REINFORCEMENT GRADE 60: $f_y = 60,000$ PSI STAINLESS, GRADE 60: $f_y = 60,000$ PSI</p> <p>XX-W" PRESTRESSED GRIDERS: CONCRETE MASONRY: $f'_c = 8,000$ PSI STRANDS: XX" DIA. WITH ULTIMATE TENSILE STRENGTH OF 270,000 PSI</p> <p>STRUCTURAL CARBON STEEL: ASTM A36, GRADE 36: $f_y = 36,000$ PSI</p> <p>HIGH STRENGTH STRUCTURAL STEEL: ASTM A36, GRADE 50: $f_y = 50,000$ PSI</p>																																																			
<p>FOUNDATION DATA (MODIFIED GATES)</p> <p>ABUTMENTS TO BE SUPPORTED ON XXXXX PILING DRIVEN TO A REQUIRED DRIVING RESISTANCE OF XXX TONS ** PER PILE AS DETERMINED BY THE MODIFIED GATES DYNAMIC FORMULA. ESTIMATED XX'-0" LONG. ESTIMATED XX'-0" LONG.</p> <p>PIER TO BE SUPPORTED ON XXXXX PILING DRIVEN TO A REQUIRED DRIVING RESISTANCE OF XXX TONS ** PER PILE AS DETERMINED BY THE MODIFIED GATES DYNAMIC FORMULA. ESTIMATED XX'-0" LONG.</p> <p>**THE FACTOR DYNAMIC RESISTANCE OF PILES IN COMPRESSION USED FOR DESIGN IS THE REQUIRED DRIVING RESISTANCE MULTIPLIED BY A RESISTANCE FACTOR OF 0.5 USING MODIFIED GATES TO DETERMINE PILE CAPACITY.</p>																																																			
<p>HYDRAULIC DATA</p> <p>100-YEAR FREQUENCY: Q: C.F.S. V: F.P.S. HW: EL. WATERWAY AREA = SQ. FT. DRAINAGE AREA = SQ. MI ROADWAY OVERTOPPING = N/A SCOUR CRITICAL CODE =</p> <p>2-YEAR FREQUENCY: Q: C.F.S. V: F.P.S. HW: EL.</p>	<p>TRAFFIC DATA</p> <p>FEATURE ON: ADT = R.D.S. = MPH</p> <p>FEATURE UNDER: ADT = R.D.S. = MPH</p>																																																		
<p>LIST OF DRAWINGS:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td>GENERAL PLANS</td></tr> <tr><td>CROSS SECTION & QUANTITIES</td></tr> <tr><td> </td></tr> <tr><td> </td></tr> <tr><td> </td></tr> </table>	GENERAL PLANS	CROSS SECTION & QUANTITIES				<p style="text-align: center;">STRUCTURE DESIGN CONTACTS: DESIGNER: AARON BONK PHONE NUMBER: 608-363-0061</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20%; text-align: center;">NO.</td> <td style="width: 40%; text-align: center;">DATE</td> <td style="width: 40%; text-align: center;">BY</td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td colspan="3" style="text-align: center;">BUREAU OF STRUCTURES</td> </tr> <tr> <td colspan="3" style="text-align: center;">RECEIVED</td> </tr> <tr> <td colspan="3" style="text-align: center;">DATE: _____</td> </tr> <tr> <td colspan="3" style="text-align: center;">STRUCTURE B-05-468</td> </tr> <tr> <td colspan="3" style="text-align: center;">5TH RG OVER UNNAMED CREEK</td> </tr> <tr> <td style="text-align: center;">ELECTRIFY</td> <td style="text-align: center;">BRDWN</td> <td style="text-align: center;">FORM</td> </tr> <tr> <td style="text-align: center;">NEW DENMARK</td> <td> </td> <td> </td> </tr> <tr> <td colspan="3" style="text-align: center;">DRAWN BY: _____</td> </tr> <tr> <td colspan="3" style="text-align: center;">CHECKED BY: _____</td> </tr> <tr> <td style="text-align: center;">ISS</td> <td style="text-align: center;">REV</td> <td style="text-align: center;">DATE</td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td colspan="2" style="text-align: center;">GENERAL PLANS</td> <td style="text-align: center;">SHEET 1 OF 10</td> </tr> <tr> <td colspan="2" style="text-align: center;">I.D. 4075-36-00A</td> <td style="text-align: center;">DATE: _____</td> </tr> </table>	NO.	DATE	BY				BUREAU OF STRUCTURES			RECEIVED			DATE: _____			STRUCTURE B-05-468			5TH RG OVER UNNAMED CREEK			ELECTRIFY	BRDWN	FORM	NEW DENMARK			DRAWN BY: _____			CHECKED BY: _____			ISS	REV	DATE				GENERAL PLANS		SHEET 1 OF 10	I.D. 4075-36-00A		DATE: _____
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I.D. 4075-36-00A		DATE: _____																																																	

