WisDOT Civil 3D training

Construction administration - beginner

CONTENTS

Civil 3D interface

Civil 3D interface introduction

Last updated: 2017-12-01
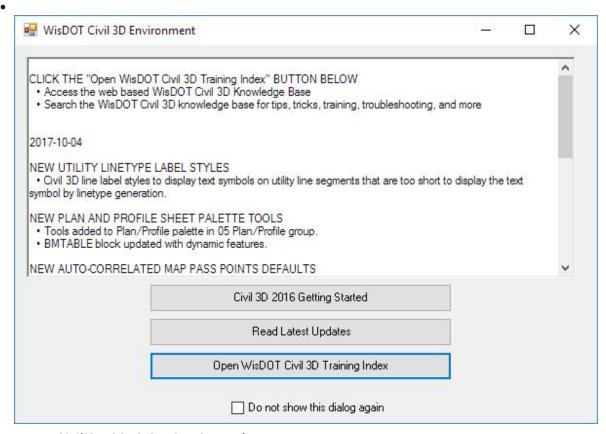
Total video time: 21:39

Workspace components

c3d-intrfc-intro-01.mp4 5:13

- WisDOT Civil 3D Environment Dialog box
-

- Civil 3D 2016 Getting Started
  - Training documentation (PDF format)
- Read Latest Updates
- Open WisDOT Civil 3D Training Index
- Application Menu Browser
- Quick Access Toolbar
- Ribbon
  - Tabs and Panels

- Drawing Tabs
- Toolspace
    - Prospector
    - Settings
    - Survey
    - Toolbox
- Status Bar
- Toolbars

Application menu browser

Exercise files: c3d-intrfc-data-c3d16.zip

ProjectID\SheetsPlan\STH25-XS.dwg

c3d-intrfc-intro-02.mp4 3:52

- General File Functions
- New, Open, Save, Save As, Export, Publish, Print, Drawing Utilities, and Close
- Command Search
- Recently Opened Files or Currently Open Files List

Quick Access toolbar

c3d-intrfc-intro-03.mp4 4:16

- Typical program commands
- New, Open, Save, Plot, Undo/redo
- Workspace and workspace settings
- Can add your own commands.
    - Add More Commands
    - Right-click icon Add to Quick Access Toolbar
- Show Menu Bar
- Show below ribbon

Toolbars

c3d-intrfc-intro-04.mp4 1:05

- Held icons prior to ribbon
- Transparent Commands and filters only ones open by default

Command line

c3d-intrfc-intro-05.mp4 2:54

- For typed versions of commands
- Input settings
- Palette can be docked at the top or the bottom of screen
- Palette can be moved to another screen
- View and cycle through previous commands
- Transparency

Status bar (Icons)

c3d-intrfc-intro-06.mp4 2:43

- Icons...
- Function Key Alternatives
- Customization

Drawing scale

Exercise files: c3d-intrfc-data-c3d16.zip

ProjectID\BaseData\Mapping\ExistSurface.dwg

c3d-intrfc-intro-07.mp4 1:33

- Always draw at 1" = 1"
- Drawing Scale controls size of text
- And space between section views in array

Ribbons and tabs

Last updated: 2017-12-01

Total video time: 5:56

Exercise files: c3d-intrfc-data-c3d16.zip

ProjectID\SheetsPlan\STH25-XS.dwg

c3d-intrfc-rbn-01.mp4 5:56

Tabs for grouping of command panels

Home, Insert, Annotate, Modify, Analyze, View, Output, Survey, ...

Minimize Arrow icon

- Minimize to Panel Buttons
- Minimize to Panel Tiles
- Minimize to Tabs
- Show Full Ribbon

Contextual Ribbons

- Specific to selected object
- Launchpad commands for selected object

Panels for grouping of similar command icons Icons for starting commands

Panel Pull-downs for less frequently used commands

Panels can be dragged off ribbons and placed back.

Toolspace

Last updated: 2017-12-01

Total video time: 25:32

Toolspace tabs

c3d-intrfc-tlspc-01.mp4 3:21

- Prospector
- Settings
- Survey
- Toolbox

Preview window

Active Drawing View

Master View

Drawing objects access & data shortcuts

c3d-intrfc-tlspc-02.mp4 5:15

Drawing objects

- Points
- Point Groups
- Point Clouds

- Surfaces
- Alignments (Profiles and Sections)
- Sites (Grading and Parcels)
- Catchments
- Pipe Networks (including Interference objects)
- Pressure Networks
- Corridors
- Assemblies
- Intersections
- Survey
- View Frame Groups

Data Shortcuts

- Surfaces
- Alignments (and Profiles)
- Pipe Networks
- Pressure Networks
- View Frame Groups

Active Drawing View/MasterView

[c3d-intrfc-tlspc-03.mp4](#) 3:07

- Master view
- Active Drawing Settings View
- Active Drawing Labels Only View
- Labels Only View

Object Style Defaults

[c3d-intrfc-tlspc-04.mp4](#) 2:24

Managing objects

- Right-click on object names for Properties or Edit Current Style

Styles for each object

- Object styles
- Label styles
- Table styles
- Commands
- Other settings - criteria or rules

Toolspace

- Right-click on object collection name (header)
- Edit Feature Settings
- Drawing Settings and Object Defaults

Command Settings

c3d-intrfc-tlspc-05.mp4 4:35

Commands

- Macros for creation settings
    - Edit Command Settings

Overall drawing settings

- **Right-click on drawing name > Edit drawing settings**
    - Units and Zone (coordinates)
        - WisDOT specific coordinate systems
    - Transformation (coordinates)
    - Object Layer defaults
    - Abbreviations (for labels)
    - Ambient Settings (drawing settings)

Survey database access

Exercise files: c3d-intrfc-data-c3d16.zip

ProjectID\SheetsPlan\STH25-XS.dwg

c3d-intrfc-tlspc-06.mp4 4:16

- External to any drawing
- Survey Databases (per project)
- Equipment Database
    - Survey equipment data to aid analysis
- Figure Prefix Database
    - Point codes that have linework
    - Manages the linework style, layer
- Linework Code Sets
    - Field codes that start linework

Toolbox

Exercise files: c3d-intrfc-data-c3d16.zip

ProjectID\Design\Corridors\Corridor-STH25-4thAve.dwg

c3d-intrfc-tlspc-07.mp4 2:31

Toolbox - extra functionality

- Report Manager
- Subscription Extension Manager
- Miscellaneous Utilities
- WisDOT Toolbox
  - WisDOT Macros
  - WisDOT Reports
  - Survey File Conversion
- Productivity Packs
- Autodesk Labs tools (extensions)

To access tools

- Right-click and choose Execute

Command shortcuts and hotkeys

Last updated: 2017-12-01

Total video time: 9:27

Exercise files: c3d-intrfc-data-c3d16.zip

ProjectID\SheetsPlan\STH25-XS.dwg

c3d-intrfc-cmnd-shrtct-htky-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

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: 2017-12-01

Total video time: 4:56

Exercise files: c3d-intrfc-data-c3d16.zip

ProjectID\SheetsPlan\STH25-XS.dwg

c3d-intrfc-basc-mous-01.mp4 4:56

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 cus-
tomization

Context sensitive

Repeat Last command

Steering wheel control

Last updated: 2017-12-01

Total video time: 3:10

Exercise files: c3d-intrfc-data-c3d16.zip

ProjectID\SheetsPlan\STH25-XS.dwg

> [c3d-intrfc-strng-whl-01.mp4](#) 3:10

Navigation controls that follow your cursor

Sections of the wheel do different tasks

- Zoom
- Pan
- Orbit
- Center

Open through the Navigation Bar

Different sized steering wheels depending on your preference

Set pivot point for orbits

Status bar

Last updated: 2017-12-01

Total video time: 8:31

> Exercise files: [c3d-intrfc-data-c3d16.zip](#)
>
> ProjectID\SheetsPlan\STH25-XS.dwg
>
> [c3d-intrfc-status-bar-01.mp4](#) 8:31

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/new

Last updated: 2017-12-01

Total video time: 5:32

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c3d-intrfc-fil-opn-sav-new-01.mp4 5:32

All new files start with a "template" (.DWT) file

DWT brings settings into new drawings

Similar to "seed" files

AutoCAD settings like text styles, linestyles, etc.

Civil 3D specific object and label styles

WisDOT provides four Startup templates for new drawings

- wisdot16.dwt
- wisdot16-county-map-import.dwt
- wisdot16-plat.dwt
- wisdot16-survey.dwt

Use the New command

1. Application Menu Browser
2. Browser starts at DWT location
3. Browse and choose the appropriate template
4. Save the new DWG in location and with name

QNEW command

- In Quick Access Toolbar
- Begins file with default template

Default Template is set at **Options > Files > Template Settings > Default Template File Name for QNEW**

WisDOT Sheets ribbon tab

- Startup Templates in tool palette
- Sheet Templates in tool palette

WisDOT Standards ribbon tab

- Startup Templates in tool palette

WisDOT Design ribbon tab

- Startup Templates in tool palette

File/model/layout tabs

Last updated: 2012-09-01

Total video time: 5:32

Exercise files: c3d-intrfc-data-C3D12.zip

File, model & layout tabs

c3d-intrfc-fil-mdl-lyout-01.mp4 5:32

Exercise file: 123456789_2.dwg

File tabs

Display current files open

Turning on/off file tabs

- Right click in modelspace **Options > Display tab**

- check or uncheck Display File Tabs

Right click on file tab to:

- New... Open... Save Save as... Save All
- Close Close All Close All other drawings
- Copy full file path
- Open File Location

Layout tabs include:

For plotting to scale

- The printable area of the paper
- Titleblock information

- Viewport(s) to display portions of modelspace

Turning on layout tabs

- Right click in modelspace **Options > Display tab>**

- Check or uncheck Display Layout Tabs

- Right-click on model button
- Choose Display...

Paperspace

- Titleblock
- Dimensions and labels (ACAD labels)

Viewports

- When viewport is selected, viewport scale pop-up menu is available
  - Regen after changing the scale
  - As many viewports as you need
  - Can be any shape that you need

Modelspace viewports

Last updated: 2017-12-01

Total video time: 5:46

Exercise files: c3d-intrfc-data-c3d16.zip

ProjectID\Design\Corridors\Corridor-STH25-4thAve.dwg

c3d-intrfc-mdlspc-vwprt-01.mp4 5:46

Exercise file: Corridor-STH25-4thAve.dwg

Divide screen into real-time windows

Individual zoom and pan control

Objects in different areas can be seen together (in context)

Named Views

Configuring the screen

- Corridor Section Editor is automated configuration
- Manual configuration = **View tab > Model Viewport panel > Set Viewports**
- "In-canvas" controls, minus sign

Join Viewports

Xreference

Last updated: 2017-12-01

Total video time: 11:10

Exercise files: c3d-intrfc-data-c3d16.zip

Xreference overview part 1

c3d-intrfc-xref-01.mp4 4:44

Exercise files: ProjectID\BaseData\Mapping\ExistSurface.dwg, ProjectID\BaseData\Mapping\Uti-Ex.dwg.

For bringing drawings behind design drawings

Reduces design drawing size

"Overlays" DWG files

"Underlays" DGN files

Attaches Images

Can be Unloaded or Detached
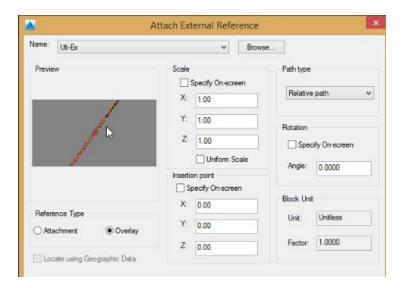
Binding brings the XREF into the current file

Insert tab > References panel > Attach (or type **XREF**)

Identify file type to attach

- DWG
- DGN
- PDF
- Image

Attachment dialog

- Location, Rotation, Scale (similar to a block)
- Path Type: Relative path
- Attachment versus Overlay

> ⊗ **Warning:** unless told (for good reason) to do otherwise, references should always be overlays and they should always be relative. Overlays prevent circular references from happening and relative path allows for project copying and moving and keeping xrefs intact.

Xreference overview part 2

c3d-intrfc-xref-02.mp4 6:26

Exercise file: ProjectID\BaseData\Mapping\Topo-Ex.dwg .

External Reference Manager

- Select Xref in model space **xref contextual ribbon> options panel> external references**
- External references options

You can…

- label Civil 3D objects
- sample data for sections
- draft in relation to those referenced files
- unload
- snap to Xref'd drawing entities
- add data from references into design drawing if needed
    - Bind, for the entire file
    - NCOPY, for individual entities (not Civil 3D objects)

Reference fading control in **Insert tab > Reference Panel pull-down**

Data shortcuts

Last updated: 2017-12-01

Total video time: 11:10

Exercise files: c3d-intrfc-data-c3d16.zip

ProjectID\Design\Corridors\Corridor-STH25-4thAve.dwg

ProjectID\BaseData\Mapping\ExistSurface.dwg

Overview

c3d-intrfc-data-shrtct-01.mp4 2:33

Exercise file: Existing Surface.dwg

Provides selective object data for use in other files

- surfaces
- alignments
- profiles
- pipe networks
- pressure networks
- view frame groups

Files must be attached to a "project"

Object geometry is in one file, can be referenced into many other files. Allows for different styles to be applied to the same object in different references.

Data References can be used simultaneously

Control/distribution of geometry held in XML file

Data shortcut folder relationship

c3d-intrfc-data-shrtct-02.mp4 3:00

Working Folder = Path where projects are stored (level above project folders)

Project Folder = in working folder path where project files are stored

"_shortcut" folder = inside Project folder, where actual data shortcuts reside

- The data is in XML format
- DO NOT go in here – this is for Civil 3D to access/manage

If a project is moved, these locations are relative.

Data shortcut process

c3d-intrfc-data-shrtct-03.mp4 5:36

1. **Right-click on Data Shortcuts > Set Working Folder**
2. **Right-click on Data Shortcuts > New (or Set) Project Folder**
3. **Right-click on Data Shortcuts > Create Data Shortcuts**

Now that project path and folder are established, this step is repeated throughout project.

Xreference vs data shortcut concepts

Last updated: 2017-12-01

Total video time: 4:14

Exercise files: c3d-intrfc-data-c3d16.zip

ProjectID\SheetsPlan\STH25-XS_2016.dwg

ProjectID\Design\AliProfs\AliProf4thSt-Best-Fit.dwg

Concepts

c3d-intrfc-xref-vs-data-shrtct-01.mp4 4:14

XREFS

- Connects to an entire file, then items can be filtered out by layer
- Intended for items that you cannot data shortcut (acad objects, and a few civil 3d objects, corridors most notably)

Data shortcuts

- Connects to individual objects
- Intelligent data remains intact through connection (example: you can get station offset of an alignment through a data shortcut, but not an xref)
- Styles can be different per connection (you cover this well)

> **ⓘ Info:** In general, you should use the data connection intended for the object (i.e. use data shortcut for those objects, xref for others). The reverse is also true. You

> ℹ️ should generally not XREF objects that can have a data shortcut. If you happen to XREF a file that has connections to data shortcut objects, you can either remove the data shortcut or freeze the layer of the data shortcut object in the XREF. Classic example here is XREF topo and there's a DS to an alignment. That alignment will show up static and cannot be styled or queried. It's better to freeze the ali out of the xref and data shortcut it.

Both tools for referencing data in different ways

- Data Shortcuts are more Civil 3D specific.
- XREFs are "generally" more AutoCAD entities.
- Civil 3D Objects will Xref and are usable

Data shortcuts usage

- When you need data from surface, alignment, profile or pipes
- View Frames for plan and profile sheets
- When object interaction is needed
- Alignment (for sample line creation)

XREFS usage

- Background information
- Just for labeling, but not for interaction with other objects
- Everything else, especially the corridor

Inquiry tools

Last updated: 2017-12-01

Total video time: 3:15

c3d-intrfc-inqry-01.mp4 3:15

For reporting data from Civil 3D objects

Analyze tab > Inquiry panel

Fill in a field or two to report data

Types of Inquiries:

- Point
- Surface
- Alignment
- Profile and Profile View

- Section and Section View
- Corridor Sections

WisDOT tool palettes

Last updated: 2016-11-30

Total video time: mm:ss

[c3d-intrfc-wisdot-tool-paltt-01.mp4](#) 2:30

Civil 3D 2016 – WisDOT configuration

Last updated: 2016-03-09

Total video time: 09:08
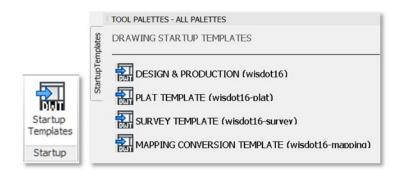
[acad-C3D2016-cnfg.mp4](#) 9:08

WisDOT drawing startup templates

A startup template is a file with a .dwt extension that is used as the base to create a Civil 3D drawing file. WisDOT provides four startup templates to use depending on the content and workflow of the drawing being created. A WisDOT Civil 3D drawing should be created using a WisDOT startup template. These four startup templates do not have any objects within the model or layout drawing spaces.

There are a few additional sheet production templates that are designated as stand-alone layout templates. These consist of Title Sheets and Speed Sheet templates for typical details or typical sections. Drawings created for these purposes do not require beginning the drawing with one of the four startup templates. These templates do contain layout objects and/or some model space objects.

WisDOT has reconfigured the drawing startup templates for 2016 to contain only objects and components that are being used in the drawing settings, Civil 3D styles, and annotation elements of the startup template. These templates are lighter and do not require any type of purge to remove extra items such as layers, linetypes, blocks and fonts. The "extra" components, along with all the parts and pieces that make up the templates are provided in a Tool Palette library accessible through the WisDOT ribbons. These Tool Palettes are the backbone for maintaining and delivering WisDOT standards and design and production components.

The startup templates for WisDOT Civil 3D 2016 can be found in **C:\WisDOT\Stnd\C3d2016\StartupTemplates**, and can be accessed from any of the WisDOT ribbons on the Startup panel which opens the Startup Template palette.

wisdot16.dwt

Used as the startup template for most design and production drawings.

wisdot16-plat.dwt

Used as the startup template for creating plat drawings.

wisdot16-survey.dwt

Used as the startup template for survey drawings. This template can also be used as a secondary template that can be imported into a drawing that was started with the wisdot16.dwt template.

wisdot16-mapping.dwt

Used only for mapping conversion.

WisDOT standard configuration components

In Civil 3D 2016, WisDOT standards design and production components have been divided into object groups. The raw component files can be found in **C:\WisDOT\Stnd\C3d2016\Components**, all of these components can be accessed by the use of a ribbon and specific palettes.

Raw component elements are organized in the following folders:

Assemblies

Reference files for all WisDOT custom assemblies accessible on palettes. Assembly help files.

Blocks

Collection of WisDOT marker symbol blocks, parametric blocks, and all other blocks used in the startup or sheet templates or organized on palettes.

Dimensions

Reference drawing of WisDOT standard dimension styles accessible on palettes. Reference drawing of WisDOT standard multi-leader styles accessible on palettes.

Fonts

Collection of legacy WisDOT font files and a reference drawing of WisDOT text styles accessible on palettes.

Layers

Reference drawing of all WisDOT layers accessible on palettes. Layer state and layer filter files. Plot style insert configuration file.

Linetype

Reference drawing of WisDOT standard linetypes accessible on palettes.

Reports

Collection of report reference files and style sheets.

SheetSets

Collection of sheet set files for standard WisDOT plan sheets.

SheetTemplates

Reference drawings of WisDOT sheet layout templates accessible on palettes.

Support

Reference shape files and pattern files to support the WisDOT templates, hatches, and line-types.

The WisDOT Civil 3D 2016 user interface

WisDOT standards, custom components and tools are included on ribbons which deliver custom palettes into the tool palette interface. There are four separate ribbon tabs:

- **WisDOT Standards**
- **WisDOT Design**
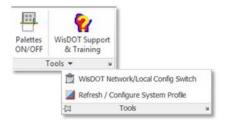- **WisDOT Sheets**
- **WisDOT Tools**

Each of these ribbons is divided into panels and each ribbon has a Tools and a Startup panel as well as ribbon-specific panels.

The Tools panel on each ribbon consists of:

- **Palettes ON/OFF** tool which turns the display of the Tool Palette on and off.
- **WisDOT Support/Training** tool which opens the WisDOT Civil 3D Environment Dialog.
- A Tools drop down option that contains the **WisDOT Network/Local Config Switch** tool and the **Refresh/Configure System Profile** tool

All of the buttons on the WisDOT ribbons that are provided to access palettes will change the palette regardless of whether the tool palettes are being displayed, but will not automatically display the palettes if the palettes are turned off. Use the **Palettes ON/OFF** tool to change the display mode.

The Startup panel on each of the ribbons consists of:

- **Startup Templates** tool to access the drawing startup templates palette.
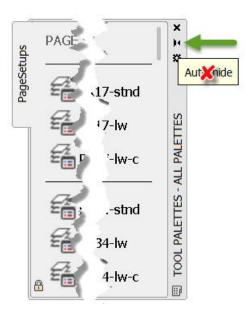

User interface best practices

The Civil 3D 2016 configuration provides many palettes and many options to switch between these palettes rapidly.

Palette Best performance

For best performance when using the ribbon tools to change palettes, whether docked or floating, keep the tool palette dialog in its expanded mode. Do not use the hide or auto-hide feature.

This is a best practice suggestion. You may use the hide or auto-hide feature, but this will result in longer wait times for the palette to refresh and the palette may "hang" until you exit and re-select the palette.

A **Palettes ON/OFF** tool that mimics the hide feature is provided on each WisDOT ribbon as a quicker alternative.

Civil 3D Startup Setting

The **STARTUP** system variable controls what tabs are displayed when the application is started, or when a new drawing is opened. In the WisDOT configuration the Start tab will not display and the ribbons will be pre-loaded when Civil 3D starts. The WisDOT Civil 3D configuration will always open with the **STARTUP** system variable set this way.

WisDOT ribbons

Last updated: 2016-03-11

Total video time: 12:43

c3d-intrfc-wisdot-rbn-01.mp4 12:43

Why WisDOT ribbons and palettes for 2016?

One reason Methods Development has created the ribbons and palettes is to encourage

drawings to be PURGED and AUDITED with the confidence that any item can easily be added to or removed from a drawing.

The widely adhered best practice is to maintain a clean and healthy drawing file by using Purge and Audit regularly. There is a common misconception that drawings should not be purged and/or audited. However, there is no reasonable argument against regularly purging and auditing of a drawing file, and we are working to correct this misconception for the rollout of Civil 3D 2016.

When a drawing is not purged or audited, it makes the file more likely to become corrupt and possibly unrecoverable. Items are purged from a drawing because they are not being consumed or used in the drawing. For more instructional information about purge, audit and tips on cleaning and keeping drawings clean read: **Keeping Drawings Clean and Working**

To add a purged component into a drawing in Civil 3D 2014 the user has to use Windows Explorer, copy from another drawing, or use Design Center to find the elements. A considerable amount of all CAE Support problems and complaints about slowness of drawings, app glitches, and crashes can be traced back to a failure to purge and audit. Out of date items or objects copied in the wrong manner from other drawings is a bad practice that has lead to drawing file problems.

In Civil 3D 2016, we have created the ribbons / palettes to introduce an easier, more reliable process, of adding components into a drawing, whether purged or not. Placing all of the components on the palettes allows us to add only the minimum required components to the startup templates. The startup templates now allow components to be added as needed. This reduces the number of items that need to be purged and audited from the start.

We are striving to keep the drawings in a clean, purge an audit ready state, with tools to allow the user easy access to all the latest and greatest component(s), if and when the component(s) are needed.

Methods Development realizes the components and tool configuration on the palettes will be a work in progress. We are open to suggestions for the sequence and groups of the items on the palettes.

Purpose of ribbons

The main purpose of the WisDOT ribbons is to provide an organized way to access palettes, standards components, and tools needed for specific WisDOT Civil 3D workflows.

Palettes can be accessed from the ribbons to conveniently add WisDOT standards components into a drawing. The components are developed to adhere to WisDOT FDM guidelines, recommendations, and standard design and production practices, to produce the correct deliverable output.

The secondary purpose of the WisDOT ribbons is to provide a common location for delivering custom macros, custom reports, and custom tools.

> **Tips:** Tool Tips: For additional information about a tool simply hover over the tool button to expose extended notes and/or a short video or animation.

WisDOT Standards ribbon

The WisDOT Standards ribbon has tools to access the standards components palettes and tools to add standards components into a drawing.

Tools panel

Palettes ON/OFF	Toggles the palette window ON or OFF
WisDOT Support/Training	Toggle the WisDOT environment dialog ON/Off, which has links to the WisDOT help and training.

Tools panel – drop down

WisDOT Network/Local Config Switch	This tool allows the user to switch between local and network-based work environment for instances when a user is not connected to the WisDOT server
Refresh/Configure System Profile	This tool will refresh or configure the WisDOT system profile

Startup panel

Startup Templates	Launches the WisDOT Startup Templates palette

Standards Components panel

Add Layers	Adds 2016 WisDOT standard layers into drawing

Add Marker Symbols	Adds 2016 WisDOT standard symbol blocks into drawing
Add Dimensions	Adds 2016 WisDOT standard dimension styles into drawing
Add Multi-Leaders	Adds 2016 WisDOT standard multileader styles into drawing
Add Textstyles	Adds 2016 WisDOT standard text styles into drawing
Add Linetypes	Adds 2016 WisDOT standard linetypes into drawing

Plot Configuration panel

Page Setups	Launches the WisDOT standard page setups palette
Layer States	Launches the WisDOT standard layer states palette
Layer States (pull-down)	Layer States set and manage tools.

Plot Configuration panel – drop down

Current Page Setup All	This tool sets all layouts in the current drawing to the current page setup.

WisDOT Design ribbon

The WisDOT Standards ribbon has tools to access the standards components palettes and tools to add standards components into a drawing.

The Design ribbon a design workflow tools and palettes. The Design Utilities panel has six useful design tools; Superelevation Design Macro, Extract Corridor Surface Feature Lines, Alignment Bearing Tip toggle, Swap Parts List Styles, Swap Pipe Network Parts, and Pipe Network Sump Adjust.

The Assemblies & Subassemblies panel includes a button to access the Autodesk and WisDOT subassemblies and assemblies. The Autodesk Palette includes a button to access all available Autodesk palettes. The Parametric Design panel provides buttons to access the parametric design block palettes for Beam Guard and Intersections.

Tools panel

Palettes ON/OFF	Toggles the palette window ON or OFF
WisDOT Support/Training	Toggle ON/OFF the WisDOT environment dialog which has links to the WisDOT help and training.

Tool panel – drop down

WisDOT Network/Local Config Switch	This tool allows the user to switch between local and network-based work environment for instances when a user is not connected to the WisDOT server
Refresh/Configure System Profile	This tool will refresh or configure the WisDOT system profile

Startup panel

Startup Templates	Launches the WisDOT Drawing Startup Templates palette

Design Utilities panel

Superelevation Design Macro	Updates the superlevation tabular editor values to adhere to WisDOT standards
Corridor Surface Feature Lines	Executes the macro to extract surface point codes from a corridor surface as lines, polylines or feature lines. (Hover over tool on ribbon for more information)
Alignment Bearing Tip	Toggles the Alignment Bearing tip On and Off.

Swap Parts List Styles	Executes the macro to switch all the style in a Parts list between design styles and production styles, with options to switch styles in existing pipe networks.
Swap Pipe Network Part	Executes the macro that changes the part type of selected pipes and or structure within a pipe network.
Pipe Network Sump Adjust	Executes the macro which make necessary sump adjustments to account for pipe thicknesses when a sump depth of a structure is set to zero.

Assemblies & Subassemblies panel

WisDOT/ Civil Imperial	Launches the WisDOT Subassemblies/Assemblies palettes
Subassembly Help	Opens the WisDOT subassembly and Assemblies help file. Users can look at how the subassemblies work without needing to access the palette or an assembly in the drawing.

Autodesk panel

Autodesk Palettes	Launches the out-of-the-box Autodesk palettes and groups.

Parametric Design panel

Beam Guard	Launches the Beam Guard EATS palette, with parametric blocks to assist in beam guard design layout.
Intersection Block	Launches the Intersection Layout palette, with parametric blocks to assist in intersection design layout.

WisDOT Sheets ribbon

The concept of the WisDOT Sheets ribbon is to provide a single plan production workflow starting point. This should offer the user the ability to progress through the specific sheet (or group of sheets) development workflows by selecting the corresponding sheet type button on the Sheet Creation Components panel of the ribbon to expose the corresponding workflow grouped palettes.

These palettes are not comprehensive and are a work in progress. Using palettes to deliver these tools and components allows for more fluid and instant updates and workflow modifications.

Sheet Utilities panel

The Sheet Utilities panel contains a few tools to assist in creating text using the new fonts styles, and creating Superelevation tables.

Superelevation Tables	Create production ready superelevation tables within the drawing, and or export excel.
Point Station Offset to UDP	Tool to add station, offset information to point collections.

Sheet Creation Components panel

Each sheet tool delivers the specific components, objects and commands on a palette that pertain to the workflow to develop the sheet. This panel is divided into two sections. On the left side are the buttons to access the sheet workflow palettes. The right side are the general AutoCAD component tools.

Title Sheets	Access the Title Sheet palette.
(pull-down)	This pull down offers access to multiple palettes, and will show the last palette selected.

Typical Sections, Construction Details, Plan Details, Storm Sewer Plan, Detail Sheets

Quantities	Access the Quantities Sheet palette
ROW / Plat	Access the ROW / Plat Sheet palette.
Plan / Profile	Access the Plan / Profile Sheet palette.
Sign Plates	Access the Sign Sheet palette.
Sections	Access the Sections Sheet palette.

Earthwork	Access the Title Sheet palette.
Set Textstyle & Size	Opens a floating dialog to set WisDOT textstyle and or text size at any time. To be used in conjunction with the Mtext and Text commands.
Dimension gallery (pull-down)	Select a dimension style to make it the current style.
Multileader gallery (pull-down)	Select a multileader style to make it the current style.
Mtext	Multi line text tool.
Dimension tool (pull-down)	Create dimensions tool.
Mleader	Create multileader tool.

Wis-Manage panel

The tools on this panel launch the legacy 2014 Wis-manage palettes.

Plot Configuration panel

Page Setups	Launches the WisDOT standard page setups palette.
Layer States	Launches the WisDOT standard layer states palette.
Layer States (pull-down)	Layer States set and manage tools.

Plot Configuration panel – drop down

Current Page Setup All	This tool sets all layouts in the current drawing to the current page setup.

WisDOT Tools ribbon

The WisDOT Tools ribbon has five panels that contain all the macros, reports and tools offered in the WisDOT Toolbox as well as additional navigation and drawing maintenance tools.

Navigation Panel

These tools allow for ease of accessing user-defined model space views between drawings.