Finish structure plan

1. With the model space open, place any needed blocks in the **Plan** section of the General Plans palette.

Info: In general, all of the blocks on the General Plans palette should be placed in model space at a scale equal to the annotation scale. The exceptions are the Lane Arrows and Elev-

Structures plan production example

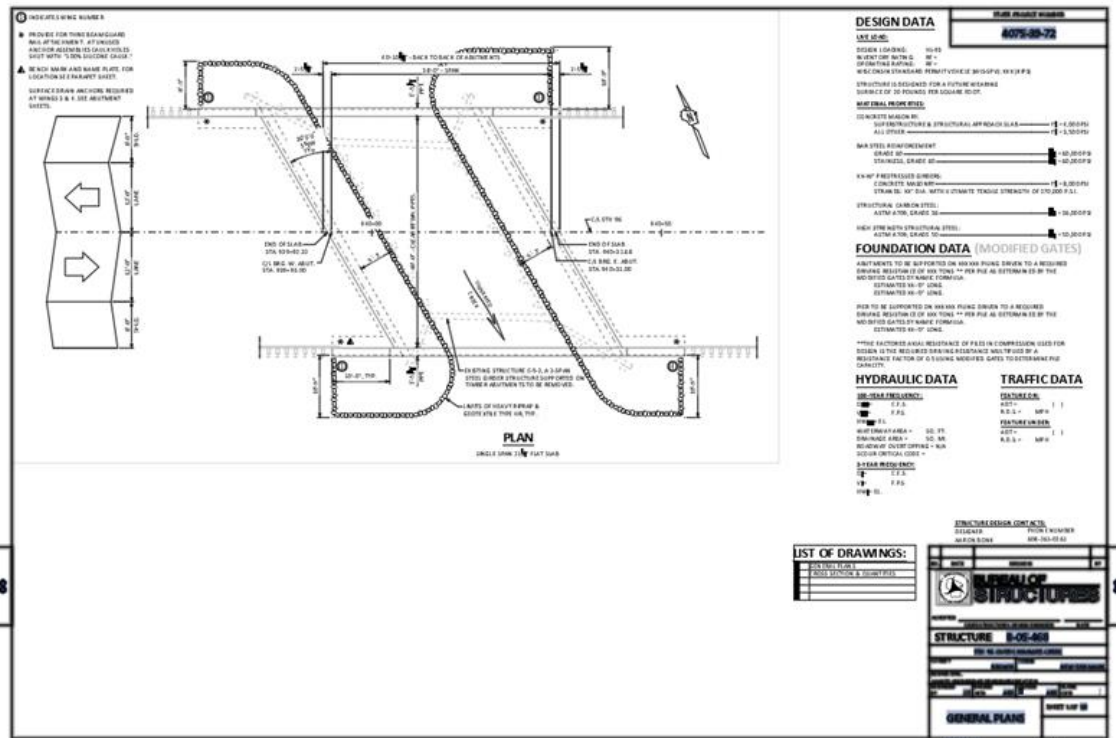
1. Add Scale blocks (which should always be placed at scale 1) and the Cross Slope block (which should be scaled down by 12).

2. Use the "Quick annotations" on page 109 to annotate the structure plan. Keep the "Structures drafting etiquette" on page 161 in mind while drafting.
3. Follow the steps on the "Structures external references" on page 131 page to ghost any references that should be shown in the final plans, and unload any other references.
4. Use the Sheet Tools - Align Viewport tool to rotate the existing viewport in the sheet layout.

Requirement: The model space coordinate system needs to be set to WCS before using this tool. For more information see the "Structures coordinate systems" on page 139 page.

5. Resize the existing viewport and set it to use the same annotation scale as used in the model space. Follow the instructions on the "Structures sheet layouts and viewports" on page 144 for more information.

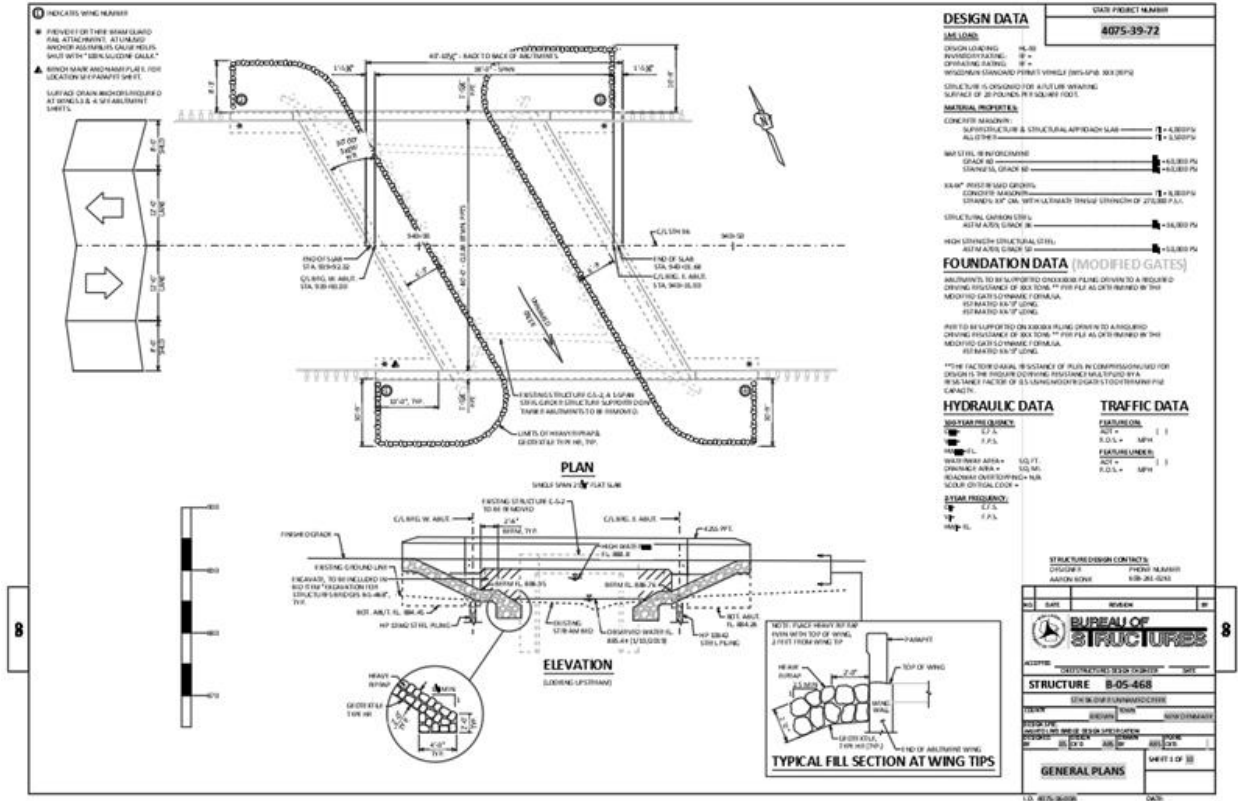
At this point, the general plan sheet layout should look like this:



Structure elevation

1. In model space, draw the elevation view below the plan. Use the blocks in the **Elevation** section of the General Plans palette. Pay attention to the "Structures drafting etiquette" on page 161 , and be sure to use appropriate "Structures template layers" on page 89.
2. Copy the plan viewport or extend it to fit both the plan and elevation. Follow the instructions on the "Structures sheet layouts and viewports" on page 144 .