Rotate View	This tool prompts the user to pick two locations in modelspace, and uses those to rotate the drawing view without changing the current UCS. Best practice for working in modelspace in design drawings is to keep the UCS set to World to maintain the proper coordinate system.
Plan View	This tool will reset the view back to plan view using the current UCS.

> **Info:** Important: Be sure that your UCS is set to WORLD before you export or import any model space views.

Export View	This tool will prompt the user for a name and location to save a text file (.txt) and add the information for the creation of any user-defined model space views in the current drawing.
Import Views	This tool will prompt the user to search for a text file containing previously exported view information and add the selected views to the current drawing.
Delete Views	Use this tool to delete any user-defined model space views from the current drawing. The user can delete a saved view in the drawing by typing the name of one particular view or when prompted press the enter key to search for a saved view text file. The tool will delete all the saved views within the drawing that match those saved in the text file.

DWG Maintenance Panel

DWG Clean	This tool should be used regularly to keep the drawing clean. It runs a macro to purge and audit the drawing.

These are the WisDOT custom macros that are also found on the Toolbox tab on the Toolspace palette.

These are the WisDOT custom reports that are also found on the Toolbox tab on the Toolspace palette.

These are the WisDOT and Autodesk conversion macros that are also found on the Toolbox tab on the Toolspace palette.

Borrowing and returning a Civil 3D license

Last updated: 2017-11-28

Total video time: 1:39

c3d-intrfc-brrw-c3d-lcns-01.mp4 1:39

Borrowing a Civil 3D license

If you borrow a license you are removing it from the network pool of licenses, whether you are actively using it or not. The license can be borrowed for a limited amount of time, after which it will automatically be removed from your computer and returned to be available on the network. You can only borrow networked licenses, not stand alone licenses.

In the title bar of the Civil 3D instance click the Help button.

At the bottom of the menu choose About AutoCAD Civil 3D.

In the About dialog, upper right, click Product Information (or Product License Information).

Click Borrow License.

In the Borrow License dialog, in the calendar, select the automatic return date. This date must be within a length of time set by your administrator.

Click Borrow License.

Click Close in the Borrowed License message.

Returning a borrowed Civil 3D license

Returning a license earlier than the date specified
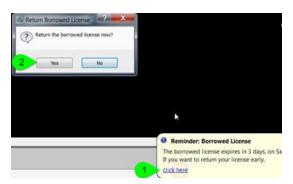
The options below all have the exact same result. You only need to choose the method that works for the circumstances you find yourself in.

Returning a license earlier than the date specified, option 1

You can return a license earlier than your chosen automatic return date.

At the beginning of each session of Civil 3D while the license is checked out you should receive a balloon notification stating that the license is checked out and can be returned early. Click the Click Here option in this balloon notification.

In the Return Borrowed License dialog click YES to confirm the early return.

In the License Returned dialog click Close.

Returning a license earlier than the date specified, option 2

If you are not receiving that balloon notification, or you closed it before using the early return option, but would like to return the license early do the following steps:

In the title bar of the Civil 3D instance select the Help button.

At the bottom of the menu choose About AutoCAD Civil 3D.

In the About dialog, upper right, choose Product Information (or Product License Information).

In the lower left select the Return License button.

In the Return Borrowed License dialog click YES to confirm the early return.

In the License Returned dialog click Close.
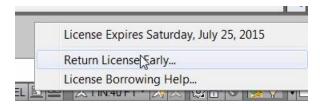
Returning a license earlier than the date specified, option 3

If you are not receiving that balloon notification, or you closed it before using the early return option, but would like to return the license early do the following steps:

In the Status Bar in the lower right of the screen, right-click the License button.

Click Return license early.

In the Return Borrowed License dialog click YES to confirm the early return.

In the License Returned dialog click Close.

Adding a folder link to a Civil 3D dialog

Last updated: 2017-12-01

Total video time: 1:27

Adding a folder link to a Civil 3D dialog

c3d-intrfc-add-fldr-lnk-to-c3d-dlg-01.mp41:27

Adding a folder shortcut

In the Application Menu, select Open

Browse to the project 12345678 folder

Click the up folder icon to go to the c3d folder above the project folders

In the right-hand window click and drag the c3d folder to the blue shortcut bar and release the mouse button.

Click on the new c3d shortcut to see the project folders.

In the right-hand window click and drag the 12345678 project folder to the blue shortcut bar and release the mouse button.

Left click on the new 12345678 shortcut icon.

Click cancel to close the dialog.

Select Yes when prompted to save changes to the Places list.

Removing a folder link from a Civil 3D dialog

In the Quick Access toolbar select Open.

In the Open dialog, left-hand blue Places bar, right-click on the 12345678 folder.

Click Remove.

Confirm you wish to remove the shortcut by clicking Yes.

Click cancel to close the dialog.

Select Yes when prompted to save changes to the Places list.

Civil 3D 2016 – WisDOT configuration

Last updated: 2016-03-09

Total video time: 09:08

[acad-C3D2016-cnfg.mp4](#) 9:08

WisDOT drawing startup templates

A startup template is a file with a .dwt extension that is used as the base to create a Civil 3D drawing file. WisDOT provides four startup templates to use depending on the content and workflow of the drawing being created. A WisDOT Civil 3D drawing should be created using a WisDOT startup template. These four startup templates do not have any objects within the model or layout drawing spaces.

There are a few additional sheet production templates that are designated as stand-alone lay-out templates. These consist of Title Sheets and Speed Sheet templates for typical details or typical sections. Drawings created for these purposes do not require beginning the drawing with one of the four startup templates. These templates do contain layout objects and/or some model space objects.

WisDOT has reconfigured the drawing startup templates for 2016 to contain only objects and components that are being used in the drawing settings, Civil 3D styles, and annotation elements of the startup template. These templates are lighter and do not require any type of purge to remove extra items such as layers, linetypes, blocks and fonts. The "extra" components, along with all the parts and pieces that make up the templates are provided in a Tool Palette library accessible through the WisDOT ribbons. These Tool Palettes are the backbone for maintaining and delivering WisDOT standards and design and production components.

The startup templates for WisDOT Civil 3D 2016 can be found in **C:\WisDOT\Stnd\C3d2016\StartupTemplates**, and can be accessed from any of the WisDOT ribbons on the Startup panel which opens the Startup Template palette.

wisdot16.dwt

Used as the startup template for most design and production drawings.

wisdot16-plat.dwt

Used as the startup template for creating plat drawings.

wisdot16-survey.dwt

Used as the startup template for survey drawings. This template can also be used as a secondary template that can be imported into a drawing that was started with the wisdot16.dwt template.

wisdot16-mapping.dwt

Used only for mapping conversion.

WisDOT standard configuration components

In Civil 3D 2016, WisDOT standards design and production components have been divided into object groups. The raw component files can be found in **C:\WisDOT\Stnd\C3d2016\Components**, all of these components can be accessed by the use of a ribbon and specific palettes.

Raw component elements are organized in the following folders:

Assemblies

Reference files for all WisDOT custom assemblies accessible on palettes. Assembly help files.

Blocks

Collection of WisDOT marker symbol blocks, parametric blocks, and all other blocks used in the startup or sheet templates or organized on palettes.

Dimensions

Reference drawing of WisDOT standard dimension styles accessible on palettes. Reference drawing of WisDOT standard multi-leader styles accessible on palettes.

Fonts

Collection of legacy WisDOT font files and a reference drawing of WisDOT text styles accessible on palettes.

Layers

Reference drawing of all WisDOT layers accessible on palettes. Layer state and layer filter files. Plot style insert configuration file.

Linetype

Reference drawing of WisDOT standard linetypes accessible on palettes.

Reports

Collection of report reference files and style sheets.

SheetSets

Collection of sheet set files for standard WisDOT plan sheets.

SheetTemplates

Reference drawings of WisDOT sheet layout templates accessible on palettes.

Support

Reference shape files and pattern files to support the WisDOT templates, hatches, and linetypes.

The WisDOT Civil 3D 2016 user interface

WisDOT standards, custom components and tools are included on ribbons which deliver custom palettes into the tool palette interface. There are four separate ribbon tabs:

- **WisDOT Standards**
- **WisDOT Design**
- **WisDOT Sheets**
- **WisDOT Tools**

Each of these ribbons is divided into panels and each ribbon has a Tools and a Startup panel as well as ribbon-specific panels.

The Tools panel on each ribbon consists of:

- **Palettes ON/OFF** tool which turns the display of the Tool Palette on and off.
- **WisDOT Support/Training** tool which opens the WisDOT Civil 3D Environment Dialog.
- A Tools drop down option that contains the **WisDOT Network/Local Config Switch** tool and the **Refresh/Configure System Profile** tool

All of the buttons on the WisDOT ribbons that are provided to access palettes will change the palette regardless of whether the tool palettes are being displayed, but will not automatically display the palettes if the palettes are turned off. Use the **Palettes ON/OFF** tool to change the display mode.

The Startup panel on each of the ribbons consists of:

- **Startup Templates** tool to access the drawing startup templates palette.

User interface best practices

The Civil 3D 2016 configuration provides many palettes and many options to switch between these palettes rapidly.

Palette Best performance

For best performance when using the ribbon tools to change palettes, whether docked or floating, keep the tool palette dialog in its expanded mode. Do not use the hide or auto-hide feature.

This is a best practice suggestion. You may use the hide or auto-hide feature, but this will result in longer wait times for the palette to refresh and the palette may "hang" until you exit and re-select the palette.

A **Palettes ON/OFF** tool that mimics the hide feature is provided on each WisDOT ribbon as a quicker alternative.

Civil 3D Startup Setting

The **STARTUP** system variable controls what tabs are displayed when the application is started, or when a new drawing is opened. In the WisDOT configuration the Start tab will not display and the ribbons will be pre-loaded when Civil 3D starts. The WisDOT Civil 3D configuration will always open with the **STARTUP** system variable set this way.

WisDOT Civil 3D project setup

WisDOT standards – Civil 3D project

Last updated: 2015-01-13

Total video time: 06:05

WisDOT standards – Civil 3D project

prj-wisdot-stnd-c3d-prj-01.mp4 6:05

Why project folder structure is important

Connectivity of referenced data, for data shortcut references and external references (XREF)

Project consistency. The ability to find files based on the type of data.

Project portability. The ability to move a project internally, or externally, and maintain the connectivity and file locations.

How project folder structure is created
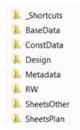
Use the data shortcut project creation tools.

- All projects will need data shortcuts
- The data shortcuts project creation lends itself well to the WisDOT workflow.

Use the folder structure at C:\Civil 3D Project Templates\WisDOTProjectTemplate

A look at the project folder structure

The top level of the project folders should not change.

Underneath that top level folders can be added.

Standard folders should never be deleted, removed or moved.

Steps to create the project folder structure

1. Set the data shortcut working folder to the c3d folder
2. Create a new project folder
3. Use the WisDOTProjectTemplate

> ✅ **Requirement:** Reference FDM 15-5-3, Att 3.1 for file naming and locations

AutoCAD fundamentals

AutoCAD basic creation and editing

Last updated: 2017-11-28

Total video time: 19:24

There are several tools available in Civil 3D that are intended for basic geometry object creation. These basic objects can either be an end product such as with a standard detail layout or they can be used as a foundation from which to create Civil 3D objects. This section will focus on using basic Line, Polyline, 3D Polyline, Rectangle, Curve and Circle tools along with basic Object Snap settings to create geometry for a standard detail drawing.

Osnap & Line
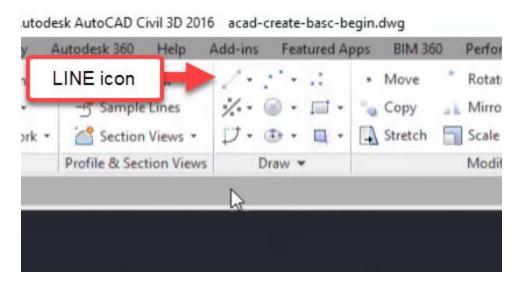
Exercise files: acad-basc-creat-edit-data-c3d16.zip

Start with acad-basc-creat-edit-begin.dwg

acad-basc-creat-edit-01.mp4 5:00

Line

One of the most basic geometry objects available is the Line. In Civil 3D, a single Line has two vertices with independent locations and elevations. The Line is often used as a starting point or guide by which other objects are laid out.
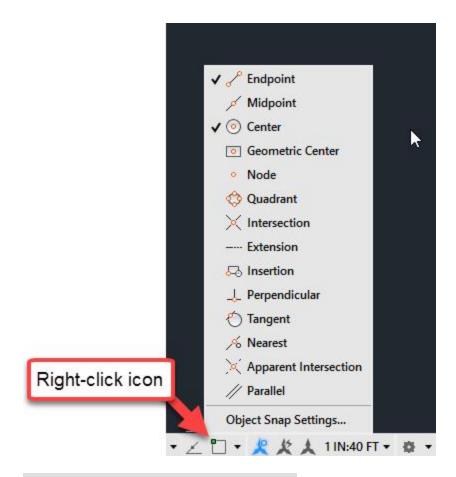
1. Open acad-basc-creat-edit-begin.dwg
2. **Ribbon > Home tab > Draw panel > Line icon >** Create Line
   A. Move cursor to location of start point
      I. Left-click
   B. Move cursor to location of end point
      I. Left-click
3. Enter
   A. repeat steps 2.A-2.B
4. Activate ERASE command: **E**
   A. Enter
      I. select both Lines create in steps 2-3
   B. Enter

> **i Info:** Keying Enter immediately after a command is executed will repeat the last command (see step 3 above)

Object snaps

When laying out object geometry or specifying a location when prompted in a command, it is often helpful to be able to reference existing object geometry. The object snap tool is built for just that. When Object Snaps are turned on (as a system variable) and you are prompted to specify a location within a command you can "snap" to the exact point desired based on the type of Object Snap turned on simply by moving the cursor within an Object Snap tolerance distance from that point. There are multiple ways to turn on Object Snaps for either "one-time" use or to remain on until turned off. We will cover these and other uses of Object Snaps in a later training module. This section is intended to show what Object Snaps are and provide a few examples of their use.

1. Continue working in acad-basc-creat-edit-begin.dwg
2. **Status Bar > right-click Object Snap icon**
   A. Endpoint: checked
   B. CEnter: checked
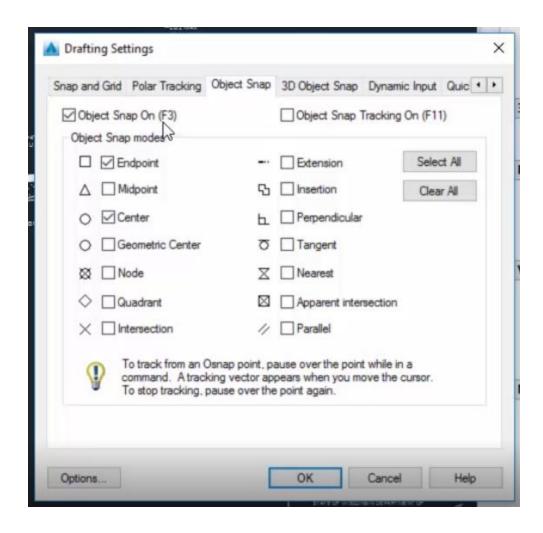
3. **Status Bar > right-click Object Snap icon**
    A. Object Snap Settings
        I. Object Snap On = checked
        II. OK
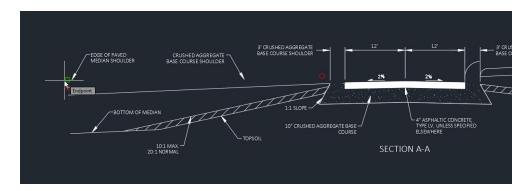
4. F3
5. F3
6. **Ribbon > Home tab > Draw panel > Line icon > Create Line**
   A. Move cursor near bottom endpoint of red guiding line on left side of Section A-A
   B. Observe Endpoint Object Snap glyph appear
        I. Left-click
   C. Move cursor near bottom endpoint of red guiding line on right side of Section A-A
        I. Left-click

> ℹ️ **Info:** F3 is a "hotkey" that will toggle Object Snaps on/off

> 💡 **Tips:** F3 A common theme you will notice in Civil 3D is that there are multiple ways to access the same commands. Toggling Object Snaps on via Object Snaps Settings vs F3 hotkey is only one example. With experience you will find the workflows you are comfortable with, thus reducing the some of the complexity of Civil 3D.

Polyline

Exercise files: acad-basc-creat-edit-data-c3d16.zip
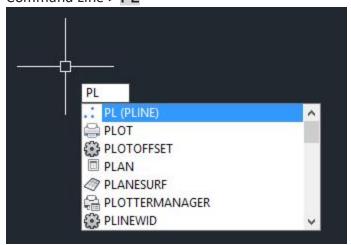
Start with acad-basc-creat-edit-01.dwg

acad-basc-creat-edit-02.mp4 4:53

A Polyline is arguably one of the most versatile basic AutoCAD drawing objects. It can be edited in many ways including joining multiple linear geometry objects to one, adding/removing vertices, adding/removing curves and more. In addition, many Civil 3D objects can be created from a Polyline, thus allowing you to set geometry in place using the simpler Polyline object then generate more powerful objects necessary for Civil 3D workflows. This section focuses on basic Polyline creation. It should be noted that when adding elevation data to your objects, a Line can have different elevations at start and end vertices, while a Polyline can have only one elevation for all vertices.

1. Start with acad-basc-creat-edit-01.dwg
2. Command Line > **PL**

   A. Spacebar
      I. Move cursor near red guiding circle on left side of Section A-A
         a. Left Click

       II. Move cursor near red guiding circle on just to the left of of Section A-A

         a. Left Click

      III. Mid-command option: A

         a. Enter

         b. Move cursor near endpoint of subgrade Line

           i. Left Click

           ii. Enter

3. Zoom out using mouse wheel

    A. Command Line > **PL**

      I. Begin drawing Polyline border using outermost guiding circles

      II. Command line prompt: Close

> **ⓘ Info:** PL is a command alias that will activate the Polyline command. A command alias is an alternative to activating a command from the Ribbon or typing the full name of the command on the command line. Simply begin typing any command alias when your drawing area (ie Modelspace) is active to call it up on the command line

> **ⓘ Info:** Keying Spacebar executes an active command the same way as keying Enter

3D polyline & rectangle

> Exercise files: acad-basc-creat-edit-data-c3d16.zip
>
> Start with acad-basc-creat-edit-02.dwg
>
> acad-basc-creat-edit-03.mp4 5:25

3D Polyline

A 3D Polyline behaves in many ways the same as a Polyline. The chief difference is that a 3D Polyline can have different elevations at each of its vertices. Having multiple vertex elevations assigned ahead of time can be useful when creating a Civil 3D object such as a Feature Line, Surface Breakline, or Pipe Network from a 3D Polyline.

1. Open acad-basc-creat-edit-02.dwg
2. Select Polyline border

    A. **Properties palette > expand Geometry > Elevation = 100**

      I. Cycle Current Vertex

      II. Observe same elevation for all vertices

    B. Delete
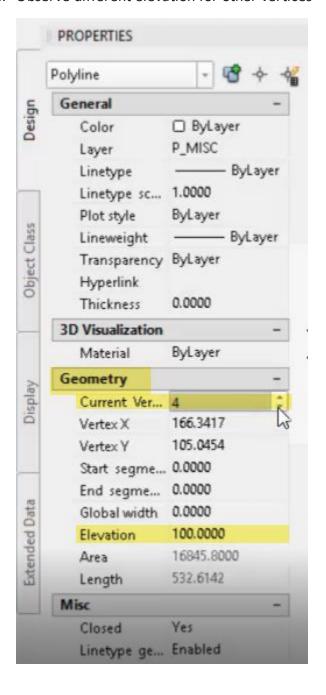
3. **Ribbon > Home tab > Draw panel > Draw flyout > 3D Polyline button**
   A. Begin drawing 3D Polyline border using outermost guiding circles
   B. command line: C
      I. Enter
   C. **Select 3D Polyline > Properties palette > expand Geometry > Elevation = 100**
      I.   a. Cycle Current Vertex
            b. Observe different elevation for other vertices

PROPERTIES		
Polyline		
General		−
Color	☐ ByLayer	
Layer	P_MISC	
Linetype	——— ByLayer	
Linetype sc...	1.0000	
Plot style	ByLayer	
Lineweight	——— ByLayer	
Transparency	ByLayer	
Hyperlink		
Thickness	0.0000	
3D Visualization		−
Material	ByLayer	
Geometry		−
Current Ver...	4	
Vertex X	166.3417	
Vertex Y	105.0454	
Start segme...	0.0000	
End segme...	0.0000	
Global width	0.0000	
Elevation	100.0000	
Area	16845.8000	
Length	532.6142	
Misc		−
Closed	Yes	
Linetype ge...	Enabled	

Side tabs: Design, Object Class, Display, Extended Data

Rectangle

The Rectangle command creates a closed Polyline with rectangle geometry. This simplifies the creation of a Polyline using the common rectangle shape.

1. Continue working in acad-basc-creat-edit-02.dwg
2. Select 3D Polyline border
   A. ⌑delete⌑
3. **Ribbon > Home tab > Draw panel > Rectangle button**
   A. Specify first corner
      I. Snap to upper left guiding circle
   B. Specify second corner
      I. Snap to lower right guiding circle
4. ⌑Enter⌑
   A. Repeat 3.A - 3.B around "6" text on left side of drawn objects
5. Command line: **RECT**
   A. ⌑Enter⌑
      I. Snap to guiding circle around "6" text on right side of drawn objects
      II. **D**
         a. ⌑Enter⌑
      III. **2.8**
         a. ⌑Enter⌑
      IV. **11.6**
         a. ⌑Enter, F3⌑
      V. Move cursor to upper right quadrant relative to Rectangle starting corner
         a. ⌑Left-click⌑

Curve & Circle

> Exercise files: acad-basc-creat-edit-data-c3d16.zip
>
> Start with acad-basc-creat-edit-02.dwg
>
> acad-basc-creat-edit-04.mp4 4:06
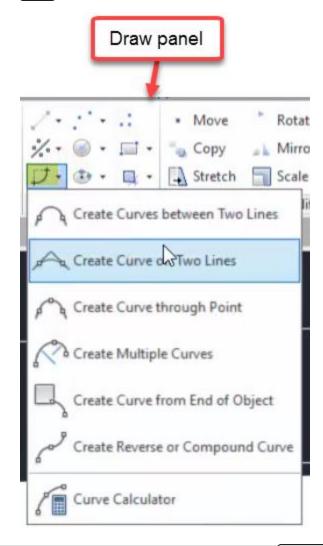
Curve
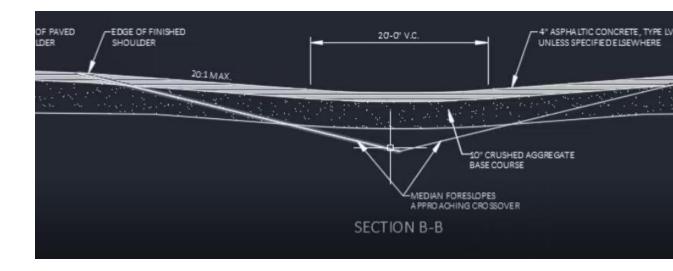
The Curve command includes several variations that use existing reference objects (ie tangent Lines) to create single radius, compound, or reverse curves. The object created is referred to as an Arc. The curve command can be helpful when laying out geometry from which to create a smart Civil 3D object.

1. Continue working in acad-basc-creat-edit-02.dwg
2. **Ribbon > Home tab > Draw panel > Curve flyout > Create Curve on Two Lines**
    A. Select edge of paved median shoulder (Section A-A) as first tangent
    B. Select left edge of asphalt concrete hatch boundary as second tangent
    C. Radius: **3**
        I. Enter
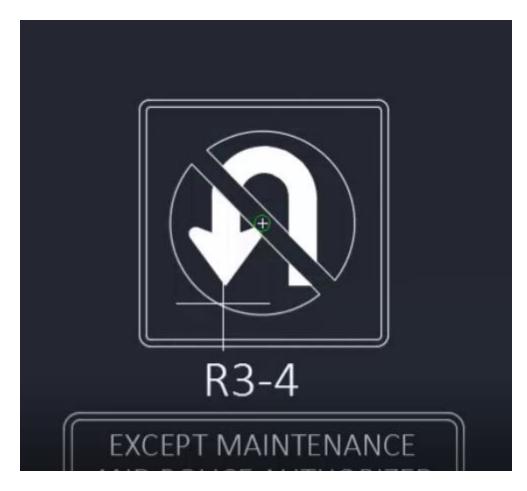
3. **Ribbon > Home tab > Draw panel > Curve flyout > Create Curves between Two Lines**
    1. Select one Section B-B Median Foreslope Line as first tangent
    2. Select other Section B-B Median Foreslope Line as second tangent
        1. **R**
            1. Enter
        2. `SPECIFY RADIUS: 20`

SECTION B-B

Circle

The Circle command creates an object with circular geometry. Civil 3D refers to the object as a Circle. If a Circle object is trimmed, it becomes an Arc object. Several options are built into the command from which to dictate the radius and location of the Circle.

1. Continue working in acad-basc-creat-edit-02.dwg
2. **Ribbon > Home tab > Draw panel > Circle flyout > CEnter, Radius**F
   A. Ensure CEnter Object Snap is toggled on: F3
   B. Pan and Zoom to Plan View, R3-4 signage
   C. Move cursor over existing signage Arcs to activate CEnter Object Snap glyph
      I. Left-click
      II. `SPECIFY RADIUS OF CIRCLE: 2.4`

3. Zoom Extents

Object Selection

In order to direct commands or apply edits to an object, the objects must be selected. In many cases this can be either before or after a command is activated. Selecting an object is also a good way to gather information about the object via the Properties palette. Objects can be selected using a variety of methods. In this section we will cover simple cursor selection, Window, Crossing, Lasso, Fence and Quick Selection. We will also cover ways to deselect, append and edit the current selection without need to start your selection over from scratch.

Exercise files: acad-basc-creat-edit-data-c3d16.zip

Start with acad-basc-creat-edit-end.dwg

acad-basc-creat-edit-05.mp4 6:44
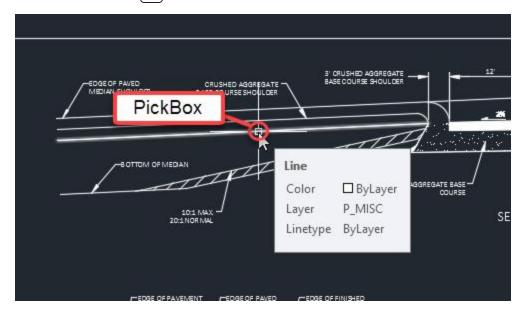
Properties palette population

When the Properties palette is open, selecting an object or group of objects will populate the Properties palette with object information common to the entire selection.

1. Open acad-basc-creat-edit-end.dwg
2. Activate the Properties palette
   A. Command line > **PROPERTIES**
3. Move cursor over Line representing subgrade
   A. Left-click Line geometry
   B. Observe population of Properties palette
4. esc

Cursor selection

1. Continue working in acad-basc-creat-edit-end.dwg
   A. move cursor PickBox over any object geometry in Modelspace
      I. Left-click to select object
      II. esc
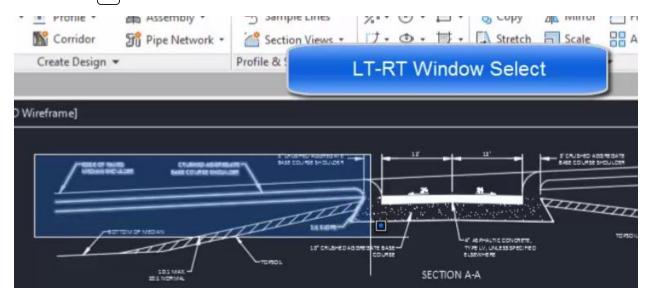
LT-RT Window Select

All objects completely enclosed by a Window Selection will be included in the Selection Set. Objects to be selected are highlighted white.

1. Continue working in acad-basc-creat-edit-end.dwg
2. Move cursor left of desired object(s)
   A. Left-click to activate Window Selection
   B. Move cursor right of desired object(s)
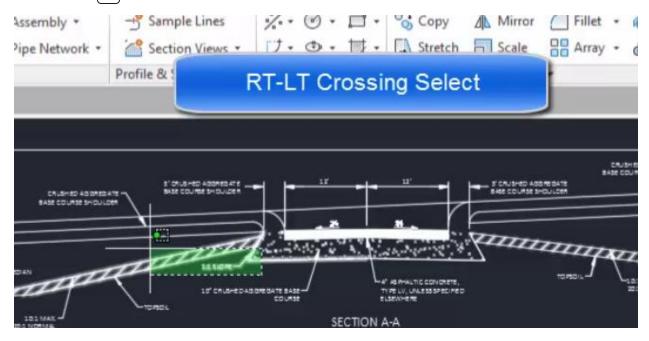
C. Left-click to specify selection area
D. esc

RT-LT Crossing Select

All objects at least partially enclosed by a Window Selection will be included in the Selection Set. Objects to be selected are highlighted white.

1. Continue working in acad-basc-creat-edit-end.dwg
2. Move cursor right of desired object(s)
   A. Left-click to activate Crossing Selection
   B. Move cursor left of desired object(s)
   C. Left-click to specify selection area
   D. esc
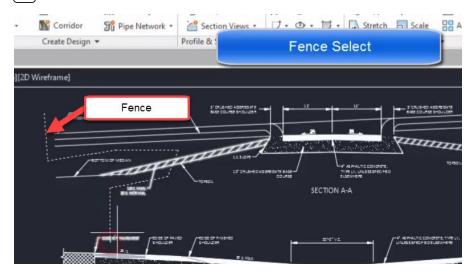
Fence Select

All objects crossed by a Fence Selection path will be included in the Selection Set. Objects to be selected are highlighted white.

1. Continue working in acad-basc-creat-edit-end.dwg
2. Move cursor to desired location of Fence
    A. Left-click to activate Selection
        I. Command Line > **F**
        II. [Enter]
            a. Left-click to dictate additional Fence path vertices
            b. [Enter]
            c. [Esc]
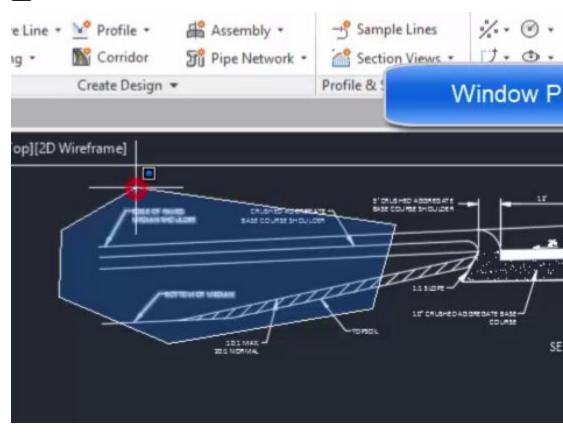
Window Polygon Select

Similar to the standard Window Selection, all objects completely enclosed by a Window Polygon Selection will be included in the Selection Set. Objects to be selected are highlighted white.

1. Continue working in acad-basc-creat-edit-end.dwg
2. Move cursor to desired initial vertex of Window Polygon
    A. Left-click to activate Selection
        I. Command Line > **WPF**
        II. [Enter]
            a. Moving clockwise, Left-click to dictate successive Window Polygon vertices
            b. [Enter]

c. Esc
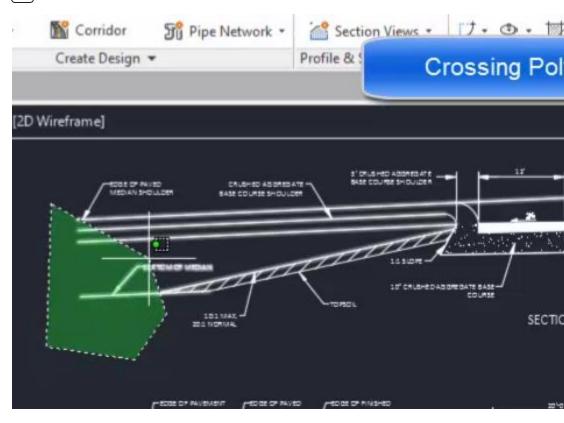
Crossing Polygon Select

Similar to the standard Crossing Selection, all objects at least partially enclosed by a Crossing Polygon Selection will be included in the Selection Set. Objects to be selected are highlighted white.

1. Continue working in acad-basc-creat-edit-end.dwg
2. Move cursor to desired initial vertex of Window Polygon
   A. Left-click to activate Selection
      I. Command Line > WP
      II. Enter
         a. Left-click to dictate successive Window Polygon vertices
         b. Enter

c. Esc
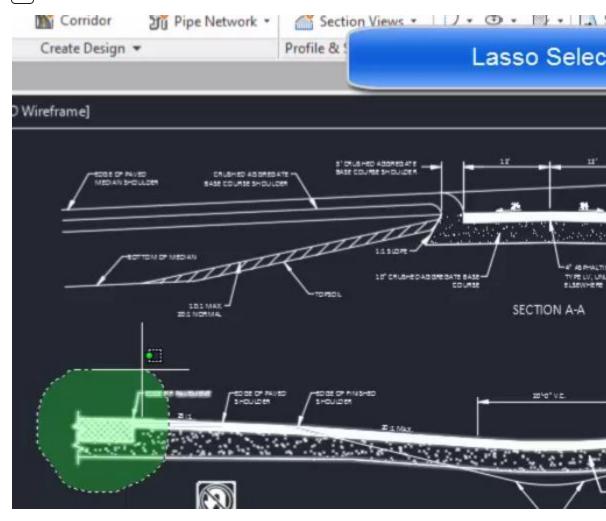
Lasso Select

Similar to both standard Window/Crossing or Polygon Window/Crossing Selection, a Lasso selection can be applied either clockwise or counter-clockwise. Objects to be selected are highlighted white.

1. Continue working in acad-basc-creat-edit-end.dwg
2. Move cursor to desired initial start point of Lasso Selection
   A. Left-click and hold mouse button to activate Lasso Selection
      I. Move cursor along desired boundary of Lasso Selection (begin path left of start point for crossing-type and vice-versa)
      II. Release mouse button

III. esc
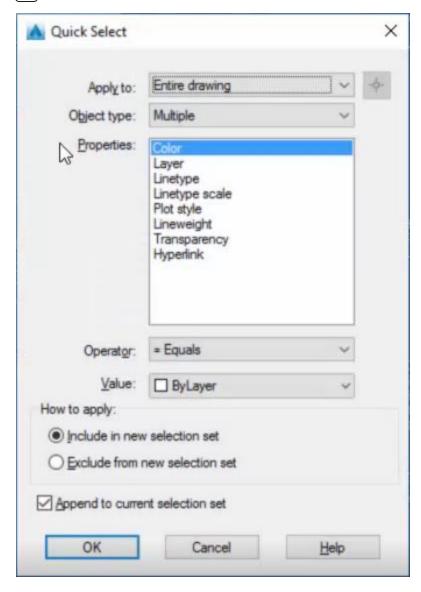
Quick Select

The Quick Select tool allows you to build a selection query based on object properties. The query can either be inclusive (select what is queried) or exclusive (select all but what is queried). The query can also be set to append or replace any current selection set.

1. Continue working in acad-basc-creat-edit-end.dwg
    A. Command line > **QSELECT**
        I. Apply to = Entire drawing
        II. Object type = Line
        III. Operator = Select All
        IV. Include in new selection set = checked
        V. Append to current selection = checked
        VI. OK
    B. Command line > **QSELECT**
        I. Apply to = Entire drawing
        II. Object type = Text

III. Operator = Equals
IV. Value = CalibriLight
V. Include in new selection set = checked
VI. Append to current selection = checked
VII. OK

C. esc
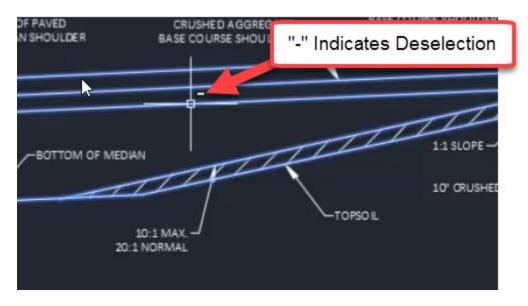
Editing current selection

Once multiple objects are selected, you may wish to remove certain objects from the selection set. To switch selection tools from selecting to deselecting, hold the Shift key while performing the selection in Modelspace. A "-" glyph indicating deselection will appear next to the cursor when holding the Shift key and hovering over an object in the current selection set.

1. Continue working in acad-basc-creat-edit-end.dwg
   A. Select multiple objects using RT-LT Crossing Select method
   B. Hold Shift
      I. Use cursor selection to deselect objects from the selection set
   C. esc
   D. D

Grips

When an object is selected, Grips will be displayed along the object. These Grips make various geometric object edits available. They are generally located at key points along or adjacent to an object (ie Line endpoints/midpoint or Arc endpoints/midpoint/radius point. To edit an object based on a Grip, click on a Grip or hover over it and choose from available Grip options. There are several advanced object edits that can be performed using grips. Many of these will be covered in a later training module. This section will cover a sample of basic grip functions. This is intended to provide a general understanding of grips as a foundation for further independent exploration.

Tips: When performing grip edits, displacement values can be keyed in or specified by mouse click.
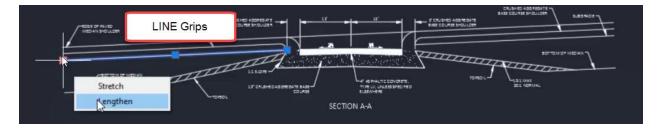
Exercise files: acad-basc-creat-edit-data-c3d16.zip

Start with acad-basc-creat-edit-end.dwg

acad-basc-creat-edit-06.mp4 3:23

Line grips
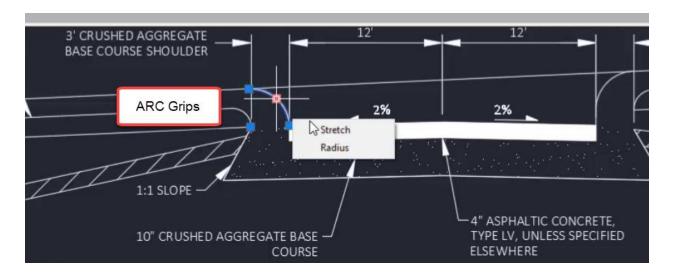
When a Line is selected, three Grips are display. The two endpoint vertex Grips allow you move/stretch or lengthen the respective vertex independently. The midpoint Grip allows you to move the Line with the midpoint as a basepoint, keeping all other geometry properties intact (ie length, rotation).

1. Open acad-basc-creat-edit-end.dwg
2. Select *Line* representing subgrade
   A. Left-click endpoint *Grip*
      I. Move mouse
      II. Left-click
   B. Hover over endpoint *Grip*
      I. Lengthen
         a. Move mouse
         b. Left-click
   C. Left-click midpoint *Grip*
      I. Move mouse
      II. Left-click
3. Close acad-basc-creat-edit-end.dwg(do not save)

Arc grips
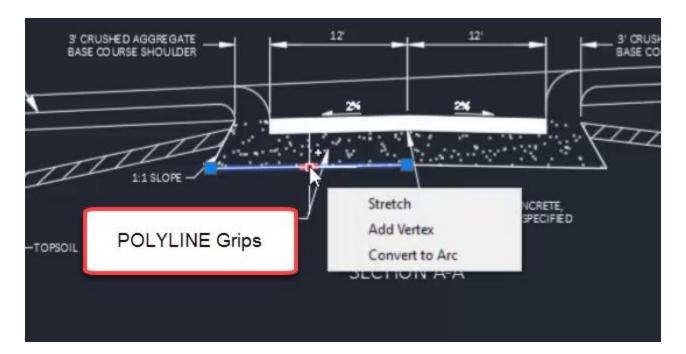
When an Arc is selected, four Grips are displayed. The two endpoint vertex Grips allow you move/stretch or lengthen the respective vertex independently. The midpoint Grip allows you to change the radius of the arc keeping intact either the location of the endpoint vertices or their alignment with the radius point. The radius point grip allows you to move the arc with the radius point as a basepoint, keeping all other geometry properties intact (ie radius).

1. Open acad-basc-creat-edit-end.dwg
2. Select *Arc* representing median nose
   A. Hover over midpoint *Grip*
      I. Stretch
         a. Move mouse
         b. Left-click
   B. Hover over midpoint *Grip*
      I. Radius
         a. Move mouse
         b. Left-click
   C. Hover over endpoint *Grip*
      I. Stretch
         a. Move mouse
         b. Left-click
   D. Hover over endpoint *Grip*
      I. Lengthen
         a. Move mouse
         b. Left-click
3. Close acad-intrfc-begin.dwg(do not save)

Polyline grips

When a Polyline is selected, square Grips are displayed at all vertices and dash Grips are displayed at all line segment midpoints. Endpoint vertex Grips allow you stretch (ie move) the respective vertex independently or add a vertex adjacent to the endpoint. The midpoint Grip allows you to stretch the line segment, add a vertex between the two adjacent endpoint vertices, or convert the line segment to an arc. When stretching a line segment, the length and rotation geometry of the selected line segment stays intact. Geometry of any adjacent line segments will adjust as necessary. When converting a Polyline line segment to arc, a radius must be specified. A Polyline arc segment can also be converted back to a line segment.

1. Open acad-basc-creat-edit-end.dwg
2. Select *Polyline* representing bottom of base course
   A. Hover over endpoint *Grip*
      I. Add Vertex
         a. Move mouse
         b. Left-click
   B. Hover over midpoint *Grip*
      I. Add Vertex
         a. Move mouse
         b. Left-click
   C. Hover over Polyline line segment midpoint *Grip*
      I. Convert to Arc
         a. Move mouse
         b. Left-click
   D. Hover over Polyline arc segment midpoint *Grip*
      I. Convert to Line
3. Close acad-basc-creat-edit-end.dwg(do not save)

Object snaps

Last updated: 2017-12-01

Total video time: 19:47
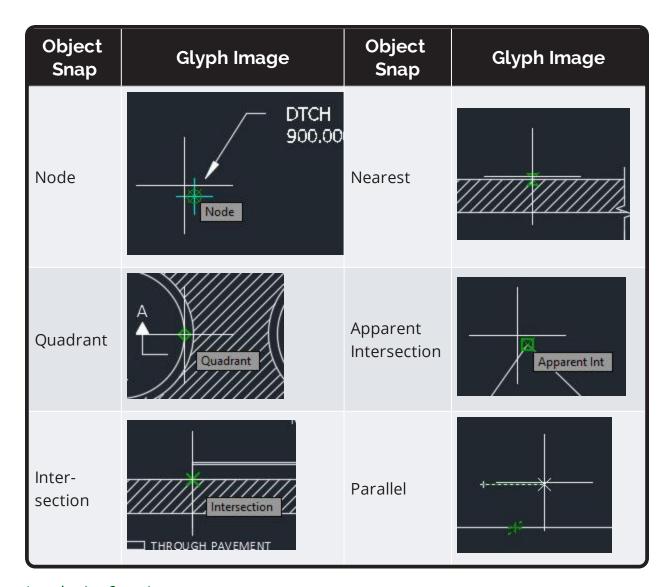
Object Snaps are tools built into Civil 3D that help ensure precision when laying out geometry with both basic objects (ie Line, Polyline) and smart Civil 3D objects. The idea is that when

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 this.

Object snap glyphs

Object Snap	Glyph Image	Object Snap	Glyph Image
Endpoint	Endpoint	Extension	
Midpoint	Midpoint	Insertion	PLAN VIEW / Insert
Center	Center	Per-pendicular	Perpendicular
Geometric Center	Geometric Center	Tangent	Tangent

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

Introduction & settings

Exercise files: acad-objct-snp-data-c3d16.zip

Start with acad-objct-snp-begin.dwg

acad-objct-snp-01.mp4 4:06

Access to settings

One of the most intuitive ways to access Object Snap settings is by interacting with the Object Snap icon on the Status Bar.

1. Open acad-objct-snp-begin.dwg
2. **Status Bar > Customization**
   A. 2D Object Snaps = checked

3. **Status Bar > Object Snap icon**
   A. Right-click
      I. Midpoint = checked
   B. Left-click icon to Turn on Object Snaps
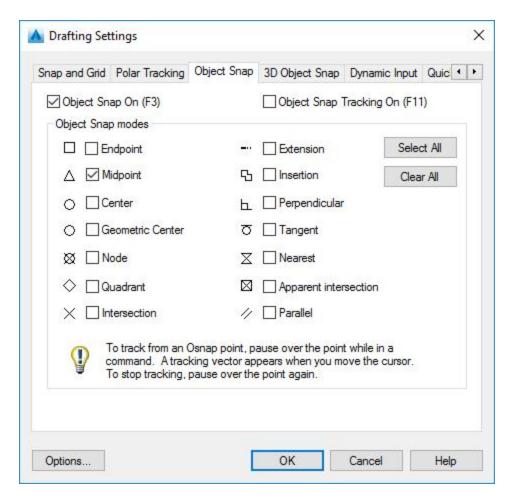
4. **Ribbon > Home tab > Draw panel > Polyline button**
    A. Move cursor over existing objects
        I. Observe Midpoint glyph appear
        II. Left click to "snap" to Object Snap location
        III. esc
5. **Status Bar > Object Snap icon**

    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
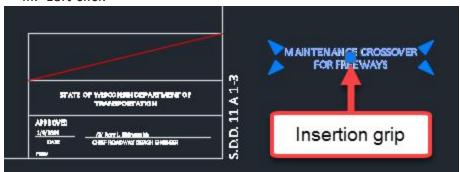
a. Object Snap On = checked
b. Select All
c. Clear All
d. Endpoint = checked

6. **Modelspace**
   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

3. Select "MAINTAINENCE 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

Exercise files: acad-objct-snp-data-c3d16.zip

Start with acad-objct-snp-01.dwg
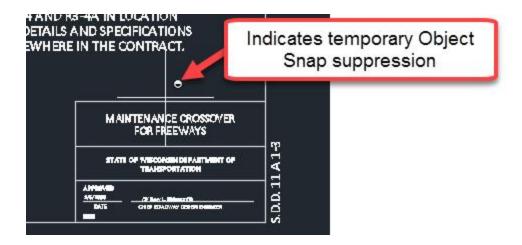
acad-objct-snp-02.mp4 5:34

F3 hotkey

A "hotkey" 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 Civil3D. 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. Open acad-objct-snp-01.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-objct-snp-01.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-objct-snp-01.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 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.

Command line

After a command requiring location input is activated, type in the Object Snap override alias you wish to use and "enter" to execute. This will generally be the first three letters of the Object Snap name (ie "end" for Endpoint). You can then continue with the cursor based location specification.

1. Continue working in acad-objct-snp-01.dwg
2. Toggle Object Snaps off: f3
3. **Ribbon > Home tab > Draw panel > Polyline button**
   A. **COMMAND LINE: END**
      I. enter
   B. Move cursor to existing object endpoint
      I. Observe endpoint glyph appear
      II. Left-click
   C. Move cursor to existing object endpoint
      I. Observe lack of endpoint glyph

D. esc

Right-click menu

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-objct-snp-01.dwg
2. Turn on running Endpoint Object Snap using your method of choice
3. **Ribbon > Home tab > Draw panel > Polyline button**
   A. Specify first Polyline vertex using Endpoint Object Snap
   B. Shift+Right-click
      I. Left-click Midpoint
   C. Move cursor near middle of existing Line object
      I. Left-click

Examples 1

Exercise files: acad-objct-snp-data-c3d16.zip

Start with acad-objct-snp-01.dwg
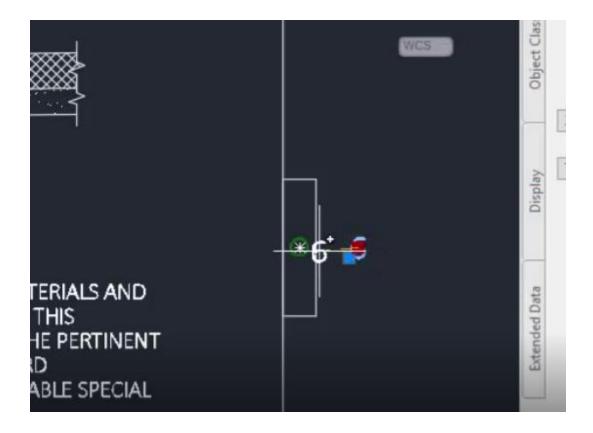
acad-objct-snp-03.mp4 4:08

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-objct-snp-01.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
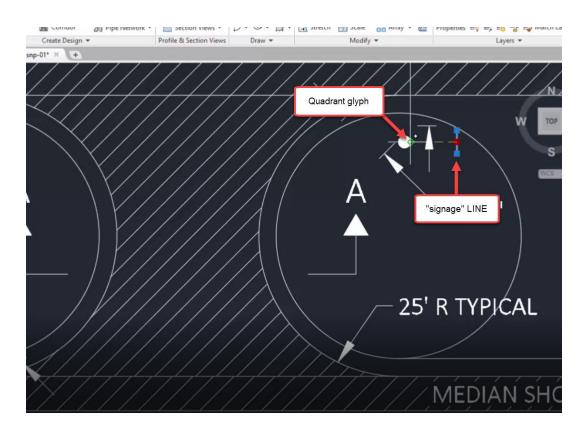
Quadrant

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

1. Continue working in acad-objct-snp-01.dwg
2. Turn on running Quadrant Object Snap using your method of choice
3. Select Line representing signage in the PLAN VIEW area of drawing extents
    A. Select midpoint grip on Line
    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

Examples 2

Exercise files: acad-objct-snp-data-c3d16.zip
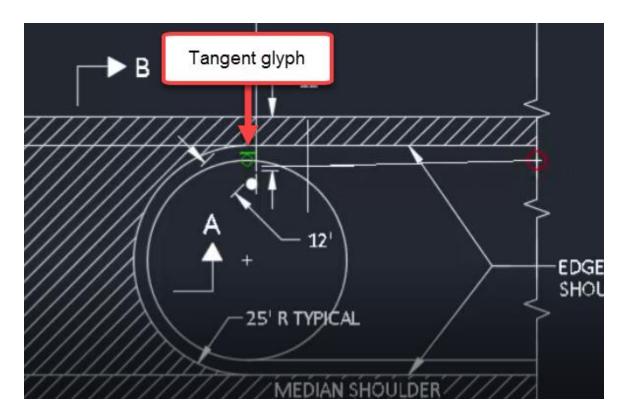
Start with acad-objct-snp-02.dwg

acad-objct-snp-04.mp4 5:59

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-objct-snp-02.dwg
2. Turn on running Center and Tangent Object Snaps using your method of choice
3. **Ribbon > Home tab > Draw panel > Polyline button**
   A. Move cursor near red Circle guiding mark in PLAN VIEW area of drawing extents
      I. Observe Center Object Snap glyph appear
      II. Left-click
   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

Parallel
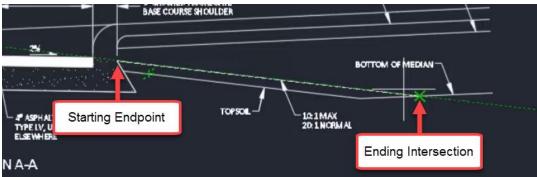
Use the Parallel Object Snap to lay out new linear objects while referencing existing linear objects for directional orientation. You will first start the new linear object command (ie Line), then hover over the desired linear reference object. This will activate the Parellel Object Snap and you will see a dashed extension line as a preview of your new linear object draw parallel to that existing.

1. Continue working in acad-objct-snp-02.dwg
2. Turn on running Enpoint, Apparent Intersection and Parallel Object Snaps using your method of choice
3. **Ribbon > Home tab > Draw panel > Line flyout > Create Line**
    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: 2017-12-01

Total video time: 13:52

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-polr-osnp-trak-data-c3d16.zip

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

acad-polr-osnp-trak-01.mp4 4:12

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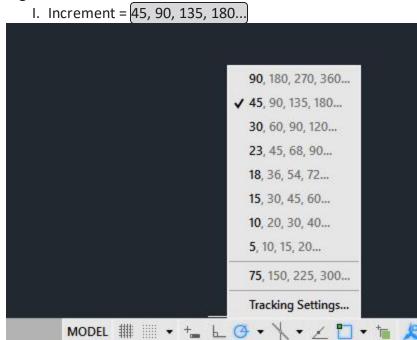
This section will get you started using Polar Tracking with an example exercise laying out title block Lines.

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

Polar Tracking on

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4. **Status Bar > Polar Tracking icon**
    A. Right-click
        I. Increment = 45, 90, 135, 180...

```
        90, 180, 270, 360...
    ✓   45, 90, 135, 180...
        30, 60, 90, 120...
        23, 45, 68, 90...
        18, 36, 54, 72...
        15, 30, 45, 60...
        10, 20, 30, 40...
        5, 10, 15, 20...

        75, 150, 225, 300...

        Tracking Settings...

MODEL ▦ ▦ ▾ ⁺▭ ∟ ⊕ ▾ ⤬ ▾ ∠ ▢ ▾ ⫟ 🧍
```

5. **Ribbon > Home tab > Draw panel > Polyline button**
    A. Left-click anywhere in Modelspace to specify first points
    B. Rotate cursor around first point location
    C. Observe Polar Tracking vector "snapping"
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. **L**
    A. Enter
    B. Snap to bottom red guiding Circle for first point
        I. @26<180
            a. Enter
        II. Enter
    C. Enter

      D. **Status Bar**
          I. Dynamic Input on
      E. Snap to middle red guiding Circle for first point
          I. **26**
          II. tab
          III. **180**
              a. Enter

9. **Status Bar**
      A. Dynamic Input off
      B. Polar Tracking on

10. **L**
      A. enter
      B. Snap to top red guiding Circle for first point
          I. Move cursor until 180 deg Polar Tracking vector appears
              a. **26**
                  i. enter
          II. Move cursor until 270 deg Polar Tracking vector appears
              a. **16.5**
                  i. enter

Access to settings

Exercise files: acad-polr-osnp-trak-data-c3d16.zip
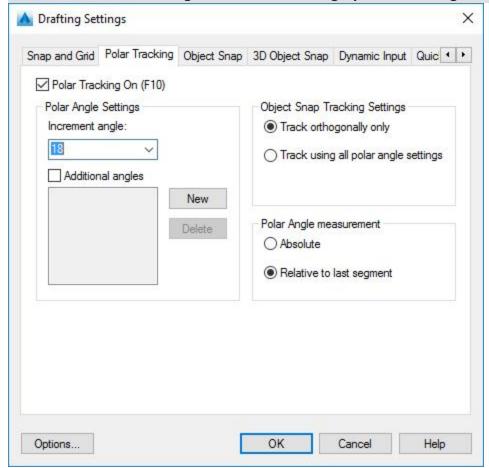
Start with acad-polr-osnp-trak-01.dwg

acad-polr-osnp-trak-02.mp4 4:28

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. **PL**
   A. enter
   B. Left-click in anywhere in Modelspace to specify first point
       I. Rotate cursor around first point
       II. Observe 60 deg Polar Tracking angle increments
   C. 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. **PL**
   A. enter
   B. Left-click in anywhere in Modelspace to specify first point
      I. Rotate cursor around first point
      II. Observe 75 deg Polar Tracking additional angle
   C. esc
6. **Status Bar > Polar Tracking icon > Polar Tracking flyout > Tracking Settings**
   A. Polar Angle measurement
      I. Absolute = checked
   B. OK
7. **Status Bar > Polar Tracking icon > Polar Tracking flyout**
   A. Increment = 45, 90, 135, 180...
8. **PL**
   A. enter
   B. Left-click in anywhere in Modelspace to specify first and second points
      I. Rotate cursor around second point
      II. Observe Polar Tracking increment angle relative to positive x-axis = 0 deg
      III. **Status Bar > Polar Tracking icon > Polar Tracking flyout > Tracking Settings**
         a. Polar Angle measurement
            i. Relative to last segment = checked
         b. OK
      IV. Rotate cursor around second point
      V. Observe Polar Tracking increment angle relative to last line segment drawn = 0 deg
   C. esc

Object Snap Tracking

Exercise files: acad-polr-osnp-trak-data-c3d16.zip

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

acad-polr-osnp-trak-03.mp4 4:59
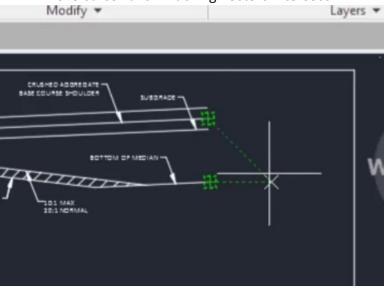
In this section you will be introduced to the Object Snap (aka Osnap) Tracking tool including functionality when combined with Polar Tracking and Dynamic Input. Keep in mind that for Object Snap Tracking to take effect, you will first need to have at least one Osnap turned on.

Basics

1. Open acad-polr-osnp-trak-02.dwg
2. **Status Bar > Polar Tracking icon > Polar Tracking flyout**
   A. Increment = 45, 90, 135, 180...
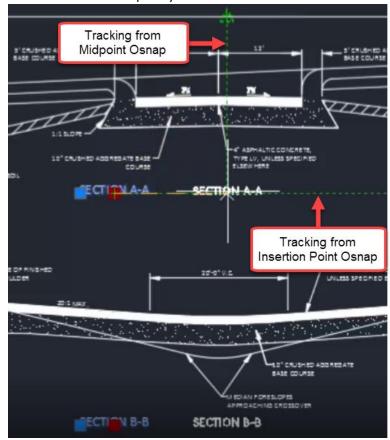
3. **Status Bar > Object Snap icon > Object Snap flyout**
   A. Endpoint = checked
4. **Status Bar**
   A. Polar Tracking on
   B. Object Snap Tracking on
   C. Object Snap on
5. **PL**
   A. enter
6. Move cursor to hover over a Line endpoint
   A. Observe Object Snap Tracking activate
   B. Rotate cursor 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. 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 x and y-axes only
10. Move cursor to hover over activated Object Snap Tracking location again to deactivate
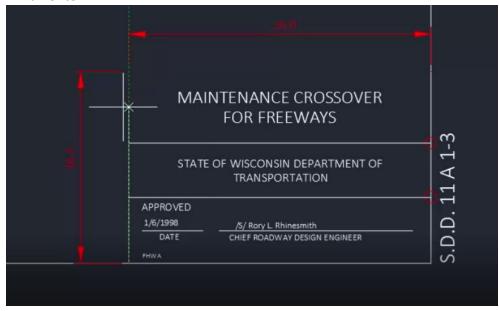
Exercise: align objects

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. Polar Tracking on
   B. Dynamic Input on
4. **L**
   A. [enter]
5. Move cursor to hover over lower right sheet border Line endpoint
   A. Observe Object Snap Tracking activation
   B. Move cursor left of Endpoint Snap location along 180 deg Object Snap Tracking vector
      I. 26
      II. enter
      III. Move cursor above Line first point along 90 deg Object Snap Tracking vector
         a. 16.5
         b. enter
      IV. Move cursor right of Line second point along 0 deg Object Snap Tracking vector
         a. 26
         b. enter
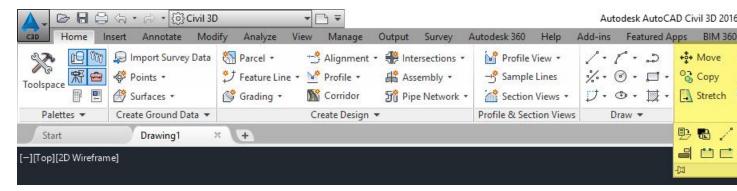
AutoCAD modify

Last updated: 2017-12-01

Total video time: 39:51

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-modify-data-c3d16.zip

Start with acad-modify-begin.dwg

acad-modify-01.mp4 3:40

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**
    A. Select objects: *SD.D.11.A 1-3* text in lower right of drawing extents
    B. Specify base point: lower right Endpoint of sheet border Line
    C. Specify second point: lower left Endpoint of sheet border Line
    D. Ctrl+z
3. s**Ribbon > Home tab > Modify panel > Move**
    A. Select objects: *SD.D.11.A 1-3* text in lower right of drawing extents
    B. **D**
        I. Enter
    C. **-50,0,0**
        I. enter
    D. Ctrl+z

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**
   A. Select objects: *SD.D.11.A 1-3* text in lower right of drawing extents
      I. Right-click
   B. Specify second point: lower left Endpoint of sheet border Line
   C. Left-click multiple additional destination points
   D. **Quick Access Toolbar > Undo**
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
   B. **D**
      I. enter
   C. **−50,0,0**
      I. enter
   D. Ctrl+z
4. **CO**
   A. enter
   B. Mode
      I. Single
   C. Displacement
      I. **−50,0,0**
         a. enter

Rotate & Scale

> Exercise files: acad-modify-data-c3d16.zip
>
> Continue with acad-modify-begin.dwg
>
> acad-modify-02.mp4 5:05
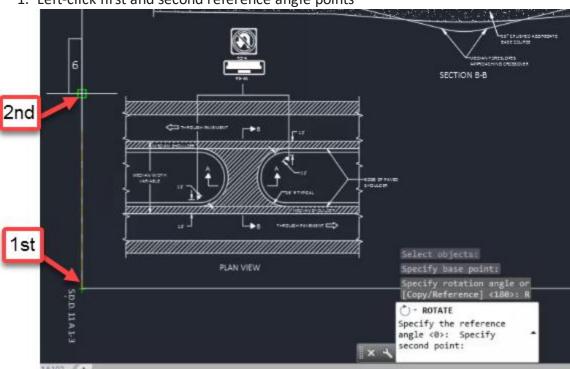
Rotate

The Rotate command allows you to rotate an object in the XY plane about a point either by key-ing in a rotation angle, selecting a relative rotation point, or picking two points to form a ref-erence "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. **M**
      I. enter
   B. hold f3 to temporarily override Osnaps
      I. Specify base point: lower left of **SD.D.11.A 1-3** text
      II. Specify second point: lower left Endpoint of sheet border Line
   1. **Ribbon > Home tab > Modify panel > Rotate**
      1. Select **SD.D.11.A 1-3** text
         1. Right-click
         2. Specify base point: lower left Endpoint of sheet border Line
         3. `SPECIFY ROTATION ANGLE: 180`
            1. enter
   2. **RO**
      1. enter
   3. Select **SD.D.11.A 1-3** text
      1. Right-click
      2. Reference
         1. Left-click first and second reference angle points

      3. Specify the new angle: **P**
         1. enter
      4. Left-click first and second new angle points
      5. Select **SD.D.11.A 1-3** text
         1. Right-click

6. **RO**
   1. enter
   2. Hold shift to temporarily use ORTHOMODE (force cursor along X or Y-axis)
   3. Move cursor until text is rotated 180 degrees
   4. left-click

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**
   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**
      I. enter
   D. Ctrl+z
5. Window-Select half-sized objects to left of full-size objects
   A. **SC**
      I. enter
   B. Specify base point: lower right of half-size border Line
   C. Reference
      I. enter
   D. Specify reference length: Left-click beginning and end of bottom half-size border Line
   E. Specify new length: **P**
      I. enter
      II. Left-click beginning and end of bottom full-sized border Line
6. Window Select "PLAN VIEW" objects that were Scaled up
   A. **M**
      I. 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

Exercise files: acad-modify-data-c3d16.zip

Start with acad-modify-01.dwg
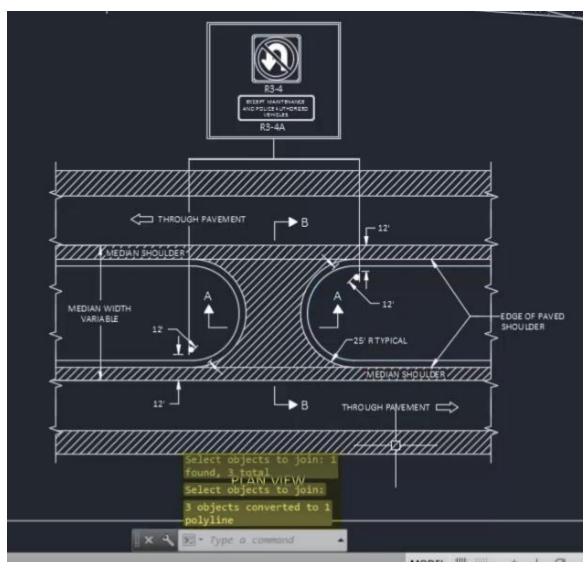
acad-modify-03.mp4 5:34

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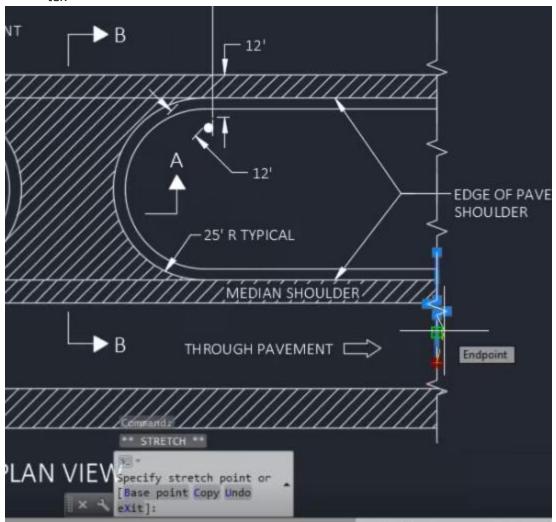
The Join command will take all Line and/or Arcs objects included in a selection set that share common start and end point coordinates (same X,Y,Z) and combine them into a single Polyline.