At this point, the general plan sheet layout should look like this:




List of drawings

Once all sheets are complete, make sure to update the **total pages** property in the sheet set and **REA** to update the sheet border. Follow the directions on the "Structures sheet sets" on page 150 of the sheet set page to create a sheet list using the sheet set manager.

LIST OF DRAWINGS:	
1	GENERAL PLANS
2	CROSS SECTION & QUANTITIES
3	SUBSURFACE EXPLORATION
4	WEST ABUTMENT
5	WEST ABUTMENT DETAILS
6	EAST ABUTMENT
7	EAST ABUTMENT DETAILS
8	SUPERSTRUCTURE
9	SUPERSTRUCTURE DETAILS
10	SINGLE SLOPE PARAPET 42SS

Cross section and quantities sheet

Info: New bridges are typically the only structure type to have a separate Cross Section and Quantities sheet. Rehabs and other structure types tend to combine the general plans and quantities on

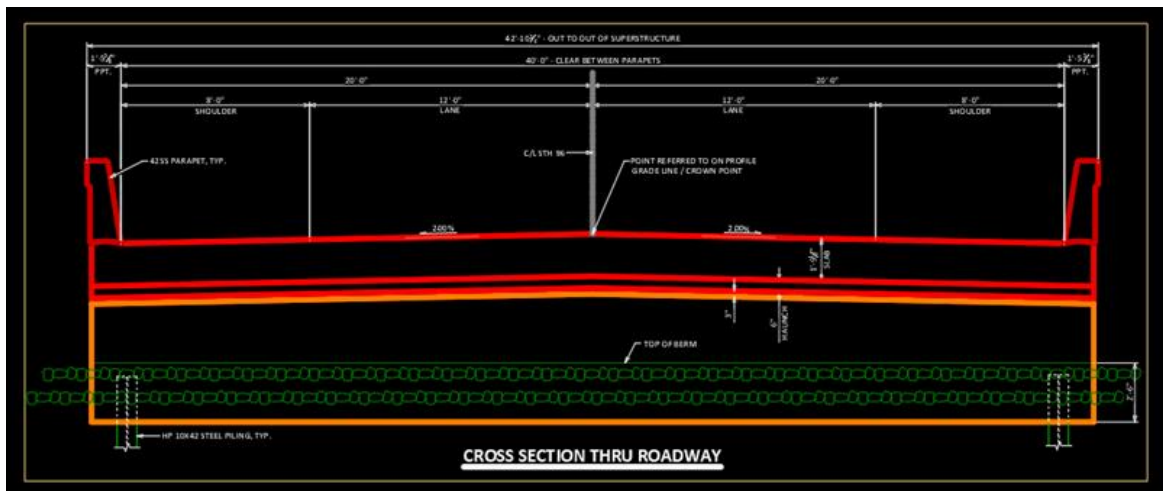
 one page.

File setup

1. Start a new drawing file with the Details/Architectural Template. For more information see Structures Drawing Templates .
2. Save the new file to the structure CAD folder. The drawing should be named YEAR-02-STRUCTID_QUAN.dwg or for this example 2021-02-B05468_QUAN.dwg.

Structure cross section


1. Draw the cross section thru the bridge. Don't worry about any dimensions or annotations yet. Be sure to use appropriate "Structures template layers" on page 89 .
2. Determine the best annotation scale for the structure plan by inserting a Viewport Outline block (**Structures tool palette > Misc. palette > Viewport section > Outline**). Try using different scales for the block to see which fits the cross section best. The cross section should fit in the upper left corner of the sheet with room for the bid item table below and the general notes on the right. The scale needed for the block will be equal to your annotation scale for the plan.
3. Set the active annotation scale equal to the viewport outline scale.
4. Use the "Quick annotations" on page 109 to annotate the structure cross section. Keep the "Structures drafting etiquette" on page 161 in mind while drafting.
5. Draw a rectangle around the structure cross section on B_ANNO_NOPLOT. This rectangle will be used to resize the viewport.