1. Open acad-modify-01.dwg
2. Pan and zoom to PLAN VIEW detail
3. **Ribbon > Home tab > Modify panel flyout > Join button**
4. Select Lines and Arc representing median back of curb
   A. enter

1. **J**
   A. enter
2. Select all "breakline symbol" Polylines along right side of PLAN VIEW detail
   A. enter
3. Observe "0 objects joined, 6 objects discarded..." on command line history
4. 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

5. Select two Polylines whose vertices were aligned in step 4
6. **J**
   A. enter
7. Observe "5 segments joined into 1 polyline" on command line history
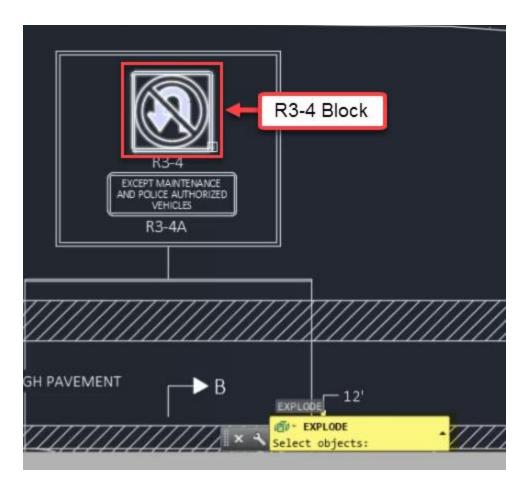
Explode

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

Erase & Stretch

Exercise files: acad-modify-data-c3d16.zip

Continue with acad-modify-01.dwg

acad-modify-04.mp4 2:41

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 button**
3. Select outermost Lines surrounding the R3-4 and R3-4A details
   A. enter
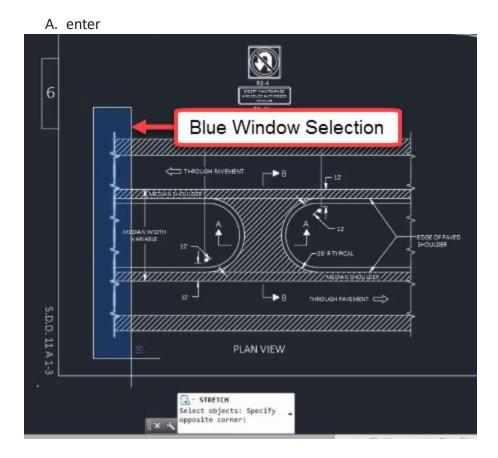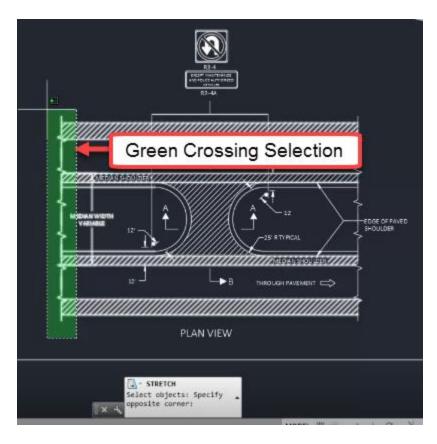
Stretch

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 flyout > Stretch**
3. Use a Window 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 move-only behavior
4. Ctrl+z
5. **Ribbon > Home tab > Modify panel flyout > 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

Exercise files: acad-modify-data-c3d16.zip

Start with acad-modify-02.dwg

acad-modify-05.mp4 5:21
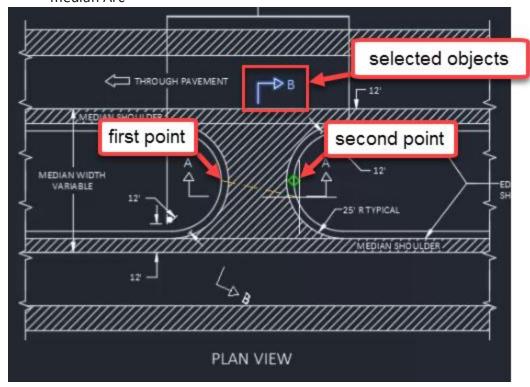
Mirror

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**
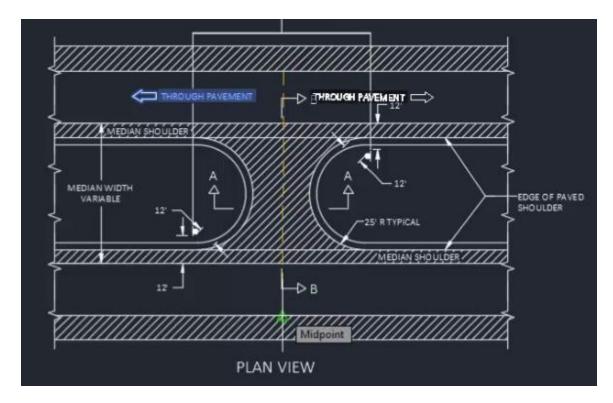
4. Select "section line arrow" and "B" Text in upper pavement area of PLAN VIEW detail
   A. Right-click
   B. Turn on Quadrant Osnap
   C. Use Quadrant Osnap to specify first point of mirror line at quadrant point on median Arc
   D. Use Quadrant Osnap to specify second point of mirror line at center of opposite median Arc

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

PLAN VIEW

    G. **ERASE SOURCE OBJECTS: N**
        I. enter
6. Select newly created "THROUGH PAVEMENT" Text and adjacent "arrow symbol"
7. **M**
    A. enter
    B. Specify base point and second point to move objects to lower pavement area of
       PLAN VIEW detail

Offset
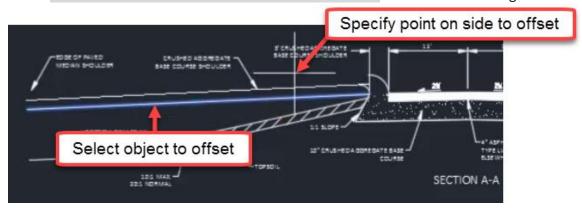
The Offset command allows you to create an object in reference to existing Polyline, Line or Arc objects. The geometry of the newly created objects is dictated by a constant distance measured perpendicularly from the source object. You can call out the offset distance using a known numeric value or by specifying an offset location using your cursor. This tool is especially helpful when laying out proposed roadway or parcel linework (ie Edge of Pavement, ROW)
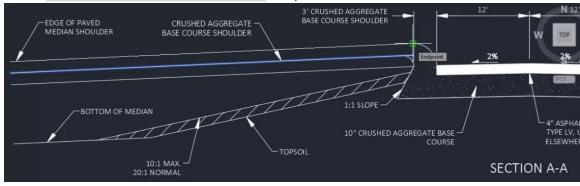
> 💡 **Tip:** Using modify commands such as Offset to manipulate Polylines is a great way to lay the foundation for dynamic Civil 3D Objects. This is because many dynamic Civil 3D Objects (ie Alignment, Feature Line) can be initially created from simpler AutoCAD Objects (ie Polyline).

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**
    A. `SPECIFY OFFSET DISTANCE:` `1.5`
    B. `enter`
    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`
4. **OFFSET**
    A. `enter`
    B. `SPECIFY OFFSET DISTANCE:` `THROUGH`
    C. Turn on Endpoint Osnap
    D. `SPECIFY THROUGH POINT:` Endpoint of median nose Arc
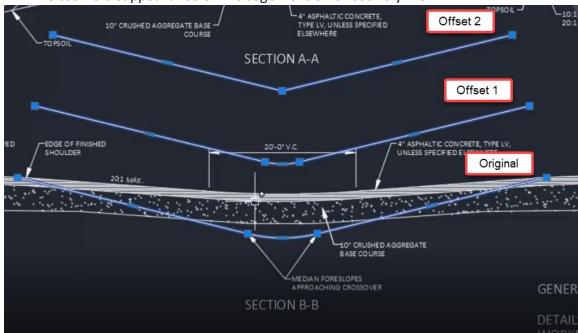
    E. `SELECT OBJECT TO OFFSET`: select "CRUSHED AGGREATED BASE COURSE SHOULDER" Line on right side of SECTION A-A detail
    F. `SPECIFY THROUGH POINT:` Endpoint of median nose Arc on right side of SECTION A-A detail
5. **OFFSET**
    A. `enter`
    B. `SELECT OBJECT TO OFFSET:` MEDIAN FORESLOPES Polyline in SECTION B-B detail
    C. `SPECIFY OFFSET DISTANCE:` `10`
        I. `enter`

D. specify point on side to offset: above selected Polyline
E. Repeat steps 5.A thru 5.D selecting previously offset Polyline as object to offset
   I. Observe disappearance of Arc segement on offset Polyline

Trim, Extend & Lengthen

Exercise files: acad-modify-data-c3d16.zip

Continue with acad-modify-02.dwg
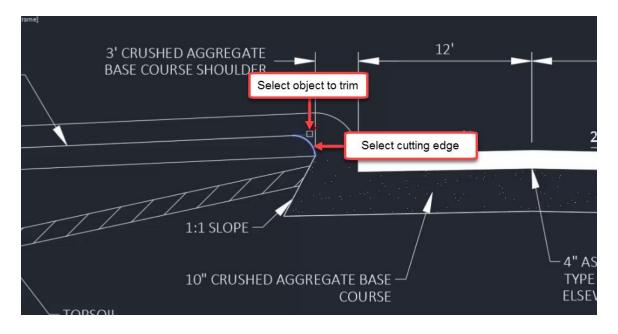
acad-modify-06.mp4 3:50

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**
   A. **SELECT OBJECTS:** select smaller Arc intersecting with Line representing AGGREGATE SHOULDER
   B. **TRIM:** select segment of Line you wish to trim
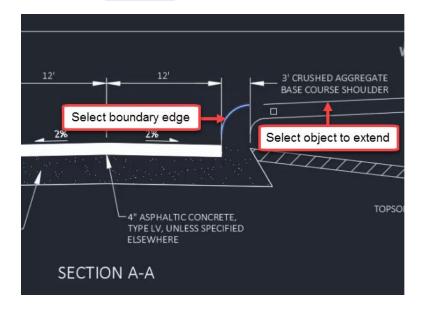
Extend

The Extend command is essentially the reverse of the Trim command. Extend allows you to lengthen a geometry object (ie 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**
   A. **SELECT OBJECTS:** select median nose Arc on right side of SECTION A-A detail
   B. **EXTEND:** select Line you wish to extend

> 💡 **Tips:**
> Hold shift while the Trim command is active in order to switch to the Extend command
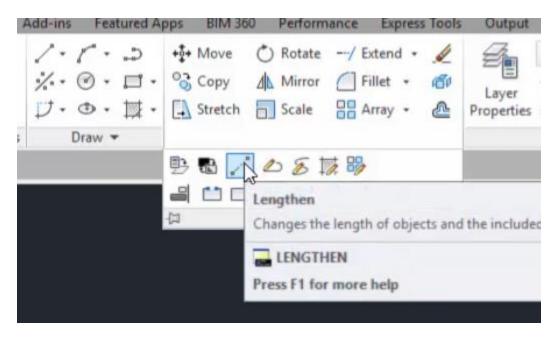
> 💡 on the fly.
>
> While selecting objects to Extend or Trim, choose the mid-command option <select all>. This allows you to use any existing geometry object as a potential Extend boundary or Trim cutting edge.
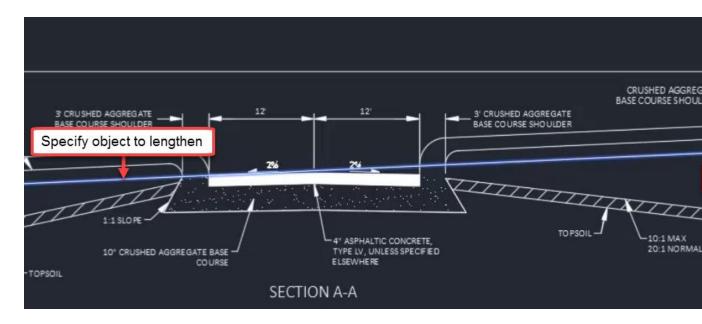
Lengthen

The Lengthen command allows you to continue an object along it's 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 button**

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

SECTION A-A

Fillet & Break

Exercise files: acad-modify-data-c3d16.zip

Start with acad-modify-03.dwg
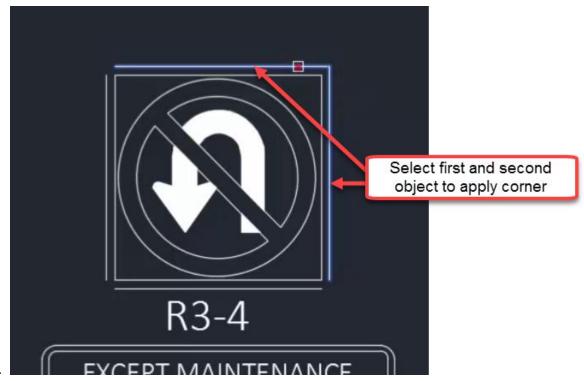
acad-modify-07.mp4 6:03

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 button**
   A. `SELECT FIRST OBJECT OR: R`
      I. enter
   B. `SPECIFY FILLET RADIUS: 0`
      I. enter

C.
D. **SELECT FIRST OBJECT:** select one of the outermost R3-4 detail Lines
E. **SELECT SECOND OBJECT TO APPLY CORNER:** select adjacent R3-4 detail Line

4. **F**
   A. enter
   B. **SELECT FIRST OBJECT OR: R**
      I. enter
   C. **SPECIFY FILLET RADIUS: 0.35**
      I. enter
   D. **SELECT FIRST OBJECT:** select one of the outermost R3-4 detail Lines
   E. **SELECT SECOND OBJECT TO APPLY CORNER:** select adjacent R3-4 detail Line

5. **F**
   A. enter
   B. **SELECT FIRST OBJECT OR: M**
      I. enter
   C. Apply Fillets to all remaining outermost R3-4 detail Lines
      I. enter

6. Select all four innermost Lines on R3-4 detail
   A. **J**
      I. enter

Join innermost R3-4 detail Lines

R3-4

EXCEPT MAINTENANCE

B. **F**
    I. enter
C. **SELECT FIRST OBJECT OR: R**
    I. enter
D. **SPECIFY FILLET RADIUS: 0.2**
    I. enter
E. **SELECT FIRST OBJECT OR: POLYLINE**
    I. enter
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.
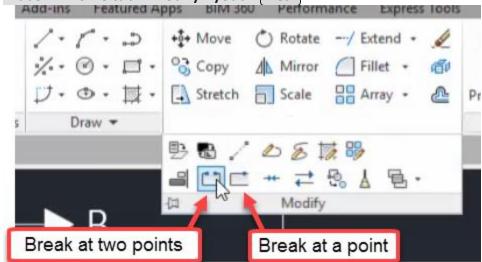
Break

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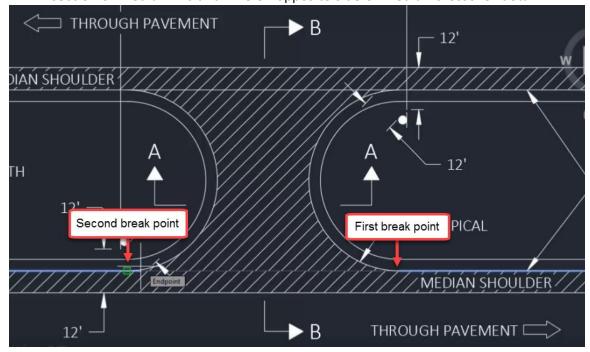
1. Continue working with acad-modify-03.dwg
2. Zoom and Pan to PLAN VIEW detail area of drawing

3. **Ribbon > Home tab > Modify flyout > Break**

Break at two points   Break at a point

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: F**
   I. enter
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

Array

Exercise files: acad-modify-data-c3d16.zip
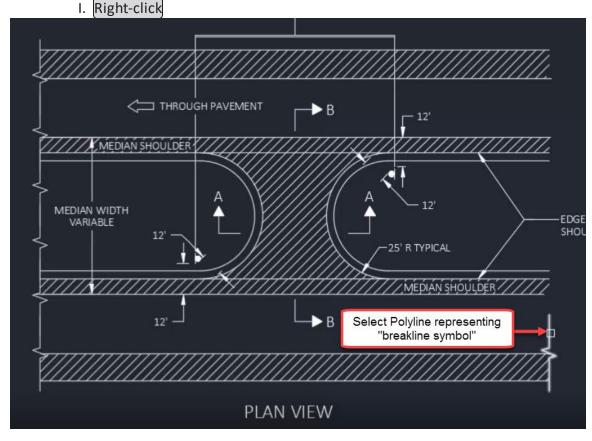
Continue with acad-modify-04.dwg

acad-modify-08.mp4 4:34

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 arranges the copied object 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.
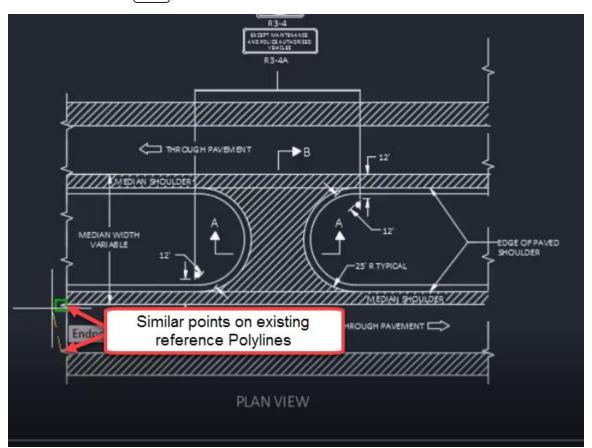
1. Open acad-modify-04.dwg
2. Zoom and Pan to PLAN VIEW detail area of drawing
3. **Ribbon > Home tab > Modify panel > Array (Rectangular)**
   A. `SELECT OBJECTS:` select Polyline representing "breakline symbol"
      I. `Right-click`

PLAN VIEW

   B. **Ribbon > Array contextual tab > Columns panel**
      I. Columns = 1
   C. **Ribbon > Array contextual tab > Rows panel**
      I. Rows = 6

D. **SELECT GRIP TO EDIT ARRAY OR: SPACING**
    I. enter
E. **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

Reverse & Align

Exercise files: acad-modify-data-c3d16.zip

Continue with acad-modify-04.dwg

acad-modify-09.mp4 3:03
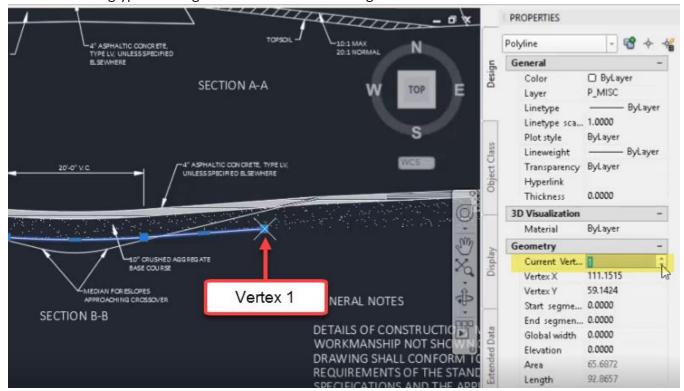
Reverse

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
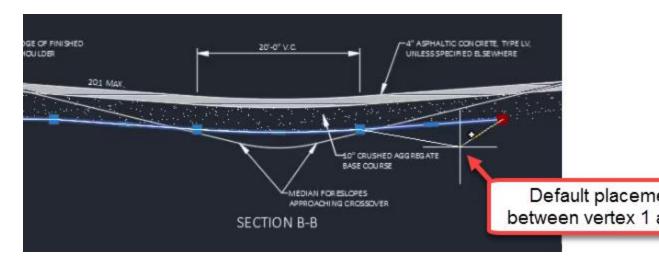
order of Polyline and Line vertices also affects how a Linetype is generated. Linetypes will start at vertex 1.

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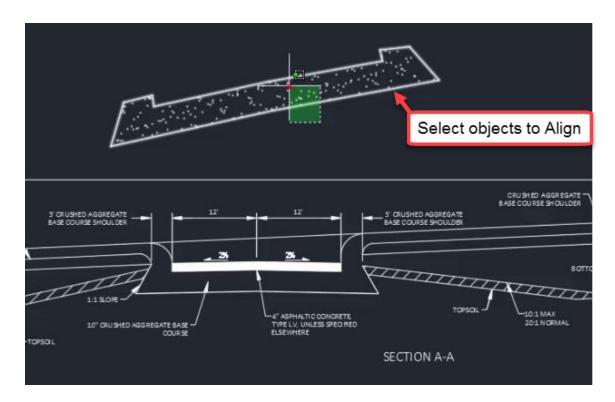
E. **Ribbon > Home tab > Modify flyout >** Reverse
   I. **Properties palette > Geometry dropdown > Current Vertex**
   II. Observe reversed order of Polyline vertices
F. Hover cursor over vertex 5
   I. Add vertex
   II. Observe default placement of new vertex
   III. Use desired Osnap to place new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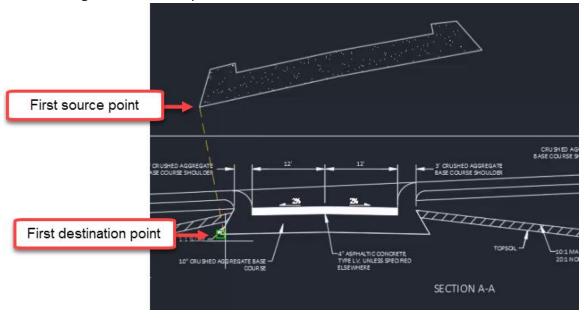
Align

The Align command combines the functionality of the Move, Rotate, and Scale commands. Most basic AutoCAD objects can be affected by the Align command (ie Polyline, Block, Hatch, Text). Once the command is activated, you will select obects 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
   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. enter

G. **SCALE OBJECTS BASE ON ALIGNMENT POINT?: Y**
   I. enter

Hatch

Last updated: 2017-12-01

Total video time: 14:23

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 stablitly. This is especially true if Hatch transparency is used.

> ⓘ **Info:** Many of the desired effects of a Hatch object are handled by Styles when working with Civil 3D objects (ie 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-htch-data-c3d16.zip
>
> Start with acad-htch-begin.dwg
>
> acad-htch-01.mp4 6:29
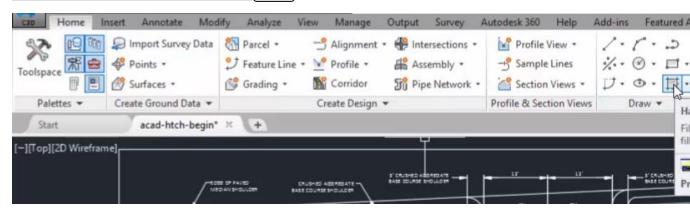
Hatch creation

1. Open acad-htch-begin.dwg
2. Zoom and Pan to SECTION A-A detail
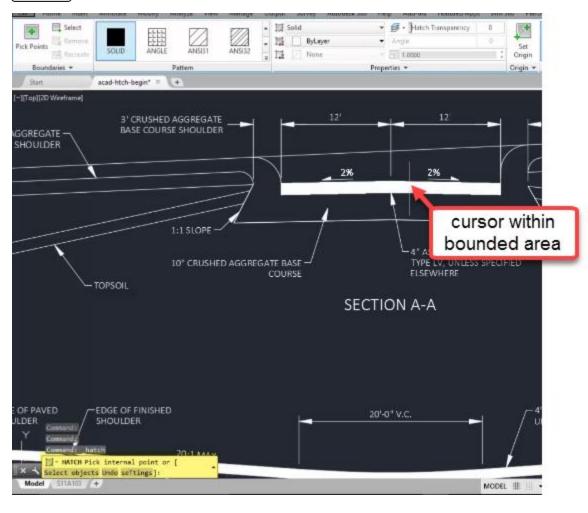
3. **Ribbon > Home tab > Draw panel >** Hatch
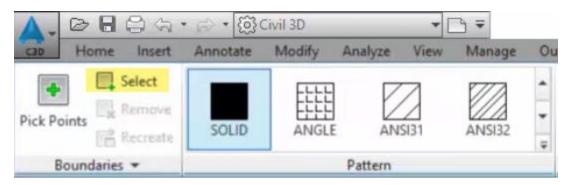
4. `HATCH PICK INTERNAL POINT OR:` leave default to pick internal point
   A. Or, if necessary, `HATCH SELECT OBJECTS OR:` PICK INTERNAL POINT
   B. Move cursor inside area bounded by Lines representing 4" ASPHALTIC CONCRETE
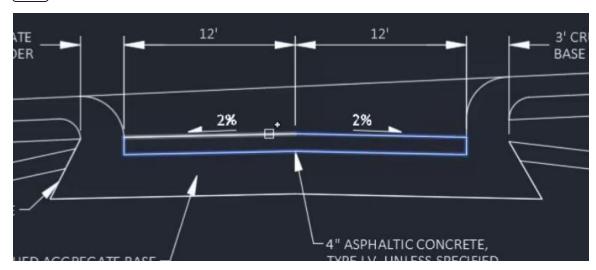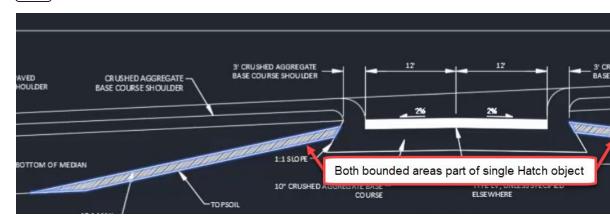   C. Observe Hatch preview

D. Left-click to place Hatch

E. Select previously created Hatch
   I. delete

5. **Ribbon > Home tab > Draw panel > Hatch**

   A. **Ribbon > Hatch contextual tab > Boundaries panel > Select**

    B. Select individual Lines bounding SECTION A-A PAVEMENT area
        I. enter
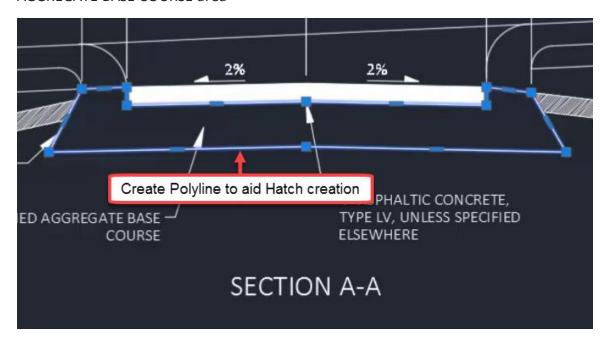
    C. Select previously created Hatch
        I. delete

6. Select individual Lines bounding SECTION A-A PAVEMENT area
    A. **J**
        I. 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

Both bounded areas part of single Hatch object

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

Exercise files: acad-htch-data-c3d16.zip
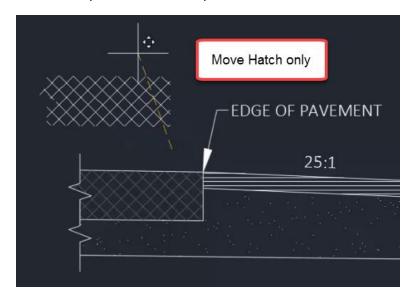
Start with acad-htch-01.dwg

acad-htch-02.mp4 5:25

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.Ipsum lorem. Ipsum lorem. Ipsum lorem. Ipsum lorem.