Sheet layout setup

1. Create a Sheet 2 layout using the structures sheet templates. For more information see the Structures Drawing Templates page.
2. **SAVE** the drawing so the new layout can be added to the sheet set.
3. **Right-click** the new sheet layout and **Import Layout as Sheet...** to add the sheet to your sheet set.

 **Requirement:** You must have your sheet set open in the sheet set manager (**SSM**) first.

 **Info:** For more information about how to add sheet layouts to a sheet set, see the "Structures sheet sets" on page 150 page.

After completing the sheet properties in the sheet set manager, **REA** to update the sheet border.

4. Set the annotation scale for the viewport equal to the annotation scale used to draw the structure cross section. Pan and resize the viewport so it matches the rectangle drawn around the cross section. Move the viewport to the upper left corner of the sheet. For more information, see the "Structures sheet layouts and viewports" on page 144 page.

Bid items and quantities table

With the sheet layout created in the previous section open:

1. Open the "Cross section and quantities blocks #quan" on page 116 palette.
2. Place the Bid Item Table block in the bottom left corner of the sheet at scale 1.
3. Use the dynamic block dropdown to choose the structure type. In the final menu, choose **Table** for this example (not OLE).
4. **EXPLODE** the block.
5. Edit the bid item table directly, or use the Paste Table Tool to paste data from an excel table. For this example, an excel table has been provided with the bid item data.

General notes and detail blocks

With the sheet layout open:

1. Open the "Cross section and quantities blocks #quan" on page 116 palette.
2. Place the applicable blocks in the **General Notes** and **Typical Details** sections. All of these blocks should be placed at scale 1.0 in paper space.
3. Make customizations to the blocks as needed.

Subsurface exploration sheet



Info: The Bureau of Structures receives the subsurface exploration details as a MicroStation DGN file. Convert the drawing to Civil 3D first using the Convert DGN Drawing tool.

The subsurface exploration sheet should be set up similarly to the general plan sheet. There is a special Structures drawing templates and sheet border block for the subsurface exploration sheet. The "Miscellaneous blocks #misc" on page 130 contains blocks for the subsurface exploration grid and boring table. In the example files, the subsurface exploration drawing is named **2021-03-B05468_SOILS.dwg**.

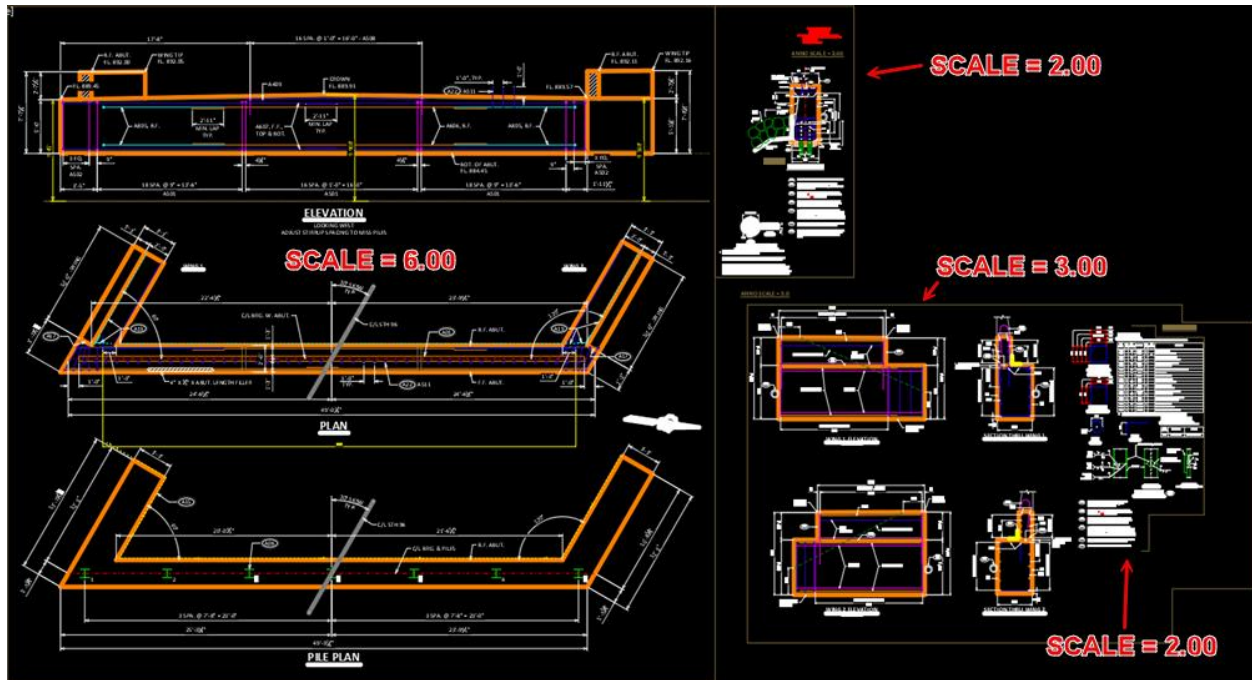
Substructure sheets

Similar substructure sheets can all be combined in one drawing. It is useful to combine similar sheets in one drawing so similar or identical details can be easily referenced or copied when drawing. The example substructure drawing, **2021-04-B05468_ABUT.dwg** contains 4 sheets:

1. WEST ABUTMENT
2. WEST ABUTMENT DETAILS
3. EAST ABUTMENT
4. EAST ABUTMENT DETAILS

Each sheet in this drawing has two viewports with different annotation scales. In the model space, these viewports are generally defined with a polyline drawn in **B_ANNO_NOPLOT** and a noplot text note documenting the annotation scale for each detail. The viewport scales can also be confirmed by selecting each viewport in paperspace, as shown on the "Structures sheet layouts and viewports" on page 144 page.

Structures plan production example



The substructure drawing also contains a reference to the **LAYOUT.dwg** drawing. Note that because the substructure drawing uses a Details/Architectural template, the layout file references in 12x too small. In this drawing the reference is kept at a scale of 1.0, but then two copies of the reference are made. Each copy is scaled and rotated to line up with the substructure sheet. References like this can be either used directly in the plan details, or as in this drawing, just used as a reference while drafting.



Rebar detailing

Blocks for rebar detailing are available in the "Rebar blocks #rebar" on page 120 . Similar to the Bid Item Table block covered earlier, the bill of bars table contains dynamic options to choose the sheet type and whether to use an OLE table or built-in table for the bill of bars. It is recommended to use the **TABLE** options where possible, since importing data as an OLE object can cause file slowdown or corruption. **EXPLODE** the block after selecting the required table. The table can be edited directly in C3D, or the Paste

Superstructure details

The **2021-09-B05468_SUPERDET.dwg** drawing in the example files contains superstructure details like the bill of bars and bar bend diagrams, slab camber details, and top of slab elevations. In this drawing, everything is drawn directly on the sheet layout because there are no scaled details. Unlike the sub-structure sheets, the superstructure sheets are split into two drawings because they don't have shared or similar details. However, the sheets could be combined into one drawing at the drafter's preference.

Follow the Rebar Detailing section above for more information about creating the bill of bars table. The top of slab elevations table is created in the same way as the bill of bars and bid items tables. A spreadsheet containing the top of slab elevations is provided with the example files named **Top of Deck.xlsx**

Insert sheets

For more information about insert sheets, see the "Structures insert sheets" on page 162 page. The **2021-10-B05468_PPT.dwg** is a Single Slope Parapet 42SS insert sheet modified to meet the needs of this structure.

Drawing cleanup and closeout

Be sure to clean your drawings and make them ready for project closeout by following the steps on the "Structures drawing cleanup and closeout" on page 166 page.

Plotting

See the "Structures plan plotting" on page 167 page for information about how to plot the plan set.