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. M
       I. enter
      II. Select basepoint and second points

4. Observe lack of Hatch boundary

5. Select Hatch
    A. Observe available grips
    B. M
        I. `entern`
        II. Observe lack of grips during Move command
        III. `esc`
6. `Ctrl+z` to undo initial Move
7. 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`
8. Select Hatch boundary Polyline
    A. M
        I. `enter`
        II. Select basepoint and second point
        III. Observe Hatch association with Polyline
9. Select Hatch boundary Polyline
    A. M
        I. `enter`
        II. Use Endpoint Osnap to move Polyline back to original location

Annotative
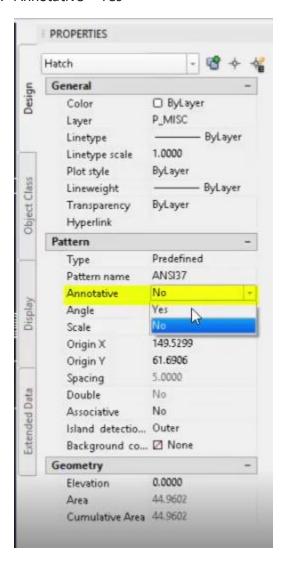
Annotative scaling is used to dynamically set an annotative object's displayed scale based on the current drawing scale. It can also be used control visibility of annotative objects based on inclusion of scales in an object's annotative scales list. The end goal here is to display objects at the correct 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
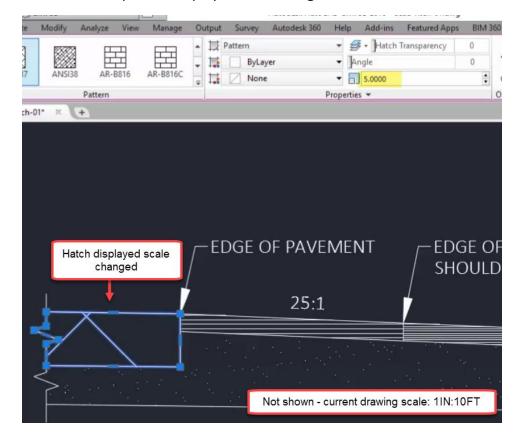
B. **Properties palette > Pattern dropdown**
  I. Annotative = Yes
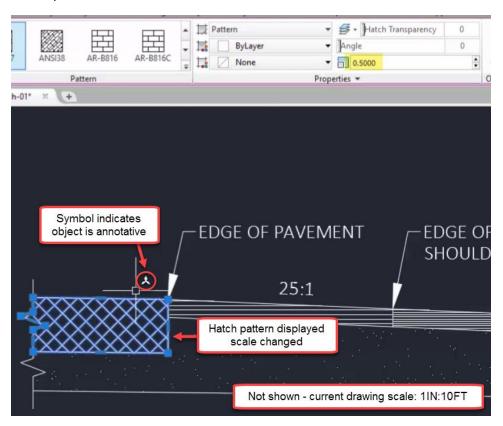
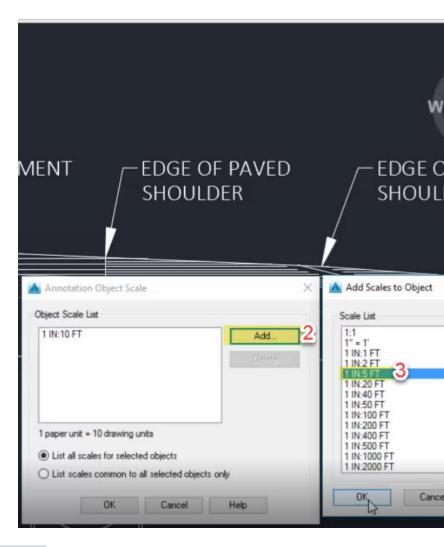A. Observe Hatch pattern displayed scale change

    B. **Ribbon > Hatch contextual tab > Properties panel**
        I. Hatch pattern scale: **0.5**

3. **Status bar > Current drawing scale flyout**
    A. Select 1 IN:5 FT
    B. Observe no change in Hatch pattern displayed scale
4. **Status bar > Current drawing scale flyout**
    A. 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...
                    1. Add Scales to Object dialog
                        1. 1 IN:5 FT
                        2. 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

Exercise files: acad-htch-data-c3d16.zip

Continue with acad-htch-01.dwg
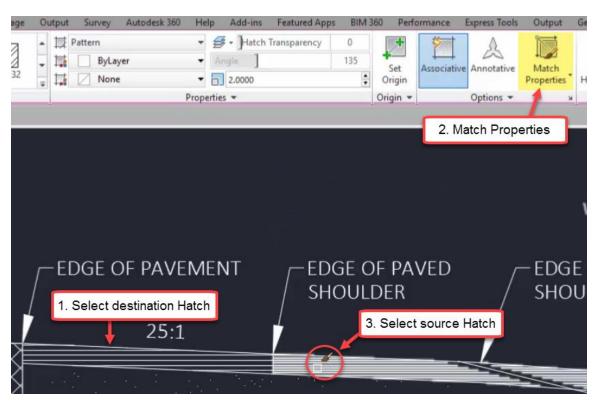
acad-htch-03.mp4 2:29

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.

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

A. Zoom and Pan to PLAN VIEW detail

B. **Ribbon > Home tab > Draw panel > Hatch**

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

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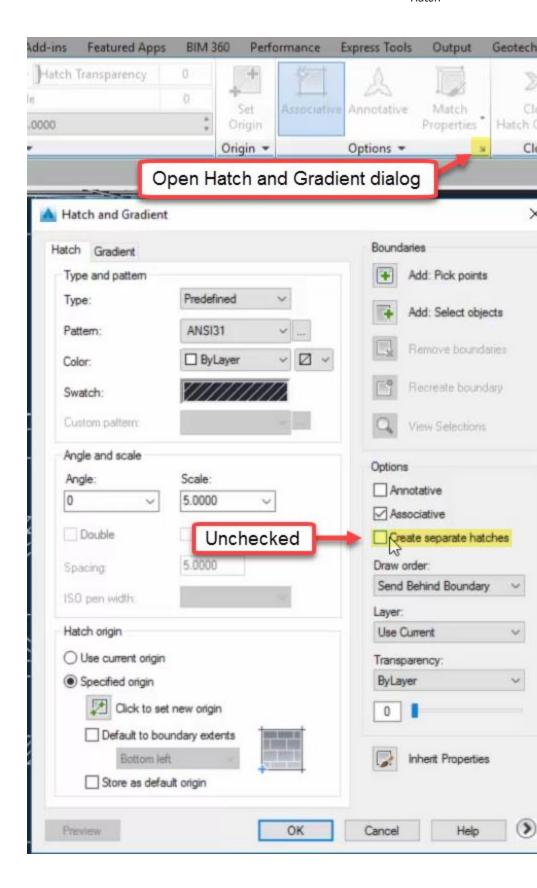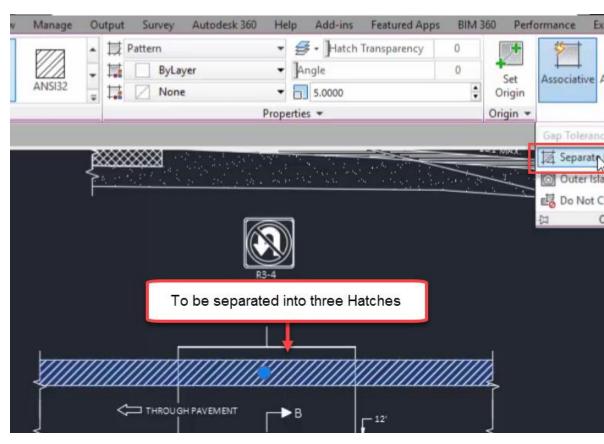
      i. Create separate hatches = unchecked

Open Hatch and Gradient dialog

Unchecked

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 button**
       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

Last updated: 2017-12-01

Total video time: 22:29

Published on: 2/15/2018

Object Grips are used to interact with and edit objects in through the drawing view (ie Modelspace). 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.

Basics: stretch vs move

Exercise files: acad-grips-data-c3d16.zip

Start with acad-grips-begin.dwg

acad-grips-01.mp4 3:21
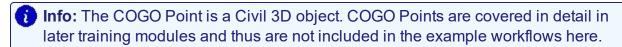
Arguably the most basic Grip function is the Stretch. Within the category of Stretch Grip functions, are two distinct types of editing behavior: Stretch and "move". In general, an endpoint Grip has a Stretch behavior and a midpoint or insertion Grip has "move" behavior. The Stretch behavior relocates the Grip and changes the length or radius and rotation or centerpoint 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
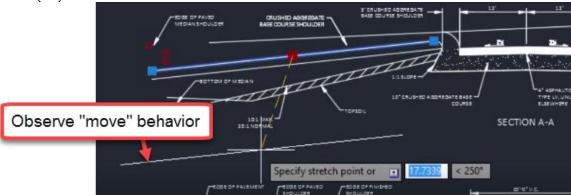
- Text insertion point
- Line midpoint
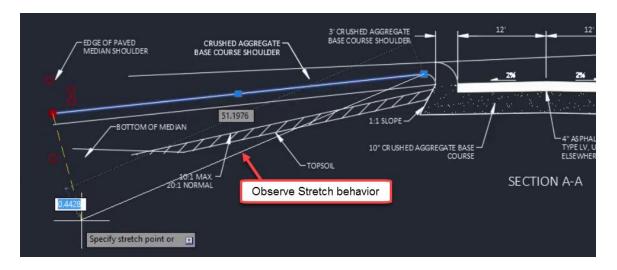- Circle center
- Block insertion point
- COGO Point

> **ⓘ 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

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
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
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
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

8. Repeat step 7 for Polyline bounding 10" CRUSHED AGGREGATE BASE COURSE Hatch
9. Repeat step 7 for SECTION A-A detail median nose Arc

Shift+select multiple

Exercise files: acad-grips-data-c3d16.zip
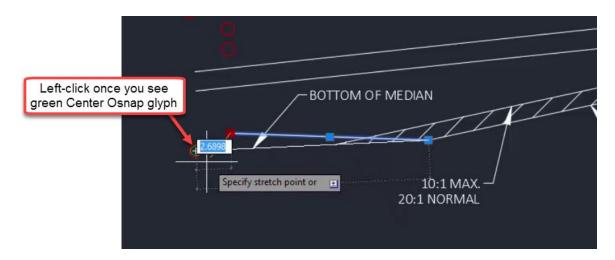
Continue with acad-grips-begin.dwg

acad-grips-02.mp4 5:42
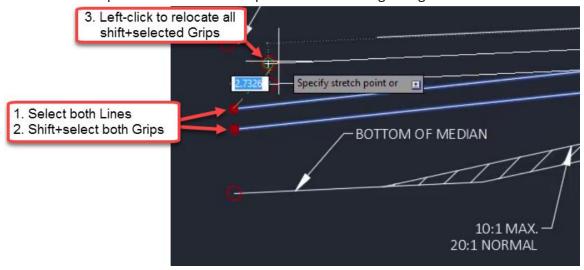
Hold the Shift key and select multiple Grips to simultaneously apply a similar Grip edit to multiple object Grip locations. The Grips will display red once selected and activated. Release the Shift key and select one of the activated Grips to apply a Grip edit as normal. The Grip edit will then be applied 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

Left-click once you see green Center Osnap glyph

BOTTOM OF MEDIAN

2.6898

Specify stretch point or

10:1 MAX.
20:1 NORMAL
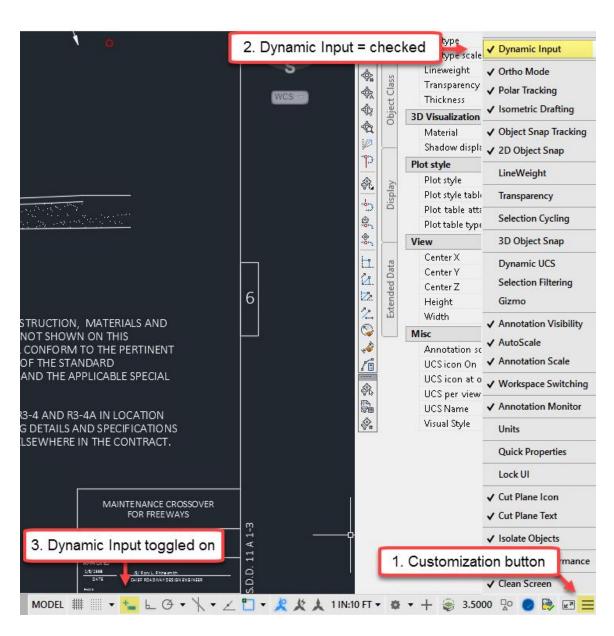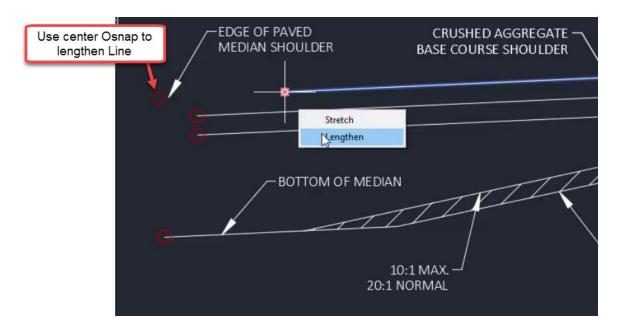
6. Select both CRUSHED AGGREGATE BASE COURSE and SUBGRADE Lines
   A. shift+select both leftmost endpoint Grips
      I. Release shift key
      II. Left-click one of the shift+selected Grips
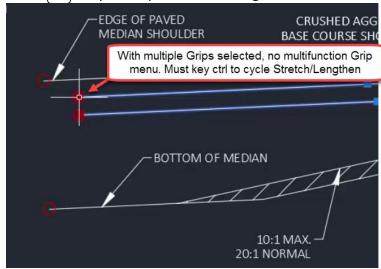   a. Use Osnaps to relocate Line endpoints at center of guiding Circles

3. Left-click to relocate all shift+selected Grips

2.7326

Specify stretch point or

1. Select both Lines
2. Shift+select both Grips

BOTTOM OF MEDIAN

10:1 MAX.
20:1 NORMAL

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
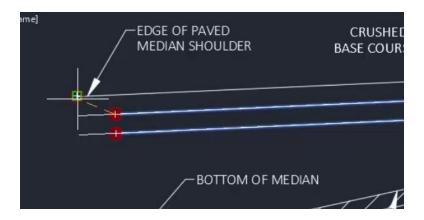
B. Hover cursor over leftmost Line endpoint
   I. Observe Dynamic Input tooltip
   II. **SPECIFY END POINT: 5**
        a. enter
   III. Use Osnaps to Lengthen Line to center of red guiding Circle
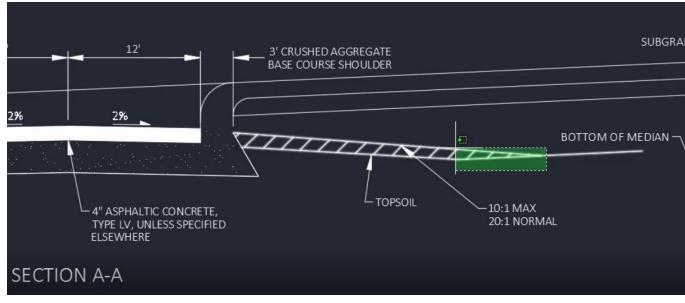
8. Select both CRUSHED AGGREGATE BASE COURSE and SUBGRADE Lines
    A. shift+select both leftmost endpoint Grips
        I. Release shift key
        II. Left-click one of the shift+selected Grips
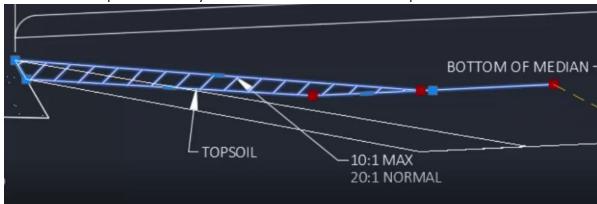   a. ctrl to cycle Grip function = Lengthen

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

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

Exercise files: acad-grips-data-c3d16.zip
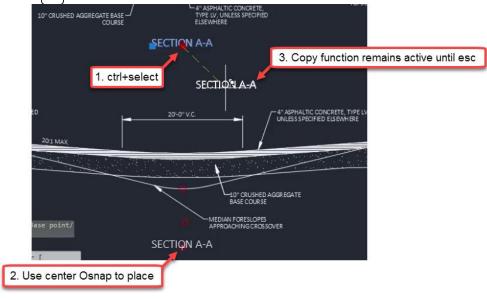
Continue with acad-grips-begin.dwg

acad-grips-03.mp4 2:44

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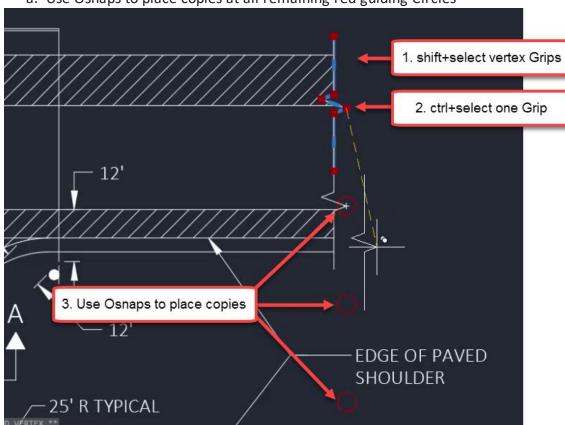
1. Continue with acad-grips-begin.dwg
2. Select SECTION A-A Text
   A. ctrl+select insertion point Grip
      I. Release ctrl key
      II. Pan to SECTION B-B detail
         a. Use Osnaps to place copied Text at center red guiding Circle
         b. esc

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 righmost vertex Grip
      II. Release ctrl key
         a. Use Osnaps to place copies at all remaining red guiding Circles
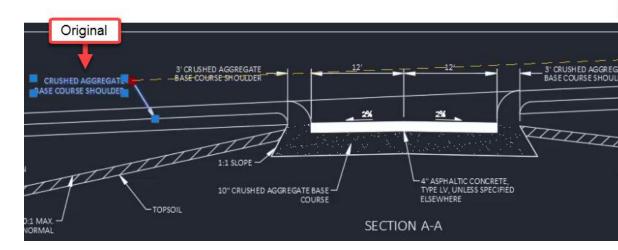

Grip modes

Exercise files: acad-grips-data-c3d16.zip

Start with acad-grips-01.dwg

acad-grips-04.mp4 6:46

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.
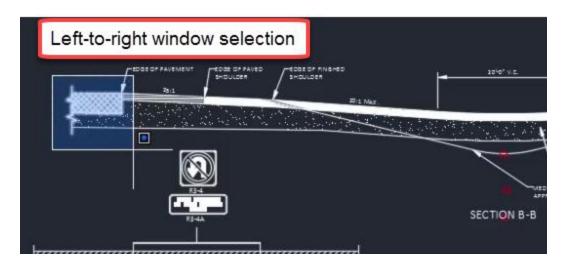
1. Open acad-grips-01.dwg
2. Zoom and Pan to PLAN VIEW detail
3. Select Line just below R3-4A signage
   A. Left-click topmost endpoint Grip
      I. Observe command line prompt **SPECIFY STRETCH POINT OR:**
      II. Move cursor and observe behavior
         a. enter
      III. Observe command line prompt change **SPECIFY STRETCH MOVE OR:**
      IV. Repeat steps 3.A.I - 3.A.III to cycle all Grip Modes
      V. esc
   B. esc
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
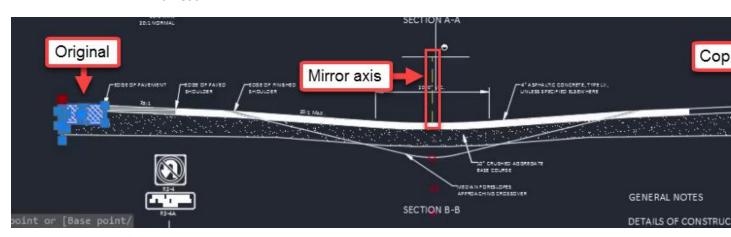
6. Pan to SECTION B-B detail
7. Verify midpoint Object Snap is on
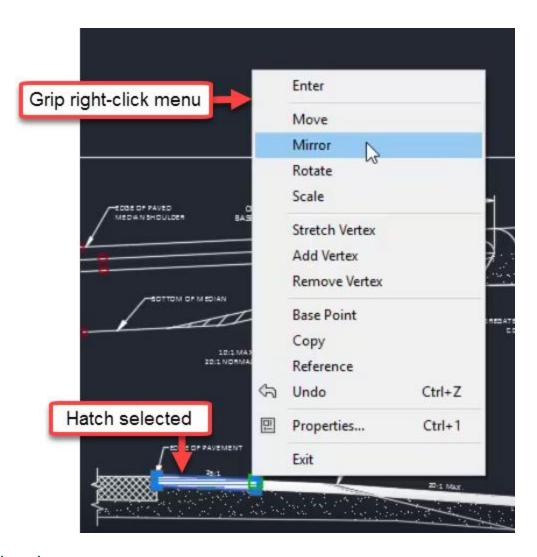8. Window select breakline symbol Polyline and Hatch near EDGE OF PAVEMENT Multileader

1. 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 key for temporary Orthomode
         b. Left-click second mirror point above basepoint
         c. esc

2. Select PAVED SHOULDER Hatch one left side of SECTION B-B detail
   A. Left-click a displayed Grip
      I. Right-click
         a. Mirror
      II. Repeat steps 1.A.I - 1.A.II to place copy of PAVED SHOULDER Hatch

Multifunction grips

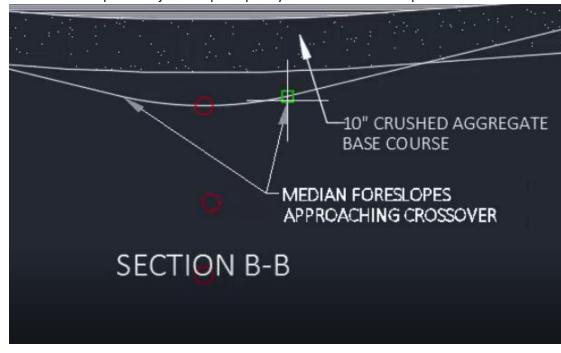Exercise files: acad-grips-data-c3d16.zip

Continue with acad-grips-01.dwg

acad-grips-05.mp4 3:56

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 funcitons 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 midpiont Grip
            a. ctrl to cycle Grip functions to Convert to Arc
                i. SPECIFY MIDPOINT OF ARC SEGMENT:
                    1. Use Osnaps to place specify center of red guiding Circle
                    2. esc

Layers and their properties

Last updated: 2017-12-01

Total video time: 35:48

Layer basics

Exercise files: acad-layr-prprtis-data-c3d16.zip

Start with acad-layr-prprtis-begin.dwg

acad-layr-prprtis-01.mp4 4:36

Layers in AutoCAD are used to control object display properties, visibility, plotting, object selection, and organization. All objects in a drawing will reside on a Layer. The Layer an individual object resides on is known as the Object Layer. When AutoCAD objects are created, they will be placed on the Current Layer. You can set which Layer is the Current Layer either through the Ribbon Layer Panel or Layer Properties Manager. Some of the most commonly used/edited Layer properties are On/off, Isolate/unisolate, Freeze/thaw, Lock/unlock.

> **Info:**
> Civil 3D objects are made up of components. For example, an Alignment can have Line, Curve, Spiral, etc components. The object and it's component can all be on unique Layers.
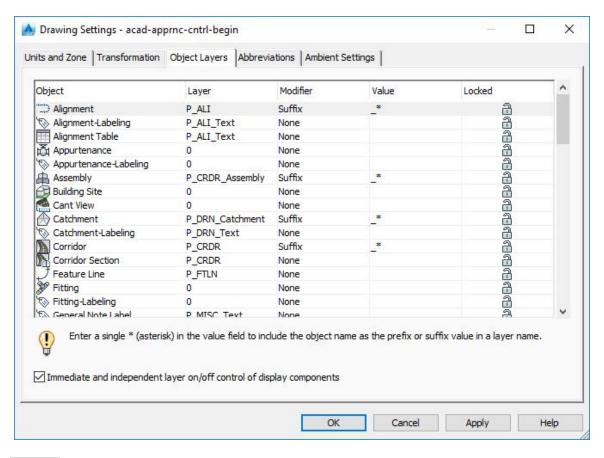>
> When Civil 3D objects (ie Alignments, Corridors, Surfaces) are created, they will be placed on the default Object Layer specified in the Drawing Settings dialog. An optional Layer name wildcard can be included that will append the default Object Layer name with the name you give to the Object. In this way, a new Layer will be created for each named Civil 3D Object created. For example, the default Object Layer for Alignments in the WisDOT design template is P_ALI_*. The * character is the wildcard. If an Alignment is named HWY 14, the default Object Layer created will be P_ALI_HWY 14.
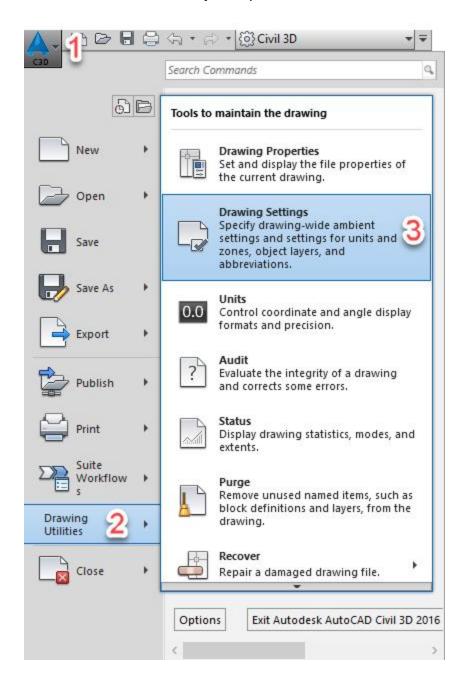
1. Open acad-layr-prprtis.dwg
2. **Ribbon > Home tab > Layers panel**
   A. Observe Current Layer = *E_ALI*
3. **Application menu dropdown > Drawing Utilities > Drawing Settings > Object Layers tab**

A. Observe default Civil 3D Object Layers

4. **PLINE**
   A. [enter]
   B. Draw Polyline with two vertices anywhere between SECTION A-A and SECTION B-B details
   C. Select Polyline just drawn
   D. **Properties palette > General**
      I. Observe Object Layer = **E_ALI**
5. Select BOTTOM OF MEDIAN Line on right side of SECTION A-A detail
   A. **Ribbon > Home tab > Layers panel**
      I. Observe Object Layer = **P_XS_FinalBorrow**

   > ℹ **Info:** The Ribbon Layer Panel shows the Current Layer if no object is selected. It shows the selected Object Layer if a object is selecting

   C. **Properties palette > General**
      I. Observe Object Layer = **P_XS_FinalBorrow**
   D. [esc]
6. **PLINE**
   A. [enter]
   B. **Ribbon > Home tab > Layers panel**
      I. Observe dropdown display change to Current Layer = **E_ALI**

    C. Draw Polyline with two vertices anywhere between SECTION A-A and SECTION B-B details

7. Select BOTTOM OF MEDIAN Line on right side of SECTION A-A detail
    A. **Ribbon > Home tab > Layers panel >** Make Current
8. `PLINE`
    A. enter
    B. **Ribbon > Home tab > Layers panel**
        I. Observe Current Layer = *P_XS_FinalBorrow*
    C. Draw Polyline with two vertices anywhere between SECTION A-A and SECTION B-B details
9. Select multiple objects
    A. **Properties palette > General**
        I. Observe Layer = *VARIES*
    B. esc
    C. **Ribbon > Home tab > Layer panel > Layer list dropdown**
        I. Choose Layer for all selected objects
            a. Observe Object Layer change
        II. Match Layer
            a. `SELECT OBJECT ON DESTINATION LAYER`
                i. Select BOTTOM OF MEDIAN Line on right side of SECTION A-A
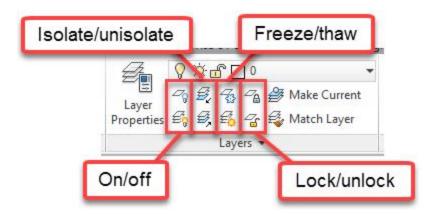   b. Observe Object Layer for selection = *P_XS_FinalBorrow*

Layer commands: off, freeze, isolate, lock

> Exercise files: acad-layr-prprtis-data-c3d16.zip
>
> Start with acad-layr-prprtis-begin.dwg
>
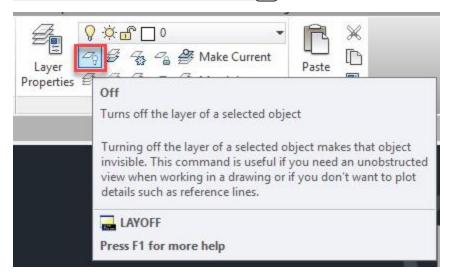> acad-layr-prprtis-02.mp4 6:57

Commonly edited Layer properties

| Layer property	Description
On/off	When a Layer is turned off, objects residing on that Layer will not display, although they will be accounted for when processing object display, such as when you Zoom Extents or Regen.
Isolate/unisolate	Depending on Layer settings, Layer Isolate will either Lock and fade display or turn off all Layer except those of selected objects.
Freeze/thaw	When a Layer is frozen, objects residing on that Layer will not display and will not be accounted for when processing object display. Freezing a Layer with an extraordinarily large number of objects can help drawing performance.
Lock/unlock	Objects on a locked Layer cannot be deleted or edited. Locking Layers can be helpful when you wish to use objects on a Locked Layer for visual reference or Osnapping while protecting their geometry.

On/ off
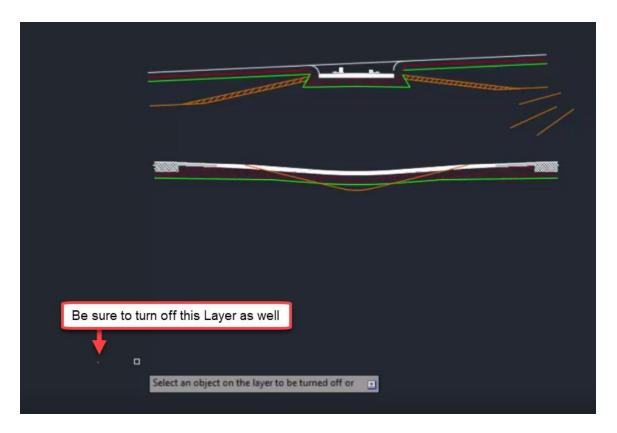
1. Continue working in acad-layr-prprtis-begin.dwg
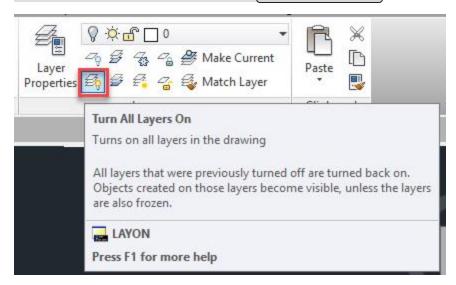2. **Ribbon > Home tab > Layer panel > Off**

3. SELECT AN OBJECT ON THE LAYER TO BE TURNED OFF
   A. Select multiple objects below SECTION A-A detail
   B. esc

Be sure to turn off this Layer as well

Select an object on the layer to be turned off or
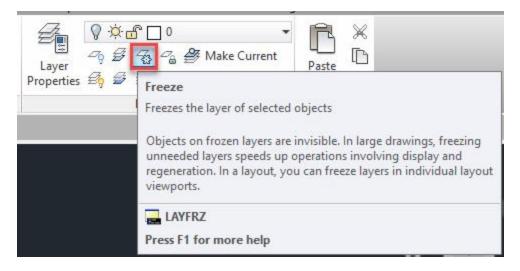
4. Double-click middle mouse wheel
    A. Observe Zoom Extents still accounting for Layers turned off
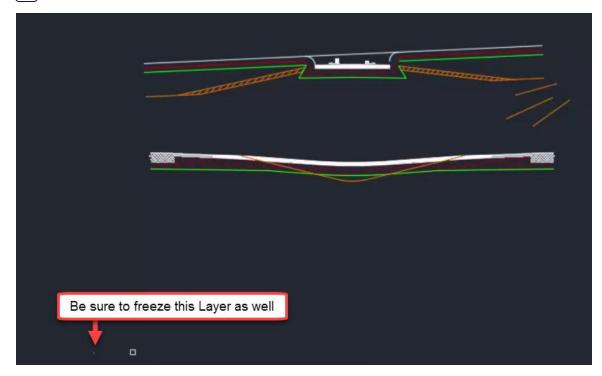5. **Ribbon > Home tab > Layer panel > Turn All Layers On**

Turn All Layers On

Turns on all layers in the drawing

All layers that were previously turned off are turned back on. Objects created on those layers become visible, unless the layers are also frozen.

LAYON

Press F1 for more help

Freeze/ thaw

1. Continue working in acad-layr-prprtis-begin.dwg
2. **Ribbon > Home tab > Layer panel > Freeze**
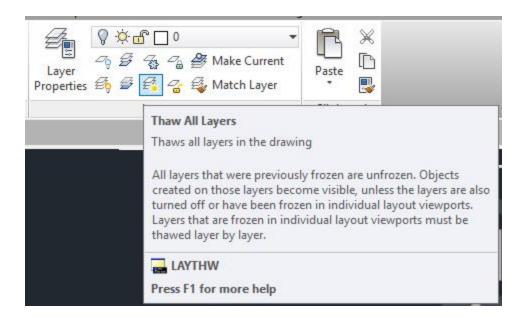
3. **SELECT AN OBJECT ON THE LAYER TO BE FROZEN**
   A. Select multiple objects below SECTION A-A detail
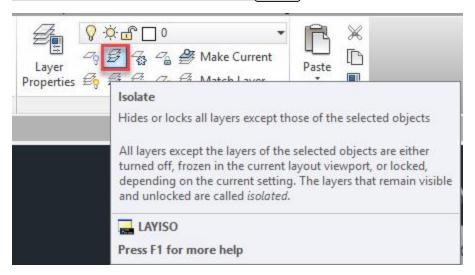   B. esc

Be sure to freeze this Layer as well

4. Double-click middle mouse wheel
   A. Observe Zoom Extents not accounting for frozen Layers
5. **Ribbon > Home tab > Layer panel > Thaw All Layers**

Isolate/ unisolate

1. Continue working in acad-layr-prprtis-begin.dwg
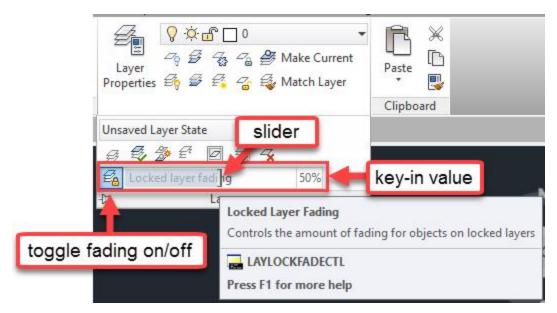2. **Ribbon > Home tab > Layer panel > Isolate**

3. SELECT AN OBJECT ON THE LAYER TO BE ISOLATED
   A. Select BOTTOM OF MEDIAN Line on right side of SECTION A-A detail
   B. enter
   C. Observe non-isolated Layers fade and lock

4. **Ribbon > Home tab > Layer panel flyout**
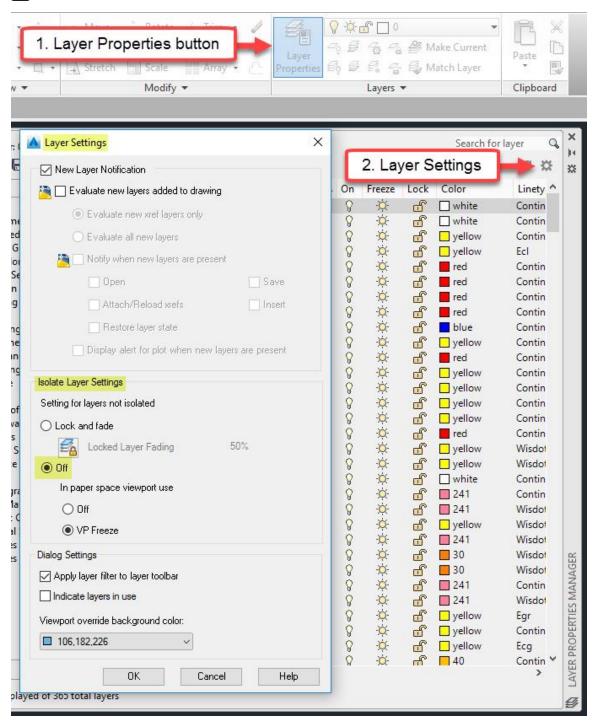   A. Adjust Locked Layer Fading with slider

5. **Ribbon > Home tab > Layer panel >** **Layer Properties**
    A. Layer Settings
        I. Isolate Layer Settings
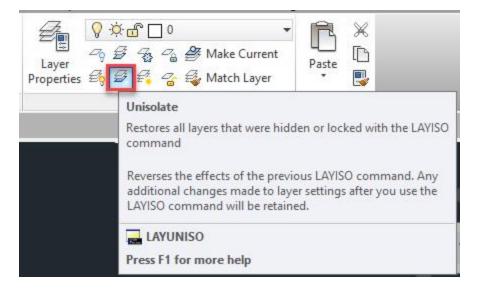   a. Settings for Layers not isolated = Off
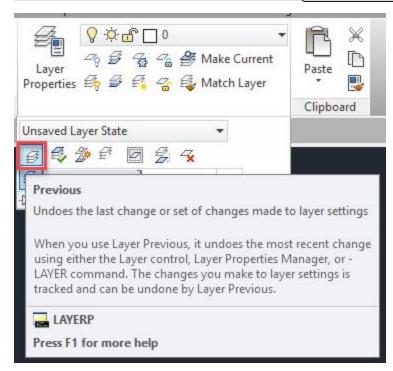
B. OK

6. **Ribbon > Home tab > Layer panel > Unisolate**

7. **Ribbon > Home tab > Layer panel > Isolate**
8. **SELECT AN OBJECT ON THE LAYER TO BE ISOLATED**
   A. Select BOTTOM OF MEDIAN Line on right side of SECTION A-A detail
   B. enter
   C. Observe non-isolated Layers turn off
9. **Ribbon > Home tab > Layer panel flyout > Layer Previous**
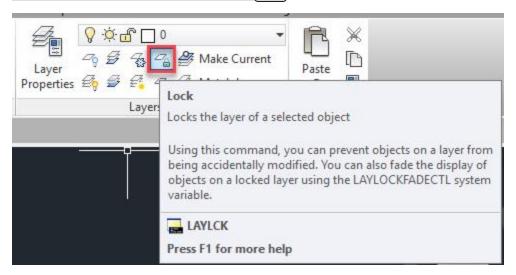

Tip: Use Layer Previous to turn on or thaw only the single Layer or selection of Layers you previously changed. The Ribbon buttons only allow you to turn on or thaw all layers
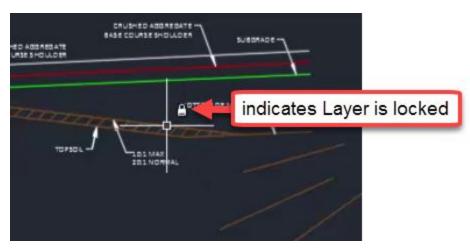
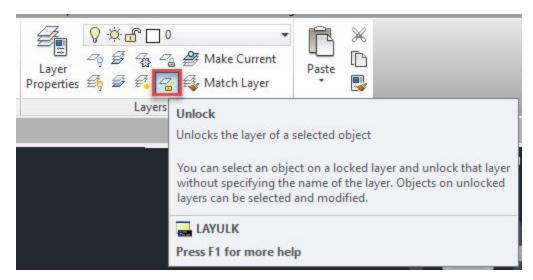Lock/ unlock

1. **Ribbon > Home tab > Layer panel > Lock**

2. Select an object on the layer to be Locked
   A. Select BOTTOM OF MEDIAN Line on right side of SECTION A-A detail
   B. enter
   C. Observe Locked layer display fade
   D. Hover cursor over object on locked Layer
   E. Observe "padlock" glyph indicating the Layer is locked

indicates Layer is locked
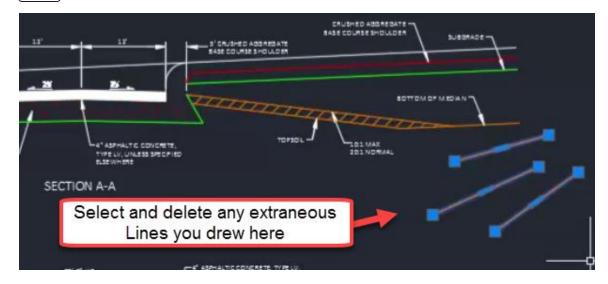
3. Select an object on the locked Layer
   A. Observe absence of any Grips
   B. M
      I. enter
      II. Observe command line history and inability to edit object on locked Layer:
         a. MOVE 1 FOUND, 1 WAS ON A LOCKED LAYER
      III. esc

4. **Ribbon > Home tab > Layer panel >** Unlock
   A. Select an object on locked ***P_XS_FinalBorrow*** Layer

5. Select the three extraneous Lines drawn near SECTION A-A detail
   A. delete

Layer properties manager: interface & editing
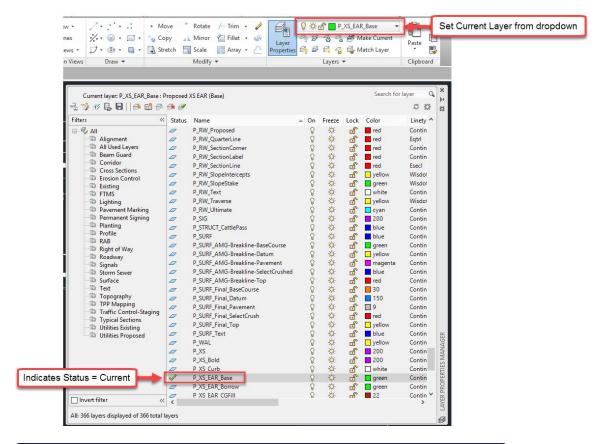
Exercise files: acad-layr-prprtis-data-c3d16.zip

Start with acad-layr-prprtis-begin.dwg
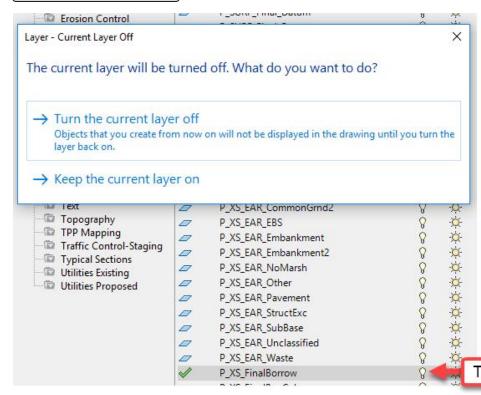
acad-layr-prprtis-03.mp4 6:39

The Layer Properties Manager is where you can sort, create and delete Layers or edit Layer properties such as Layer name, description, display color, visibility (on/off or freeze/thaw), plot style name (how thick a lines will plot), whether the Layer will plot or not, etc. Take advantage of shift+select and ctrl+select to affect multiple Layers at once.

1. Continue with acad-layr-prprtis-begin.dwg
2. **Ribbon > Home tab > Layer panel > Layer Properties**
   A. Observe "366 total Layers" listed along bottom of Layer Properties Manager palette
3. **Ribbon > Home tab > Layer panel > Layers dropdown > P_XS_EAR_Base**
   A. Layer Properties Manager
      I. Observe Status = Current

> **ⓘ Info:** Alternatively, set a Layer Current by selecting a row and clicking the Set Current button 🖉 or double-clicking a row in Layer Properties Manager

      II. Select a row in by left clicking
         a. Left click once more on the Layer name to edit the name
         b. Left click elsewhere in to cancel or finish the name edit

4. Select BOTTOM OF MEDIAN Line on left side of SECTION A-A detail
   A. **Ribbon > Home tab > Layer panel > Make Current**
   B. Layer Properties Manager
      I. *P_XS_FinalBorrow* row
         a. Toggle Layer Off
            i. "The current layer will be turned off. What do you want to do?"
               1. Turn the current layer off

         b. Toggle Layer On

    c. Toggle Layer Freeze
       i. "This layer cannot be frozen because it is the current layer."
          1. Close

II. **P_XS_EAR_Waste** row
    a. Set current by double clicking this row
III. **P_XS_FinalBorrow** row
    a. Toggle freeze
       i. Observe Layer not displayed in modelspace
    b. Toggle thaw
    c. Toggle lock
       i. Observe Layer display fade in modelspace
    d. Color column
       i. Color = yellow
       ii. OK
          1. Observe layer color change in modelspace
    e. Color column
       i. Color = 30
       ii. OK
    f. Linetype column
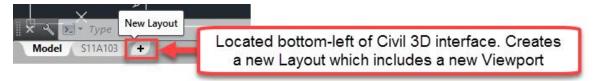   i. Select Linetype: choose Ecomlin from list
       ii. OK

g. Linetype column
- i. Select Linetype: choose Continuous from list
- ii. OK

h. Lineweight column
- i. Lineweight = 0.80mm
  - 1. observe no change to display in modelspace
- ii. **LINEWEIGHT**
  - 1. enter
  - 2. Display Lineweight = checked
  - 3. OK
  - 4. Observe change to display in modelspace
- iii. Lineweight = 0.30mm
- iv. **LINEWEIGHT**
  - 1. enter
  - 2. Display Lineweight = unchecked
  - 3. OK

i. Plot column
- i. Toggle plot/ noplot

j. Plot Style column
- i. Click on *5B-wisdot* named Plot Style
  - 1. Observe list of Plot Styles
  - 2. Cancel

> ⊗ **Warning:** Named plot styles have been assigned intentionally to Layers included in the WisDOT design template. These Plot Styles dictate the plotted color (ie Black), line-type and lineweight of plotted objects. Do not change these assigned Plot Styles as doing so will result in non-uniformity among plotted WisDOT plan sets.

k. New VP Freeze column
- i. Toggle New VP Freeze

> ⓘ **Info:** New VP Freeze affect creation of new View-ports. Viewports are used for plan production to "look" from you plan sheet Layout (Paperspace) into your Civil 3D model (Modelspace). The con-cepts and use of Layouts, Viewports and Paper-space vs Modelspace will be covered in more depth in later training modules.

C. Model and Layout tabs
    I. New Layout

Located bottom-left of Civil 3D interface. Creates a new Layout which includes a new Viewport
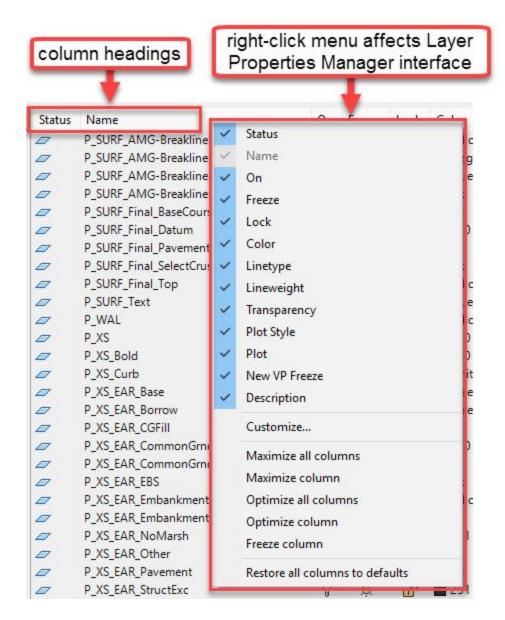
    II. Click newly created *Layout 1* to make active
        a. Status Bar > Customization > Model Space = Checked
        b. Status Bar > Model or paper space = Model

    III. Layer Properties Manager
        a. Observe VP Freeze = frozen
            i. Observe no display of *P_XS_FinalBorrow* in this Viewport only
        b. VP Freeze = thawed
D. Model and Layout tabs
    I. Set Model tab active
E. Layer Properties Manager
    I. Right-click any column header
        a. Maximize all columns
    II. Right-click Name column header
        a. Freeze column
            i. Observe static display of Name and Status Column while scrolling left-right
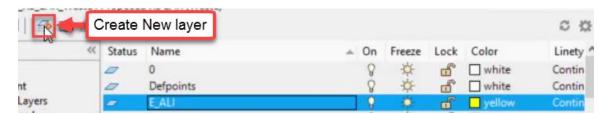
Layer properties manager: create new & layer notification

Exercise files: acad-layr-prprtis-data-c3d16.zip

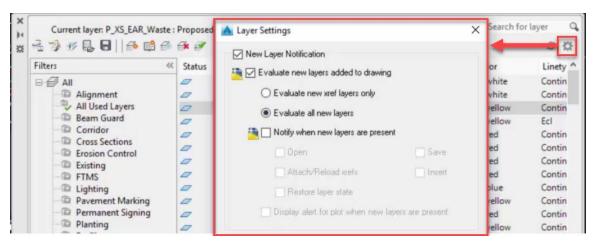Continue with acad-layr-prprtis-begin.dwg

acad-layr-prprtis-04.mp4 2:49

1. Continue with acad-layr-prprtis-begin.dwg
2. Layer Properties Manager
   A. Select **E_ALI** row
   B. Create New Layer
      I. Layer name = **E_ALI2**

> **ⓘ Info:** When creating a new Layer in Layer Properties Manager, all properties of the selected Layer other than the Layer name will be assigned to the new Layer created.

> **✅ Requirement:** When creating a new layer, follow the WisDOT Layer naming convention. For example, E_ALI_<object name> ("E for existing or P for proposed"_"three or four letters for object type"_"optional additional sections of three or four letters for object type"_ "object name or description")

	Status	Name	▲ On	Freeze	Lock	Color	Linety ^
	⬭	0	♀	☀	🔓	☐ white	Contin
	⬭	Defpoints	♀	☀	🔓	☐ white	Contin
	⬭	E_ALI	♀	☀	🔓	☐ yellow	Contin

   C. Select E_ALI2
      I. Right-click > Merge selected layer(s) to...
         a. Select **E_ALI**
         b. OK
         c. "The selected layers will be merged into layer **E_ALI**. Do you want to continue?"
            i. Yes
   D. Layer Settings
      I. New Layer Notification = checked
      II. Evaluate new layers added to drawing = checked

III. Evaluate all new layers = filled

E. Select *E_ALI*
F. Create new Layer
G. Right click newly created *Layer 1*
  I. Reconcile Layer

Layer properties manager: properties filter & settings
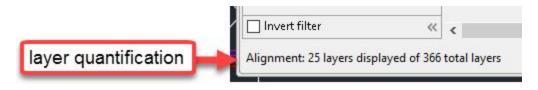

Exercise files: acad-layr-prprtis-data-c3d16.zip

Continue with acad-layr-prprtis-begin.dwg
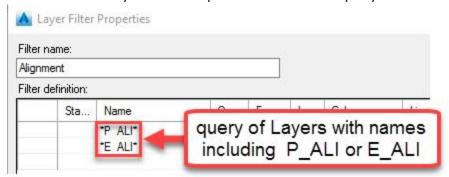
acad-layr-prprtis-05.mp4 6:07

Layer Properties Filters essentially query all the Layers in your drawing based on Layer name text or other Layer properties. This allows you to reduce the Layers listed in Layer Properties Manager, making Layers easier to find and work with. You can also use the search field in the upper right corner of Layer Properties Manager to filter the Layers shown based on Layer name. Using Layer Settings, you can also apply the current Layer Properties Filter to the Ribbon Layer Panel dropdown list.

1. Continue working in acad-layr-prprtis-begin.dwg
2. Layer Properties Manager
   A. Filters
     I. *Alignment*
       a. Observe reduced list of Layers displayed in Layer Properties Manager
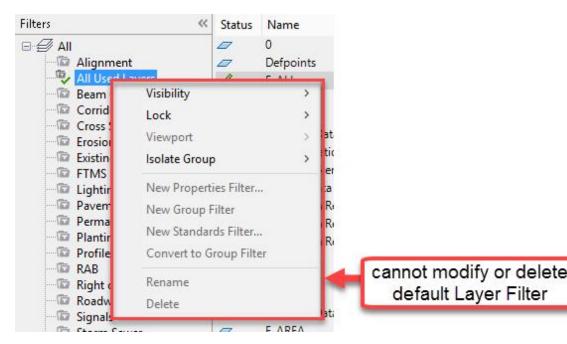   b. Observe Layer quantification note in lower-left of Layer Properties Manager window

layer quantification → Alignment: 25 layers displayed of 366 total layers

II. Right-click **Alignment** Layer Filter > Properties
    a. Observe Layer Filter Properties name-based query

query of Layers with names including P_ALI or E_ALI
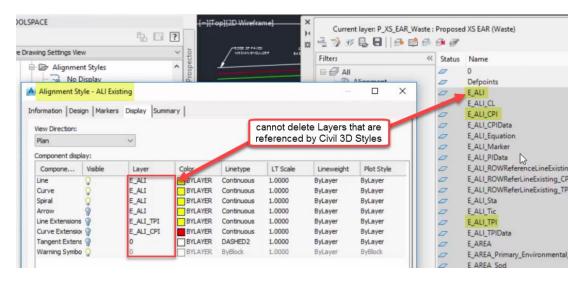
III. Right-click **All Used Layers** Filter
    a. Observe inability to modify properties or delete this filter

cannot modify or delete default Layer Filter

> **ⓘ Info:** The All Used Layers Filter is one of the default Layer Filters automatically created in any drawing. These default Layer Filters cannot be modified or deleted. Additional default Layer Filters include External Reference, Non-External Reference, Unreconciled Layers and Viewport Overrides.

       b. Shift-select multiple Layers included in the ***All Used Layers*** Filter
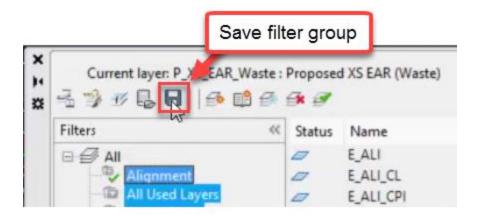   i. Right-click selection
             1. Delete Layer
             2. Observe notification informing that you cannot delete these Layers

> ℹ️ **Info:** When Layers are referenced by a Civil 3D Style included in a drawing or template, the Layers are included in the All Used Layers Filter and cannot be deleted. This is true even if there are no Civil 3D objects in the drawing. For example the Alignment Civil 3D Style is included in the WisDOT design template even before any Alignments are created.

3. **Ribbon > Home tab > Toolspace**
    A. **Toolspace palette > Settings tab > Alignments > Alignment Styles > Double-click ALI Existing**
        I. **Alignment Style palette > Display tab > Layer column**
           a. Observe Layers referenced by the ***ALI Existing*** Civil 3D Alignment Style
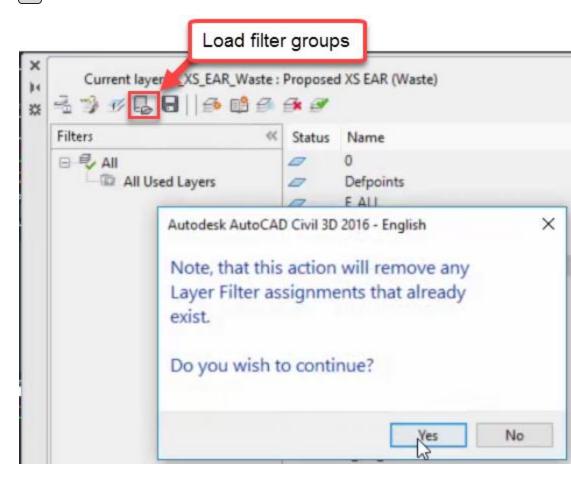

4. Layer Properties Manager
    A. Shift-select all Layer Filters
        I. Save filter group
           a. Save Layer Filters dialog > File name = filter groups.lft
           b. Save

Save filter group

B. Shift-select all Layer Filters > Right-click > Delete
C. Load Filter Groups
    I. "Note, that this action will remove any Layer Filter assignments that already exist. Do you wish to continue?"
       a. Yes

Load filter groups

Autodesk AutoCAD Civil 3D 2016 - English

Note, that this action will remove any Layer Filter assignments that already exist.

Do you wish to continue?

Yes   No

    II. Browse to filter groups.flt
       a. Open

        D. Layer Properties Manager search field
            I. syntax = p_ar*
            II. Observe real-time filtering of Layer list

        E. Layer Settings
            I. **Dialog Settings > Apply layer filter to layer toolbar = unchecked**
            II. OK
        F. Set *Beam Guard* Layer Filter active

5. **Ribbon > Home tab > Layer panel > Layer list dropdown**
        A. Observe all Layers in drawing included in Layer list

6. Layer Properties Manager
        A. Layer Settings
            I. **Dialog Settings > Apply layer filter to layer toolbar = checked**
            II. OK

7. **Ribbon > Home tab > Layer panel > Layer list dropdown**
        A. Observe only the Current Layer and those Layers included in the *Beam Guard* Layer Filter included in Layer list dropdown

Layer states & layer walk

Exercise files: acad-layr-prprtis-data-c3d16.zip

Continue with acad-layr-prprtis-begin.dwg

acad-layr-prprtis-06.mp4 5:00

A Layer State is a saved version of the way a drawings Layer properties are set up. The properties saved in a Layer State include Layer On/ off, Freeze/ thaw, Lock/ unlock, Color, Linetype, Lineweight, Transparency, Plot style, Plot/ no plot, New VP Freeze and VP Freeze. Layer States can be imported, saved from the current Layer Properties setup, or restored in a drawing at any time. Restoring a Layer State will reset all Layer properties currently set in a drawing to those saved in the Layer State. Use Layer States to quickly and accurately switch to a desired
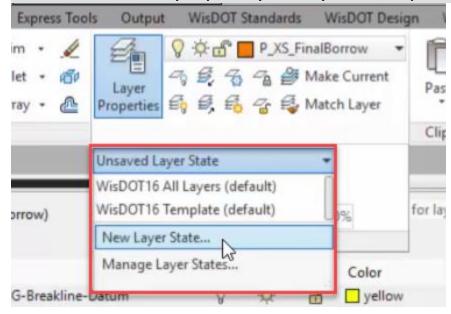
Layer properties setup for specific design, external referencing, or plotting workflows. Some key Layer States are included in the WisDOT design template and on the Ribbon WisDOT Standards tab. The Layer States on the WisDOT Standards tab can be imported through the Layers Tool Palette.

The Layer Walk command allows you to sort and select Layers from a list or your drawing area and see them displayed in real time. You can use Layer Walk to efficiently select a group of Layers either by name or by selecting objects in the drawing area, then create a Layer State based on that selection from within the Layer Walk dialog. The Layer State created from within the Layer Walk command will only affect visibility through the Layer on/ off property. All other properties will remain unchanged.

Layer states

1. Continue working in acad-layr-prprtis-begin.dwg
2. **Ribbon > Home tab > Layers panel flyout > Layer State dropdown >** New Layer State
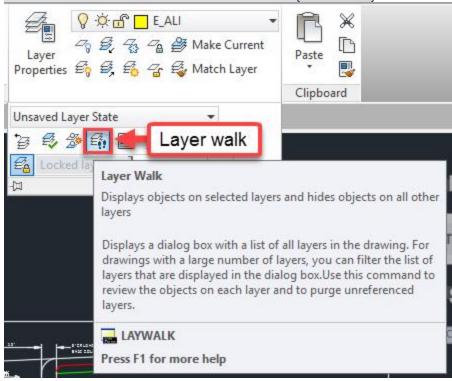

   A. New layer state name = *color*
   B. OK
3. Layer Properties Manager
   A. Shift+select all Layers
   B. Click any Layer Color field
      I. Color = white
      II. OK
4. **Ribbon > Home tab > Layers panel flyout > Layer State dropdown >** New Layer State
   A. New layer state name = white
   B. OK
5. **Ribbon > Home tab > Layers panel flyout > Layer State dropdown >** color
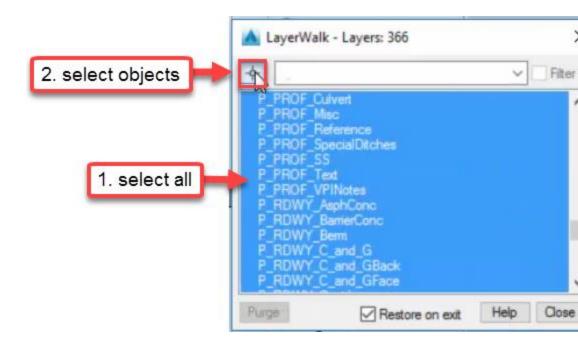   A. Observe all Layer Color properties restored based on color Layer State

6. Layer Properties Manager
   A. Shift+select all Layers
   B. Click any Layer Lock field
7. **Ribbon > Home tab > Layers panel flyout > Layer State dropdown > white**
   A. Observe Layer Color and Lock properties restored based on *white* Layer State

Layer walk

1. **Ribbon > Home tab > Layers panel flyout > Layer Walk**

   A. Layer Walk dialog
      I. Right-click in Layer list
         a. Select all
         b. Observe Layers displayed in drawing area
      II. Select objects
         a. Use crossing selection to select objects in drawing area
         b. Observe selection in Layer list based on object selection:

III. Right-click in Layer list
    a. Save Layer State
        i. New layer state name = *layer walk*
        ii. OK
IV. Select only *P_XS_Final Borrow*
V. Restore on exit = checked
    a. Close

2. **Ribbon > Home tab > Layers panel flyout > Layer State dropdown >** layer walk
    A. Layer Properties Manager
        I. Observe Layer On property restored based on *layer walk* Layer State

WisDOT layer tools & best practices

> Exercise files: acad-layr-prprtis-data-c3d16.zip
>
> Continue with acad-layr-prprtis-begin.dwg
>
> acad-layr-prprtis-07.mp4 3:40

Find tools to import WisDOT Layers and Layer States in the Ribbon WisDOT Standards tab. You might import all WisDOT Layers if a drawing is lacking standard WisDOT Layers either because the drawing was started from a template other than WisDOT design or if Layers have been Purged. Several pre-defined Layer States can also be imported to help with things like switching a drawing so Layer Plot Style properties work with the latest WisDOT Plot Style Table.

Two key best practices for working with Layers in Civil 3D are to always assign relevant object Layers (don't leave objects on Layer 0) and to never assign object the Defpoints Layer. Layer 0
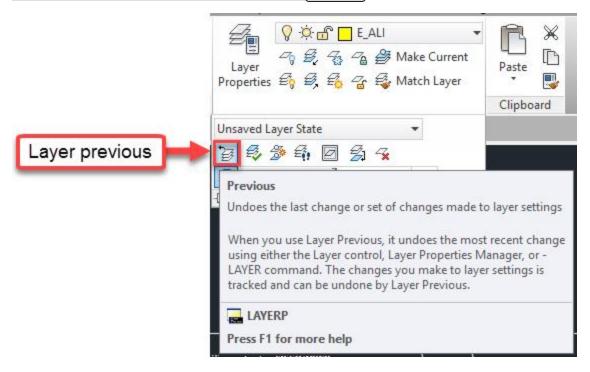
is unique in that it is used by many Civil 3D styles to inherit parent object Layers or used by AutoCAD Blocks so that objects within a Block are control by the overall Block object Layer. The Defpoints Layer is used by Civil 3D to track object geometry for things like Dimensions. Civil 3D objects will typically default to the appropriate Layer based on default Object Layers as covered in previous videos in this training module. Basic AutoCAD Layers for thing like preliminary or reference line work must be assigned correct Layers, however. AutoCAD Blocks and Dimensions will be covered in detail in later training modules

> ❌ **Warning:** Never leave objects on Layer 0 when finishing a drawing or workflow. Always assign or verify assignment of relevant Layers to objects created. Never place objects on the Defpoints Layer. The Defpoints Layer is used by Civil 3D to track object geometry for things like Dimensions. Placing objects on the Defpoints Layer will inevitably cause drawing corruption at some point.

1. Continue working in acad-layr-prprtis-begin.dwg
2. Layer Properties Manager
    A. Observe total number of Layers in drawing = 366
3. **Ribbon > WisDOT Standards tab > Standards Components panel >** Add Layers
    A. Observe total number of Layer in drawing = 669
4. **PURGE**
    A. enter
    B. Items not used in drawing:
        I. Layers
        II. Confirm each item to be purged = unchecked
        III. Purge
    C. Observe total number of Layers in drawing = 366
5. **Ribbon > WisDOT Standards tab > Plot Configuration panel >** Layer States
    A. **Layer State Tool Palette > Translate Layer States >** Load Layer State: Translate 2014 Layers to 2016 Standards
6. **Ribbon > Home tab > Layers panel flyout > Layer States dropdown >** Layer Translate 2014 to 2016
7. **Ribbon > Home tab > Layers panel >** Thaw all layers
    A. Observe all Layers turned on in Layer Properties Manager

8. **Ribbon > Home tab > Layers panel flyout > Previous**

💡 **Tip:** If you do not have a Layer State to restore to, but you made an unintentional change to one or more Layer properties, use the Layer Previous button to revert back to the previous setup of Layer properties. This is your "undo" button specific for Layers.

Blocks and external references

Last updated: 2017-12-01

Total video time: 60:11

Both Block References (aka Blocks) and External References (aka Xrefs) allow you to bring previously created, external objects into your Civil 3D drawing.

A Block is an object type that is made up of one or more other drawings objects. When objects are contained in a Block, they are easily inserted into any drawing to avoid duplicated work in assembling the various objects making up the Block. Blocks are typically used for Survey Point Markers, standard construction or plan details, plan set sheet text and typical plan-view linework. Blocks can be dynamics in that you have special control options for visibility or editing. They can also contain attributes, which are text objects whose content can be edited while locking down the text Style/Layer/etc.

You can think of an Xref as a view in a destination drawing back to a source drawing. In the destination drawing, the Xref source objects are protected from editing beyond Layer display control. Additionally, a source drawing can be Externally Referenced into multiple destination

drawings simultaneously. Whenever a change is made to an Xref source drawing, you are prompted in the destination drawing to update the Xref. In this way, the referenced source content is easily kept up to date and consistent throughout all destination drawings. Xrefs can be used in design drawings to see and reference linework or other objects for the purposes of design without actually having those reference objects in your current drawing. Another use for an Xref is for displaying existing conditions or other site objects needed on multiple plan sheets. If you only want to display certain objects from the Xref on certain plan sheets, you can accomplish this through Viewport Freezing Layer control. More detailed information on plan production will be covered in later training module.

Block creation basics

> Exercise files: acad-blk-xref-data-c3d16.zip
>
> Start with acad-blk-xref-begin.dwg
>
> acad-blk-xref-01.mp4 5:07

In this exercise, you will create a Block such that you have Layer control of the Block once created. You will do this by setting the objects making up the Block on Layer 0.
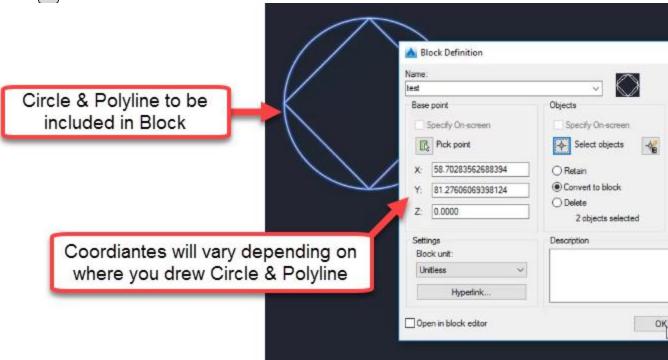
1. Open acad-blk-xref-begin.dwg
2. Set Current Layer = *0*
3. **Ribbon > Home tab > Draw panel**
   A. Draw a Circle
      I. Radius = 15±
   B. Draw a Polyline within the Circle
4. **Ribbon > Insert tab > Block panel > Create**
   A. Name = *test*
   B. Base Point
      I. Specify on-screen = unchecked
      II. Pick point
         a. Use Osnaps to specify center of Circle
   C. Settings
      I. Block unit = unitless
   D. Objects
      I. Specify on-screen = unchecked
      II. Convert to block = filled
      III. Select objects
         a. Select Circle and Polyline
         b. enter

E. Behavior
    I. Annotative = unchecked
    II. Scale uniformly = checked
    III. Allow exploding = checked
F. OK

Circle & Polyline to be included in Block

Coordiantes will vary depending on where you drew Circle & Polyline

5. Select *test* Block
    A. **Properties palette > General**
        I. Layer = *E_ALI_Marker*
        II. Observe Layer properties take effect

> **ⓘ Info:** In order to have Layer control of a Block Reference, the objects included in the Block must be placed on Layer 0. The Block itself can then be placed on any Layer as needed and the Layer properties will take effect.

Block creation continued, attributes & editing

Exercise files: acad-blk-xref-data-c3d16.zip

Continue with acad-blk-xref-begin.dwg

acad-blk-xref-02.mp4 5:24

In this exercise, you will create a Block such that you do not have Layer control, then edit the Block so that you do have Layer control. You will also learn how to add a Block Attribute, which

is a text object contained in the Block whose properties are protected and whose content value can be edited in a user-friendly interface. When you insert an Attributed Block into a drawing, you will be prompted to enter specific information for the attribute content. Block Attributes are a great way to ensure that necessary text information is entered and that it is in the correct format. In the process of completing this exercise, you will take an introductory look at the Block Editor interface.

1. Continue working in acad-blk-xref-begin.dwg
2. Current Layer = *E_ALI*
3. **Ribbon > Home tab > Draw panel**
   A. Draw a Circle
      I. Radius = 15±
   B. Draw a Polyline within the Circle
4. **BLOCK**
   A. enter
   B. Name = *test2*
   C. Base Point
      I. Pick point
         a. Use Osnaps to specify center of Circle
5. Objects
   A. Select objects
      I. Select Circle and Polyline
      II. enter
6. Select *test2* Block
   A. **Properties palette > General**
      I. Layer = *E_ALI_Marker*
      II. Observe Layer properties not taking effect
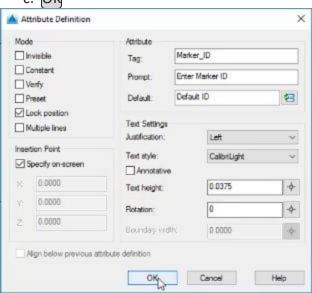
   > **ⓘ Info:** If a Block has been created such that you do not have Layer control, you can enter Block Editor and place the objects contained in the Block on Layer 0. Then you will have Layer control of the Block.

7. **Ribbon > Insert tab > Block panel > EDIT**
   A. Block to create or edit = *test2*
   B. OK
      I. Select Circle and Polyline
         a. **Properties > General**
            i. Layer = 0
      II. **Block Editor Ribbon > Close panel >** Close Block Editor
         a. Save the changes to test2
8. Observe Layer properties take effect
9. Select *test2* Block
   A. **Properties palette > General**
      I. Layer = *E_ALI*

10. Double-click *test2* Block
    A. Block to create or edit = *test2*
    B. OK
        I. **Block Editor Ribbon > Action Parameters panel > Attribute Definition**
            a. Attribute
                i. Tag = Marker_ID
                ii. Prompt = Enter Marker ID
                iii. Default = Default ID
            b. Text Settings
                i. Annotative = unchecked
                ii. Text Height = 1
            c. OK

        II. Specify insertion point of Attribute within Circle
    C. **Block Editor Ribbon > Close panel > Close Block Editor**
        I. Save the changes to test2
11. **Ribbon > Insert tab > Blocks panel flyout > Synchronize Attributes**
    A. **ENTER AN OPTION: SELECT**
    B. Select *test2* Block
    C. enter
12. Double-click *test2* Block
    A. **Enhanced Attribute Editor > Attribute tab**
        I. Value = 12345
        II. OK

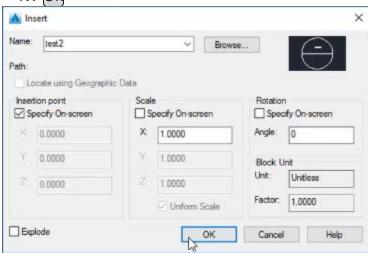*Insert from block definition & edit insertion point*

Exercise files: acad-blk-xref-data-c3d16.zip

Continue with acad-blk-xref-begin.dwg

acad-blk-xref-03.mp4 2:53

In this exercise you will learn to insert a Block from the definition stored in the current drawing. You will also learn two methods to reset a Block insertion point in Block Editor.

1. Continue with acad-blk-xref-begin.dwg
2. **Ribbon > Insert tab > Insert dropdown > More Options**
   A. Block to create or edit = *test2*
      I. Insertion point
         a. Specify on-screen = checked
      II. Scale
         a. Specify on-screen = unchecked
         b. X = 1
      III. Rotation
         a. Specify on-screen = unchecked
         b. Angle = 0
      IV. OK

3. Specify insertion point of *test2* Block near other drawing objects
   A. Edit Attributes
      I. Enter Marker ID = 6789
   B. OK
4. **BE**
   A. enter
   B. Block to create or edit = *test2*
      I. Select all objects in Block Editor drawing area
         a. **M**
         b. enter

II. Specify base point
   a. Select bottom of Circle using Osnap
III. Specify second point
   a. Verify Dynamic Input is off
   b. `0,0`
   c. `enter`
C. **Block Editor Ribbon > Close panel >** `Close Block Editor`
   I. Save the changes to test2
5. Select *test2* Block
   A. Observe Grip location at bottom of Circle
6. `BE`
   A. `enter`
   B. Block to create or edit = *test2*
   C. Block Editor Ribbon > Action Parameters panel > Parameters dropdown > Basepoint
      I. `SPECIFY PARAMETER LOCATION`
         a. Use Osnap to specify center of Circle
   D. **Block Editor Ribbon > Close panel >** `Close Block Editor`
      I. Save the changes to test2
7. Select *test2* Block
   A. Observe Grip location at center of Circle

Write block (WBLOCK)

> Exercise files: acad-blk-xref-data-c3d16.zip
>
> Continue with acad-blk-xref-begin.dwg
>
> acad-blk-xref-04.mp4 2:55

The WBLOCK command will write a Block Definition based on either existing Blocks or objects in the current drawing or the entire current drawing to a new, external drawing. This workflow is commonly used to write an entire drawing that has become corrupt to Block in order to leave behind those elements causing the corruption. This Block can then be inserted into a new drawing created from the appropriate template.

1. Continue with acad-blk-xref-begin.dwg
2. `WBLOCK`
   A. `enter`
   B. Source
      I. Entire drawing = checked

      C. Destination
         I. File name and path: `...`
            a. Browse to folder containing acad-blk-xref-begin.dwg
            b. File name = new block.dwg
            c. `Save`
      D. Insert units = unitless
      E. Include AutoCAD Map information in the export?
         I. `No`

3. **Ribbon > Insert tab > Insert >** `More Options`
      A. `Browse`
         I. Browse to new block.dwg
         II. `Open`
      B. Explode = unchecked
      C. `OK`

4. Specify insertion point near other drawing objects

> **ℹ Info:** When an entire drawing is written to a Block Definition using WBLOCK, the insertion point for the newly written Block will be at the same location relative to the newly written Block objects as the 0,0 coordinate in the original drawing was to the original drawing objects.

> **💡 Tip:** In the case where WBLOCK is used to insert an entire drawing into a blank drawing started from an appropriate template in order to leave behind corruption, the Insertion point: Specify on-screen option is typically unchecked. This way the objects in the original drawing and the Block inserted into the new drawing will be a the same coordinates. Additionally, the Explode option is typically checked. This way the newly inserted Block is automatically broken down to the level of the objects in the original drawing,

5. **X**
      A. `enter`
      B. `SELECT OBJECTS`
         I. Select *new block*
         II. `enter`

> **💡 Tip:** Another method to insert an entire drawing into another drawing is to drag and drop the DWG file from Windows File Explorer into the Civil 3D drawing area.

6. Windows File Explorer
      A. Browse to folder containing new block.dwg
      B. Select new block.dwg
         I. Drag and drop into Civil 3D drawing area

7. Specify insertion point near other drawing objects
   A. `ENTER X SCALE FACTOR <1>:`
      I. enter
   B. `ENTER Y SCALE FACTOR <USE X SCALE FACTOR>:`
      I. enter
   C. `SPECIFY ROTATION ANGLE <0>:`
      I. enter

Purged block definitions & WisDOT standards tab

Exercise files: acad-blk-xref-data-c3d16.zip

Start with acad-blk-xref-01.dwg

acad-blk-xref-05.mp4 5:26

In this video you will how it is possible to purge Block Definitions if they are not currently inserted into the drawing are or referenced by Civil 3D or AutoCAD Styles. You will then use the Add Marker Symbols tool located on the Ribbon WisDOT Standards tab to bring those Block Definitions back into the drawing. The Add Marker Symbols tool can be used to add the standard WisDOT Marker Blocks into any drawing regardless of whether that drawing ever had those Block Definitions or not.

1. Open acad-blk-xref-01.dwg
2. **Ribbon > Insert tab > Insert >** More Options
   A. Name = **AC**
   B. OK
3. Specify insertion point near other drawing objects
4. **Ribbon > WisDOT Standards tab > Standards Components panel >** Add Marker Symbols
5. **Ribbon > Insert tab > Insert >** More Options
   A. Name = **ZOR**
   B. OK
6. Specify insertion point near other drawing objects
7. Select all objects in drawing area
   A. delete
8. **Ribbon > Insert tab > Insert >** More Options
   A. Name dropdown
   B. Observe **ZOR**, **test**, **test2** and **new block** listed
   C. Cancel
9. **PURGE**
   A. enter
   B. Items not used in drawing
      I. select **Blocks**

      C. Purge
      D. Iterate steps 9.B - 9.C until no Blocks are listed
10. **Ribbon > Insert tab > Insert >** More Options
      A. Name dropdown
          I. Observe ***ZOR***, ***test***, ***test2*** and ***new block*** not listed
      B. Cancel
11. **Ribbon > WisDOT Standards tab > Standards Components panel >** Add Marker Symbols
12. **Ribbon > Insert tab > Insert >** More Options
      A. Name dropdown
          I. Observe ***ZOR*** listed
      B. Cancel

Design center: insert block

> Exercise files: acad-blk-xref-data-c3d16.zip
>
> Continue with acad-blk-xref-01.dwg
>
> acad-blk-xref-06.mp4 2:19
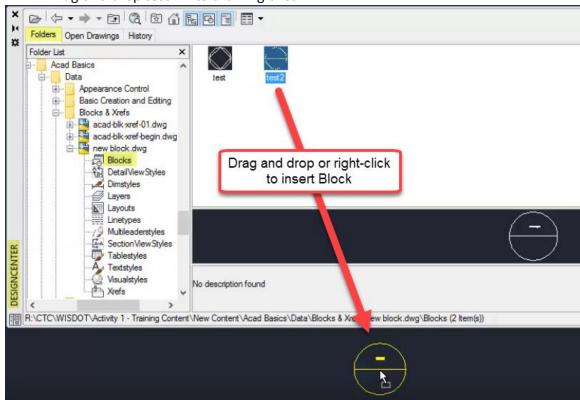
In this exercise you will explore options to insert a Block Definition from an external drawing when it is not available through the WisDOT contextual tabs. You can either insert an entire external drawing using the INSERT command or pick which Block(s) to insert from an external drawing using the Design Center interface.

1. Continue working in acad-blk-xref-01.dwg
2. **INSERT**
      A. enter
      B. Browse
          I. Browse to folder containing new block.dwg
          II. Select new block.dwg
          III. Open
      C. Specify insertion point anywhere in drawing area
3. **INSERT**
      A. enter
      B. Name dropdown
      C. Observe ***new block*** listed
      D. Cancel
4. Select ***new block***
      A. delete

5. **PURGE**
    A. enter
    B. Items not used in drawing
        I. select *Blocks*
    C. Purge
    D. Iterate steps 9.B - 9.C until no Blocks are listed
6. **Ribbon > Home tab > Palettes panel flyout > Design Center**
    A. **Folders tab > expand Folder list to new block.dwg**
        I. Select *Blocks*
        II. Drag and drop *test2* into drawing area

7. Edit Attributes
    A. OK

WisDOT sheets tab: topo tool palette

Exercise files: acad-blk-xref-data-c3d16.zip

Start with acad-blk-xref-02.dwg

acad-blk-xref-07.mp4 4:23

The topography Blocks used as Point Markers in Civil 3D Point Styles can be found and inserted directly as Blocks into any drawing through the WisDOT Topo Tool Palette, which is found on

the WisDOT Sheets contextual Ribbon. The Blocks inserted from these Tool Palettes are defined in external source drawings that install with the WisDOT Standards package.

1. Open acad-blk-xref-02.dwg
2. **Ribbon > WisDOT Sheets**
   A. **Sheet Creation Components panel >** Topo
   B. **Tools panel >** Palettes ON/OFF
      I. **Topo Tool Palette > BuildingFencesTrees tab**
         a. Tree Stump
            i. Specify insertion point near other drawing objects
3. Select *STMP* Block
   A. **Properties palette > General**
      I. Layer = *E_LAND_Vegetation*
4. Select *STMP* Block
5. **Ribbon > Home tab > Layers >** Make Current

> **ⓘ Info:** The Blocks included on the Topo Tool Palette are also included as Block Definitions in most of the WisDOT templates. They are referenced as Point Markers in Civil 3D Point Styles which are also included in the WisDOT templates. More detailed information on Civil 3D Point Styles and Markers can be found in the Points training module.

Automatic scaling: block units & insertion units

> Exercise files: acad-blk-xref-data-c3d16.zip
>
> Continue with acad-blk-xref-02.dwg
>
> acad-blk-xref-08.mp4 5:44
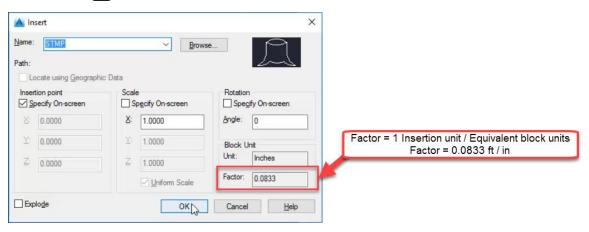
When a Block is inserted into a drawing it will be automatically scaled by a factor based on the drawing Insertion Units and the individual Block Units. The scale factor applied to a Block upon insertion will represent the Block in terms of the drawing Insertion Units. For example, a Block with Block Units of "inches" and a length magnitude of 24 that is inserted into a drawing with Insertion Units of "feet" will be scaled by a factor of 1/12 and will be have a length magnitude of 2 after insertion. Both the Insertion Units and the Block Units must be set to a value other than "unitless" in order for this form of automatic scaling to take place. If either is set to unitless in the source drawing, the Block will come in with the same length quantity as that in the source drawing.

> **ⓘ Info:** Note that automatic Block scaling is not Annotative scaling, which will be covered in later training modules.

1. Continue working in acad-blk-xref-02.dwg
2. Select **_STMP_** Block
3. Properties palette > Misc
   A. Observe Block Unit = Unitless
   B. Observe that this field is not editable here
4. **BE**
   A. enter
   B. Block to create or edit = **_STMP_**
   C. OK
   D. Properties palette > Block
      I. Units = Inches
   E. **Block Editor Ribbon > Close panel > Close Block Editor**
      I. Save the changes to STMP
5. **INSERT**
   A. Name = **_STMP_**
   B. OK

6. Specify insertion point near other objects
   A. Observe automatic scaling
7. Topo Tool Palette > BuildingFencesTrees tab
   A. Tree Stump
      I. Specify insertion point near other objects
      II. Observe lack of automatic scaling
8. When a Block is inserted from an external Block Definition, such as the source drawing used by the WisDOT Topo Tool Palette, the Block will scale based on the units in that external source drawing even if the Block Definition in the current drawing has been edited to have different Block units. To avoid this, the Block Definition in the source drawing would need to be edited.

> ⊗ **Warning:** The Blocks included in the WisDOT Tool Palettes and various Templates should not be edited by the end user. This training module exer-

⊗ is intended to teach you general Block behavior. You may need to edit Blocks coming from outside of WisDOT, however.

9. Select **STMP** Block inserted in step 7.B
    A. Properties palette
        I. Geometry
            a. Observe Scale = 12
        II. Misc
            a. Observe Block unit = Inches
10. Topo Tool Palette > BuildingFencesTrees tab
    A. Right-click Tree Stump
    B. Redefine
11. Select **STMP** Block inserted in step 7.B
    A. Properties palette
        I. Geometry
            a. Observe Scale = 1
        II. Misc
            a. Observe Block unit = unitless
12. Select all instances of **STMP** Block
    A. Properties palette > Geometry
        I. Scale = 1

Automatic scaling: redefine block from design center

> Exercise files: acad-blk-xref-data-c3d16.zip
>
> Continue with acad-blk-xref-02.dwg
>
> acad-blk-xref-09.mp4 4:16

The Blocks included on the WisDOT Tool Palettes can be redefined in a drawing by right-clicking on the corresponding Tool Palette button and choosing Redefine. For those Blocks not included on the WisDOT Tool Palettes, you can redefine the drawing Block Definition by browsing to the source drawing through Design Center. This exercise goes through the workflow to redefine a Block through Design Center.

1. Continue with acad-blk-xref-02.dwg
2. Select **test2** Block
3. **BE**
    A. enter
    B. Block to create or edit = **test2**
    C. OK

4. Properties palette > Block
   A. Units = Inches
   B. **Block Editor Ribbon > Close panel >** Close Block Editor
      I. Save the changes to test2
5. Insert
   A. Name = **test2**
   B. OK
   C. Specify insertion point near other drawing objects
      I. Edit Attributes
      II. OK
6. **DC**
   A. enter
   B. Folders
      I. Browse to new block.dwg
         a. Blocks
            i. Drag & drop **test2** into drawing area
            ii. Edit Attributes
            iii. OK
7. Properties palette
   A. Geometry
      I. Observe Scale = 12

> **Info:** In order to Insert a Block from an external source, such as through a Design Center, and have that external Block Definition update that in the current drawing, the Block in the external source drawing must be edited. Then you can browse to that Block in the external source through Design Center and redefine any instances of that Block Definition in the current drawing. This is the same functionality that is found by right-clicking a WisDOT Tool Palette button and choosing Redefine, but it applies to any Block even if it is not included in the WisDOT Tool Palette.

8. Open new block.dwg
9. **BE**
   A. enter
   B. Block to create or edit = **test2**
   C. OK
10. Properties palette > Block
    A. Units = Inches
    B. **Block Editor Ribbon > Close panel >** Close Block Editor
       I. Save the changes to test2
11. Application menu > SaveAs
    A. File name = new block1.dwg
    B. Save

12. **DC**
    A. enter
    B. Folders
        I. Browse to new block 1.dwg
           a. Blocks
           b. right-click *test2*
              i. Redfine only
13. Select all instances of *test2* Block
    A. Properties palette > Geometry
        I. Scale = 1

WisDOT sheets tab: signs tool palette

> Exercise files: acad-blk-xref-data-c3d16.zip
>
> Start with acad-blk-xref-03.dwg
>
> acad-blk-xref-10.mp4 3:23
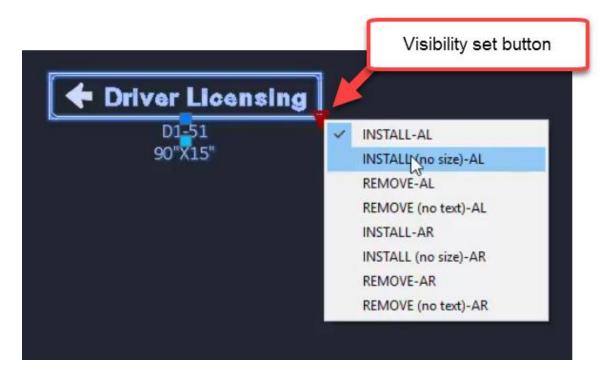
This exercise will walk you through the unique features included in the WisDOT Signs Tool Palette. The Blocks included on this tool palette represent the WisDOT standard signage details. These Dynamic Blocks include the ability to choose a version of each block from a dropdown list (Visibility Set) as well as a hyperlink to quickly view the associated WisDOT standard detail sheets.

1. Open acad-blk-xref-03.dwg
2. **Ribbon > WisDOT Sheets tab > Sheet Creation Components panel > Signs**
    A. D-Signs tab
        I. D1-51
           a. Specify insertion point anywhere in drawing area
3. Select *D1-51* Block
    A. Visibility set dropdown
    B. Choose alternative Visibilty from list
    C. esc

4. Double-click **D1-51**Block
   A. Enhanced Attribute Editor
      I. Select SIZE row
      II. Value = 120"X15"
      III. Observe update to **D1-51** Block in drawing area
   B. OK
5. Ctrl+click **D1-51** Block
   A. Observe web browser open the WisDOT signage detail D1-51.pdf

WisDOT design tab: intersections, beam guards & general blocks

Exercise files: acad-blk-xref-data-c3d16.zip

Continue with acad-blk-xref-03.dwg

acad-blk-xref-11.mp4 4:37

The WisDOT Intersection Blocks and Beam Guard Tool Palattes contain dynamic Blocks which include easily editable linework to get started with your geometric layout. Insert these Blocks and use the Properties palette or dynamic Block grips to edit the linework. The WisDOT Design Ribbon tab also includes the Autodesk Palettes button. This will populate your Tool Palette with all of the default Autodesk Tool Palette tabs. Some of these default Tool Palette tabs contain default Autodesk Blocks that could potentially be useful to convey your design intentions.

1. Continue working in acad-blk-xref-03.dwg
2. **Ribbon > WisDOT Design > Parametric Design panel >** Intersection Blocks
   A. Int-Type-A-Q-Grtr-80-In-Curve
   B. Specify insertion point near other drawing objects
3. Select *Int-Type-A-Q-Grtr-80-In-Curve* Block
   A. Select Grip along incoming intersection centerline
      I. Specify point location for centerline
   B. Select Visibility Set dropdown
      I. Graphics Mode = checked
   C. **Properties palette > Custom**
      I. Observe editable parameters in tabulated form
   D. esc
4. **Ribbon > WisDOT Design > Parametric Design panel >** Beam Guard
   A. BG EAT R Right Curve
   B. Specify insertion point near other drawing objects
5. Select *BG EAT R Right Curve* Block
   A. Observe grips to edit linework geometry
   B. **Properties palette > Custom**
      I. Observe editable parameters in tabulated form
   C. esc
6. **Ribbon > WisDOT Design > Autodesk panel >** Autodesk Palettes
   A. Left-click "stacked" tabs at bottom of Tool Palette
   B. Scroll down in list
      I. Highways
         a. Scroll to explore available out-of-the-box Blocks
      II. External Works
         a. Scroll to explore available out-of-the-box Blocks

Xref: overlay vs attach

Exercise files: acad-blk-xref-data-c3d16.zip
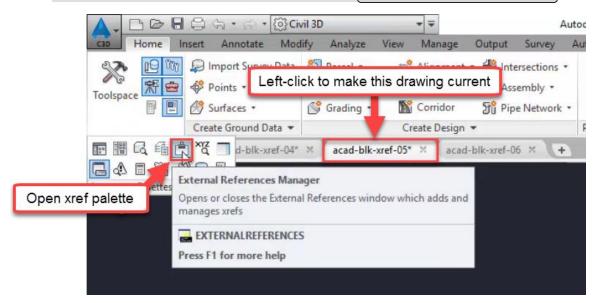
Start with acad-blk-xref-04.dwg, acad-blk-xref-05.dwg and acad-blk-xref-06.dwg

acad-blk-xref-12.mp4 5:56

This exercise will introduce you to the External Referencing (Xref) workflow. You will create an Overlay Xref then change it to an Attach Xref and observe behavioral differences between the two. When an Xref is created as the type "Overlay", the Externally Referenced source drawing will not be carried forward if the destination drawing is then Externally Referenced into another drawing. When an Xref is created as the type "Attach", the Externally Referenced source drawing will be carried forward.
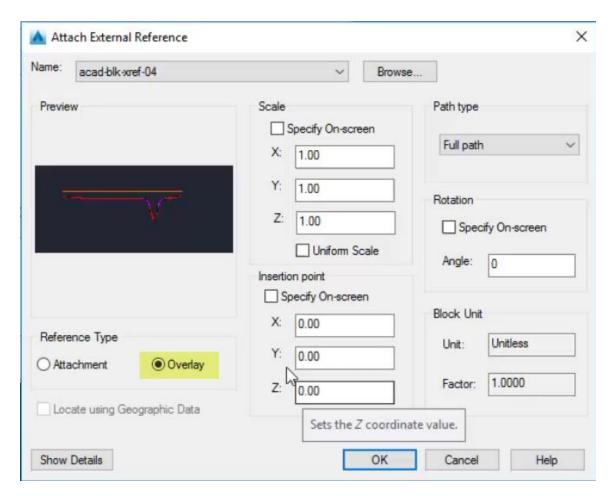
1. Open acad-blk-xref-04.dwg, acad-blk-xref-05.dwg and acad-blk-xref-06.dwg
2. **File tab >** acad-blk-xref-05
3. **Ribbon > Home tab > Palettes panel flyout >** External References Manager

4. **External References palette > Attach dropdown >** Attach DWG
   A. Browse to acad-blk-xref-04.dwg
      I. Open
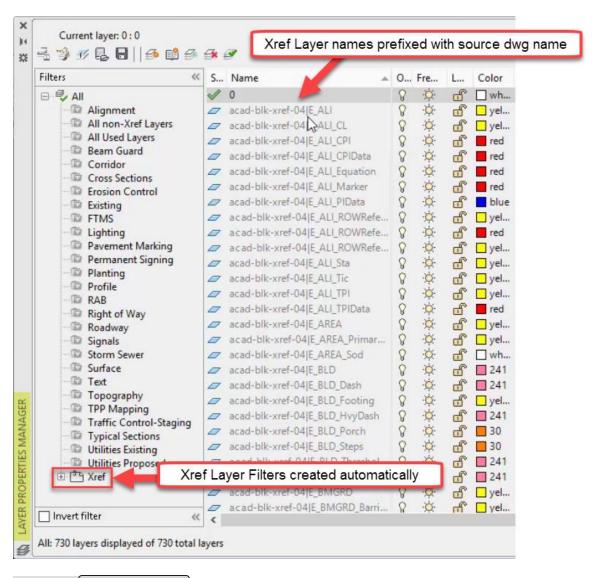5. Attach External Reference
   A. Reference Type = Overlay
   B. OK

6. **Ribbon > Home tab > Layers panel > Layer Properties**
    A. Observe presence of Xref Layer Filters and Xref Layers

7. **File tab > acad-blk-xref-06**
8. **XR**
   A. enter
9. **External References palette > Attach dropdown > Attach DWG**
   A. Browse to acad-blk-xref-05.dwg
      I. Open

> **Info:**
> When acad-blk-xref-05.dwg is externally referenced into acad-blk-xref-06.dwg, no objects are displayed in acad-blk-xref-06.dwg. This is because the objects displayed in acad-blk-xref-05.dwg are only an "Overlay" xref of acad-blk-xref-04.dwg. "Overlay" xrefs are not carried forward when their destination drawing is then used as an xref source drawing in another drawing. "Attach" xrefs are carried forward in this manner, however.
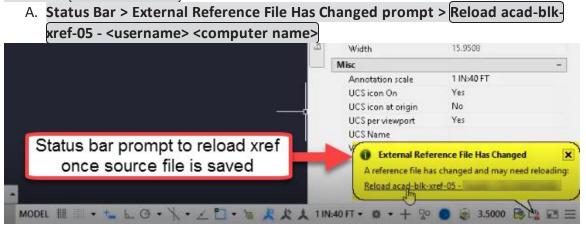
> **ⓘ** When acad-blk-xref-05.dwg is externally referenced into acad-blk-xref-06.dwg, xref Layers prefixed with acad-blk-xref-05 are created and are similar to the Layers in acad-blk-xref-04.dwg. This is because both acad-blk-xref-04.dwg and acad-blk-xref-05.dwg were started from the same template (wisdot16.dwt) and this template includes all of those Layers.

10. **File tab >** acad-blk-xref-05
11. **XR**
    A. enter
12. **External References palette > right-click** acad-blk-xref-04
    A. Xref Type = Attach
13. Save acad-blk-xref-05.dwg
14. **File tab >** acad-blk-xref-06
    A. **Status Bar > External Reference File Has Changed prompt >** Reload acad-blk-xref-05 - <username> <computer name>

Xref source path: full vs relative

> Exercise files: acad-blk-xref-data-c3d16.zip
>
> Continue with acad-blk-xref-04.dwg, acad-blk-xref-05.dwg and acad-blk-xref-06.dwg
>
> acad-blk-xref-13.mp4 4:00

You have three options to specify how the Xref file path relationship between the source drawing and destination drawing is defined. A Full Path Xref requires that the source drawing exist at the exact drive location called out in the destination drawing when the Xref was created. If not, the Xref source file will not be read and a notification will be displayed. A Relative Path Xref requires that the source drawing exist at the same folder hierarchy location relative to the destination drawing. In other words, the source and destination drawings must be the same number of folders away from each other in order for the Xref source drawing to be read. There is also a No Path option which requires that the path to the source drawing be included in the Civil

3D profile options support file search path list. This No Path Xref type is less common and will not be covered in this exercise.

1. Continue working in acad-blk-xref-04.dwg, acad-blk-xref-05.dwg and acad-blk-xref-06.dwg
2. **XR**
   A. enter
   B. Observe full path displayed in acad-blk-xref-04 row, Saved Path column
3. **File tab > Close acad-blk-xref-04**
4. Windows File Explorer
   A. Browse to acad-blk-xref-04.dwg
   B. Move acad-blk-xref-04.dwg into xref folder
5. **External References palette > right-click acad-blk-xref-04**
   A. Reload
   B. Observe "Not Found" displayed in acad-blk-xref-04 row, Status column
6. Windows File Explorer
   A. Browse to acad-blk-xref-04.dwg
   B. Move acad-blk-xref-04.dwg to location displayed in Saved Path column of External References palette
7. **External References palette > right-click acad-blk-xref-04**
   A. Reload
   B. Observe "Loaded" displayed in acad-blk-xref-04 row, Status column
   C. Right-click acad-blk-xref-04
      I. Make Relative
      II. Observe partial file path displayed in acad-blk-xref-04 row, Saved Path column
8. Save acad-blk-xref-05.dwg
9. **File tab > Close acad-blk-xref-05**
10. Windows File Explorer
    A. Browse to acad-blk-xref-04.dwg
    B. Move acad-blk-xref-04.dwg and acad-blk-xref-05.dwg into xref folder
11. Open acad-blk-xref-05.dwg
12. External References palette
    A. Observe "Loaded" displayed in acad-blk-xref-04 row, Status column

Bind xref

Exercise files: acad-blk-xref-data-c3d16.zip

Start with acad-blk-xref-07.dwg

acad-blk-xref-14.mp4 3:48

Once an Xref is created in a drawing, you can insert the source objects, styles, Block Definitions and Layers through the BIND command. This will insert the source drawing content and create or merge similar content (ie similarly named Layers or Blocks) depending on the type of Bind you specify. In this exercise, you will Bind an Xref using both types of the Bind command and observe behavioral differences between the two.
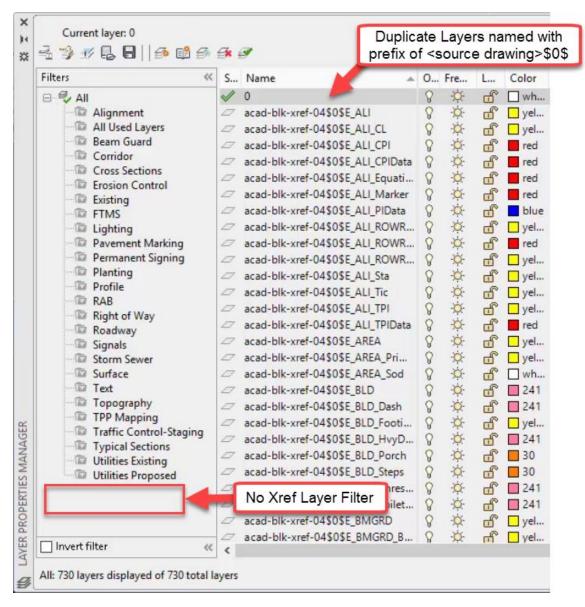
1. Open acad-blk-xref-07.dwg
2. **XR**
   A. enter
   B. Browse to acad-blk-xref-04.dwg
   C. Open
3. Add External Reference
   A. OK
4. External References palette > Right-click acad-blk-xref-04
   A. Bind
   B. Bind Xrefs/DGN underlays
      I. Bind Type = Bind
      II. OK

   > **ⓘ Info:** When you Bind an Xref using the type Bind, any content in the source drawing similarly named in the destination drawing will be duplicated. That duplicated content will be named with a prefix based on the source drawing name. When you Bind using the type Insert, any content in the source drawing similarly named in the destination drawing will be merged. The version of that similar content in the destination drawing will be used.

5. Select all drawing objects
   A. Properties
      I. Observe selected object is a Block Reference
      II. Misc
         a. Observe name = *acad-blk-xref-04*
6. **Ribbon > Home tab > Layers panel > Layer Properties**
   A. Observe duplicate Layer naming convention

7. **Quick Access toolbar > Undo dropdown > External References**
8. **XR**
   A. enter
9. **External References palette > Right-click acad-blk-xref-04**
   A. Bind
   B. Bind Xrefs/DGN underlays
      I. Bind Type = Insert
      II. OK
10. Select *acad-blk-xref-04* Block
11. **Ribbon > Home tab > Layers panel > Layer Properties**
    A. Observe no duplicate Layers created

Annotation

Last updated: 2017-11-28

Total video time: 40:14

This section will cover annotation tools used to add notes and callouts to a drawing. We will go over AutoCAD tools to create Multiline Text (text-only notes), Multileaders (callouts with text and pointer), and Dimensions as well as their associated styles. It should be noted that any Civil 3D objects have their own Label Styles which can automatically label key design features and dynamically update based on changes to associated Civil 3D objects. These Civil 3D Labels Styles should always be used where possible as they reduce the potential for human error and eliminate tedious, manual annotation work. The annotation tools covered in this section are typically reserved for cases where Civil 3D Label Styles are not applicable. For example, they can be used for things like construction details, title sheets, and plan sheet borders.

Multiline text

Exercise files: acad-annotatn-data-c3d16.zip

Start with acad-annotatn-begin.dwg

acad-annotatn-01.mp4 7:01

Multiline text is the preferred method in Civil 3D for typing or inserting general notes.

1. Open acad-annotatn-begin.dwg
2. **Ribbon > Annotate tab > Text panel > Multiline text**
   A. `SPECIFY FIRST CORNER:`
      I. Use Osnaps to pick upper left corner of title block box
   B. `SPECIFY OPPOSITE CORNER:`
      I. Use Osnaps to pick lower right corner of title block box
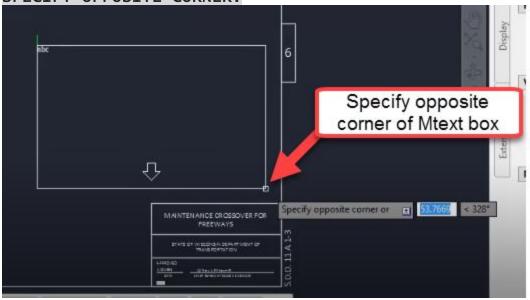
Specify first corner of Mtext box

    C. Type *notes* in Mtext box

    D. Open maintainence crossover.txt in Notepad

        I. Copy text content

    E. Paste text content into Mtext box

3. Select previously created Mtext with single click

    A. Observe insertion, column height and column width Grips displayed

    B. esc

4. Double click previously created Mtext

    A. Observe Mtext contextual Ribbon displayed

    B. Mtext Ribbon

        I. **Formatting panel > Text style dropdown**

            a. Choose alternative Text style

            b. Set back to ***Callibri Light***

        II. **Style panel > Text height field**

            a. Key in new Text height

            b. Set back to 0.1000

        III. **Paragraph panel > Justification dropdown**

            a. Choose Middle Center

    C. Left-click outside Mtext editing box

5. Select Mtext object

    A. Use Geometric Center Osnap to place insertion point at centroid of title block area

    B. esc

6. **Ribbon > Annotate tab > Text panel > Multiline Text**

    A. `SPECIFY FIRST CORNER:`

        I. Pick lower endpoint of green guiding Line

B. **SPECIFY OPPOSITE CORNER:**

C. Type *general notes* into Mtext box
D. Highlight *general notes* text content
E. **Mtext Ribbon > Formatting panel > Change case dropdown**
    I. Uppercase
F. **Mtext Ribbon > Tools panel flyout >** Import text
    I. Browse to general notes.txt
    II. Open
G. Select part of the Mtext content
H. **Mtext Ribbon**
    I. **Formatting panel > Text style dropdown**
        a. Change Text style
    II. **Style panel > Text height field**
        a. Change Text height
    III. **Formatting panel >** Match
        a. Highlight Text content with source formatting
        b. Highlight Text content for which to apply formatting
    IV. Highlight entire Mtext content
        a. **Style panel > Text height field**
            i. Text height = 0.1250
    V. **Insert panel > Columns dropdown >** No Columns
        a. Right click top of Mext box
            i. Set Mtext width = 38
            ii. OK
I. Left-click outside Mtext box to finish editing

Text editing & legacy text

Exercise files: acad-annotatn-data-c3d16.zip

Continue with acad-annotatn-begin.dwg

acad-annotatn-02.mp4 5:20
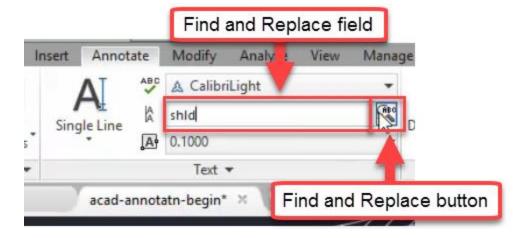
In this exercise, you will learn some time-saving text editing functions including Change Case, Convert to Mtext, Text Align, Match Properties, Check Spelling, and Find/ Replace as well as the differences between Multiline Text (Mtext) and Text (aka Dtext). Essentially, Text is the old version of Mtext. Where Mtext can have multiple lines of text content sorted into columns and rows as desired, Text is single line and has no column sorting ability built in. You can type mulitple lines of text content in a Text object, but each line will result in its own individual Text object. There is much less editing ability with Text vs Mtext and no associated contextual Ribbon. All that said, many older draw-ings or Civil 3D drawings with content imported from Microstation will contain the older legacy Text.

1. Continue working in acad-annotatn-begin.dwg
2. **Ribbon > Annotate tab > Text panel > Multiline text dropdown >** Single line
   A. SPECIFY START POINT OF TEXT OR
      I. Pick bottom endpoint of the green Line above SECTION B-B detail
   B. SPECIFY PAPER HEIGHT <0.1000>
      I. enter
   C. SPECIFY ROTATION ANGLE OF TEXT <0>
      I. enter
   D. Type *section a-a*
      I. Left-click outside of Text object
      II. esc
3. Select *section a-a* Text
   A. **Right click > Change Case >** UPPERCASE
4. Type MA to initiate the match properties command
   A. enter
   B. SELECT SOURCE OBJECT
      I. Left click *SECTION B-B* Text
   C. SELECT DESTINATION OBJECT
      I. Left click *SECTION A-A* Text
5. Select *SECTION A-A* Text
   A. **Properties palette > Text**
      I. Justify = Center
6. **Ribbon > Express tools tab > Text panel >** Convert to Mtext
   A. SELECT OBJECTS
      I. Select *STATE OF WISCONSIN DEPARTMENT OF* Text
      II. Select *TRANSPORTATION* Text
      III. enter

7. Select ***STATE OF WISCONSIN DEPARTMENT OF TRANSPORTATION*** Mtext
   A. **Properties palette > Text**
      I. Justify = Middle Center
      II. esc
8. **Ribbon > Annotate tab > Text panel > Text Align**
   A. SELECT TEXT OBJECTS TO ALIGN
      I. ***SECTION B-B*** Text
      II. ***SECTION A-A*** Text
      III. enter
      IV. SELECT TEXT OBJECT TO ALIGN TO
         a. ***SECTION A-A*** Text
         b. PICK SECOND POINT
            i. shift + left click below ***SECTION A-A*** Text
9. **Ribbon > Annotate tab > Text panel > Check Spelling**
   A. Start
   B. Add to Dictionary
   C. Close
10. **Ribbon > Annotate tab > Text panel**
    A. Find and Replace field: shld
    B. Find and Replace
       I. Replace with: SHOULDER
       II. Replace All
       III. Done

Text Styles

Exercise files: acad-annotatn-data-c3d16.zip
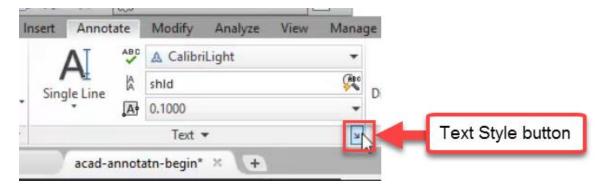
Continue with acad-annotatn-begin.dwg

acad-blk-xref-03.mp4 3:35
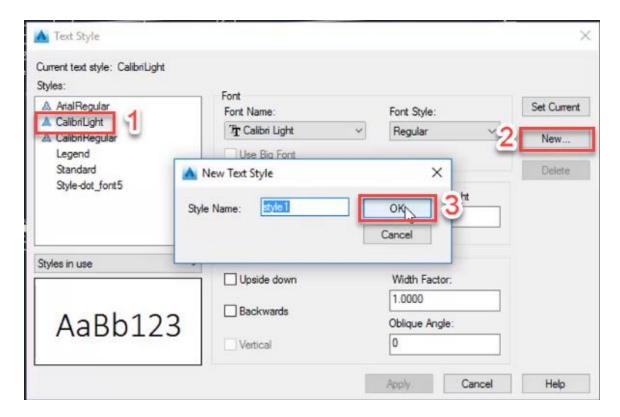
Whenever creating either Mtext or Text, the first step is to choose a Text Style. You pick this from a dropdown list on your Ribbon. As with other Civil 3D and AutoCAD Styles, the Text Styles available are associated with a drawing or template. The WisDOT Design templates come with the standard WisDOT Text Styles pre-loaded, though you may need to create or edit one when working with a drawing not created from the WisDOT template. A Text Style mainly controls font, text height, and annotative scaling functionality. In the following exercise you will learn how to interface with, edit and create a Text Style.

1. Continue with acad-annotatn-begin.dwg
2. **Ribbon > Annotate tab >** Text Style

3. Current Text Style: Callibri Light
4. New
    A. Style Name: style 1
    B. OK
        I. Font Name: Cambria
        II. Font Style: Regular
        III. Paper Text Height = 0.0000

> **Info:** When Paper Text Height = 0 in a Text Style, the height set in the TEXTSIZE system variable or the last Text Height used is applied.

        IV. Font Name: cdm.shx

> **Info:** Two basic font types can be used in Civil 3D. They are True Type or SHX. Where True Type fonts such as Arial and Callibiri can have unique shapes and thickness, the older, SHX fonts are only one pixel wide and are more limited in styling options. WisDOT Text Styles as well as most design firms and software applications in general use True Type fonts. Note the different icons in the Font Name dropdown.

Multileader creation

Exercise files: acad-annotatn-data-c3d16.zip

Start with acad-annotatn-01.dwg

acad-annotatn-04.mp4 4:05
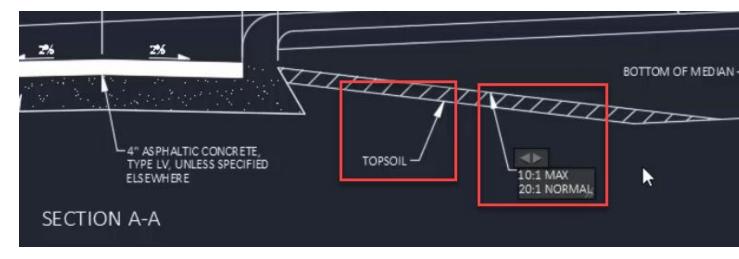
A Multileader (aka Mleader) is an annotation object consisting of a combination of a text and one or more leader/pointers. It is used to manually add notes pointing to a specific area of interest. The text portion behaves just like Mtext and the leader portion is dynamically attached to the text portion. The behavior of an Mleader is quite flexible. For instance, you can add multiple leaders on one or both sides of the text portion of an Mleader if you like. A typical use case for an Mleader would be for manual annotation of construction details or title sheets. In the following exercise, you will learn how to create and edit Mleaders.

Keep in mind that Civil 3D objects have their own automatically generated Civil 3D Labels that will automatically annotate key information like Alignment stationing, Points of Curvature/Tangency, PVIs, Corridor Cross Section information, etc and thus do not require manually created Mleaders for annotation. More information on Civil 3D Label Styles will be covered in other training modules. Use of Mleaders should be reserved for cases where you are either not deal-

ing with a Civil 3D object or need to add extra information not feasible to put into a Civil 3D Label.

1. Open acad-annotatn-01.dwg
2. Select ***BOTTOM OF MEDIAN*** Mleader on right of SECTION A-A detail
    A. Double-click on the text portion
    B. Observe Mtext contextual Ribbon populated
    C. Left-click away from Mleader
3. **Ribbon > Annotate tab > Leaders panel > Multileader**
    A. `SPECIFY LEADER ARROWHEAD LOCATION`
        I. Use Nearest Osnap to pick bottom of TOPSOIL Line on right side of SECTION A-A detail
    B. `SPECIFY LEADER LANDING LOCATION`
        I. Pick below and left of arrowhead location
    C. Type TOPSOIL
        I. Left-click away from Mleader
4. Repeat Steps 3.A - 3.C for ***10:1 MAX 20:1 NORMAL*** Mleader

5. Select ***TOPSOIL*** Mleader
    A. Select arrow Grip
        I. `SPECIFY STRETCH POINT`
            a. Pick to left of TOPSOIL text portion

> ⓘ **Info:** Note that the Leader portion of the Mleader is dynamically attached to the text portion. Once the specified location of the Leader arrow crosses the middle of the text portion, the Leader landing will automatically flip to the other side of the text.

    B. Select text insertion Grip
        I. `SPECIFY STRETCH POINT`
            a. Left-click a new location

C. Hover cursor over Leader landing Grip
   I. Lengthen landing
      a. **SPECIFY LEADER LANDING ENDPOINT**
         i. Left-click new location
   II. Add Leader
      a. **SPECIFY LEADER ARROWHEAD LOCATION**
         i. Left-click multiple new locations
D. Hover cursor over arrow Grip
   I. Remove Leader
E. **Ribbon > Annotate tab > Leaders panel > Remove Leader**
   I. **SPECIFY LEADERS TO REMOVE**
      a. Select Leader
      b. enter
F. **Ribbon > Annotate tab > Leaders panel > Align**
   I. **SELECT MULTILEADERS**
      a. Select *TOPSOIL* and *10:1 MAX 20:1 NORMAL* Mleaders
      b. enter
   II. **SELECT MULTILIEADER TO ALIGN TO**
      a. Select *10:1 MAX 20:1 NORMAL* Mleader
   III. **SPECIFY DIRECTION**
      a. shift + left-click left of *10:1 MAX 20:1 NORMAL* Mleader

Multileader styles

Exercise files: acad-annotatn-data-c3d16.zip
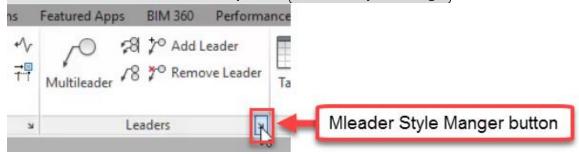
Continue with acad-annotatn-01.dwg

acad-annotatn-05.mp4 7:04
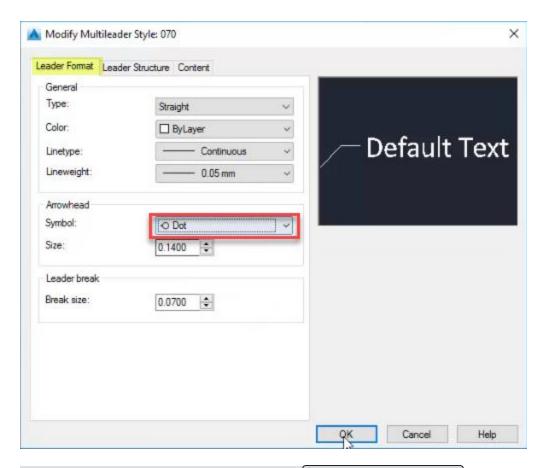
Whenever creating an Mleader, you want to be aware of the currently set Mleader Style. You set this through the Ribbon Mleader Style Manager button. Mleader Styles control what Text Style is used for the Text portion, what the Leader and arrow portion looks like, whether a user-defined Block is used for either the arrow or in place of the text, and whether the Mleader is affected by Annotative Scaling among other things. Through the following exercise, you will learn how to set the current Mleader Style, how to create or edit an Mleader Style, and what key Mleader parameters are set through the Mleader Style. The WisDOT templates come pre-loaded with standard WisDOT Mleader Styles and as with other Civil 3D or AutoCAD Styles, these should be used to streamline the plan production workflow and maintain a standard appearance across WisDOT plan sets.

1. Continue working in acad-annotatn-01.dwg
2. Select *TOPSOIL* Mleader
   A. **Properties palette > Misc**
      I. Observe Multileader style = 070
3. **Ribbon > Annotate tab > Leaders panel > Mleader Style Manager**

   A. Current mulitleader style: 070
   B. Modify
   C. Leader Format tab
      I. General
         a. Type = Straight
      II. Arrowhead
         a. Symbol = Dot
      III. OK
   D. Close
   E. Observe update to existing Mleaders with 070 Mleader Style
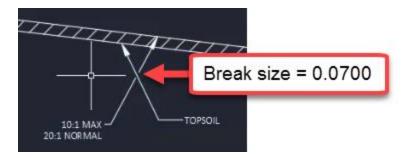
4. **Ribbon > Annotate tab > Leaders panel > Mleader Style Manager**
   - A. Modify
   - B. Leader Format tab
     - I. Arrowhead
       - a. Symbol = Closed filled
     - II. Leader break
       - a. Break size = 0.0700
     - III. OK
   - C. Close
5. Select *TOPSOIL* and *10:1 MAX 20:1 NORMAL* Mleaders
   - A. Use Mleader Grips to relocate Leader landings such that Leader lines cross
6. **Ribbon > Annotate tab > Dimensions panel > Break**
   - A. **SELECT DIMENSION TO ADD/REMOVE BREAK**
     - I. Select *10:1 MAX 20:1 NORMAL* Mleader
   - B. Select object to break dimension
     - I. Select TOPSOIL Mleader
     - II. enter

> 💡 **Tip:** The "object to break dimension" does not need to be an Mleader or Dimension. This could be most any Civil 3D or AutoCAD object

Break size = 0.0700

10:1 MAX
20:1 NORMAL — TOPSOIL
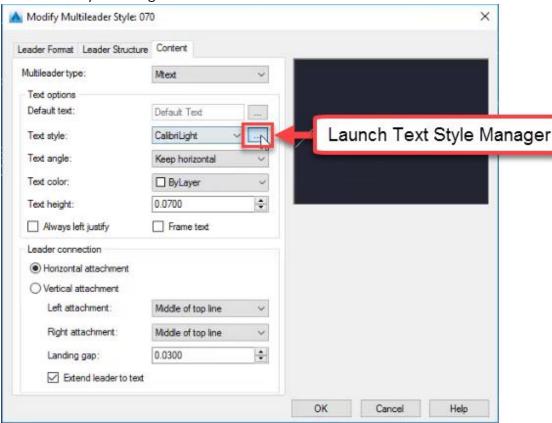
7. **Ribbon > Annotate tab > Leaders panel > Mleader Style Manager**
   A. Modify
   B. Leader Structure tab
      I. Constraints
         a. Maximum leader points = 2

   > ℹ️ **Info:** Setting Maximum leader points = 3 or greater means you will be prompted for intermediate vertex points between the arrowhead and Leader landing when creating an Mleader. If Maximum leader points = 2, you can still place additional Leader vertices manually by hovering your cursor over an Mleader arrowhead Grip and choosing Add vertex.

      I. Landing settings
         a. Automatically include landing = unchecked
         b. Observe effect in preview window
         c. Automatically include landing = checked
      II. Scale
         a. Annotative = checked
   C. Content tab
      I. Multileader type = Block
         a. Block options
            i. Source block = Detail Callout
      II. OK
   D. Close
8. **Ribbon > Annotate tab > Leaders panel > Multileader**
   A. `SPECIFY LEADER ARROWHEAD LOCATION`
      I. Pick any location
   B. `SPECIFY LEADER LANDING LOCATION`
      I. Pick any location
   C. Edit Attributes
      I. Enter view number = 1
      II. Enter sheet number = 2
   D. OK

9. **Ribbon > Annotate tab > Leaders panel > Mleader Style Manager**
   A. Content tab
      I. Multileader type = Block
         a. Block options
            i. Source block = User Block
            ii. Observe ability to pick any Block Definition in the current drawing
            iii. Cancel
      II. Multileader type = Mtext
         a. Text options
            i. Text Style = Calibri Light
            ii. Text Style Manager

            i. Cancel
         b. Leader connection
            i. Observe options affecting Horizontal, Vertical Leader landing attachment

Dimension creation

Exercise files: acad-annotatn-data-c3d16.zip
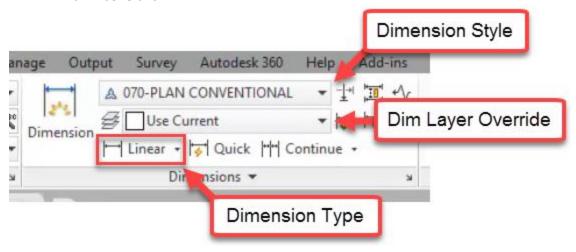
Start with acad-annotatn-02.dwg

acad-annotatn-06.mp4 3:07

In Civil 3D, a Dimension is an object used to call out an angle or distance (length, radius, etc) in your drawing. It is made up of Dimension lines, Tick marks, and an automatically generated and dynamic Dimension value derived from the object or points you specify, the drawing units, and the Dimension Style units. The following exercise will walk you though how to create a Dimension as well as the importance of setting the correct Dimension Style.

1. Open both acad-annotatn-02.dwg and acad-annotatn-end.dwg
2. acad-annotatn-end filetab
   A. Observe **20'-0"V.C.** Dimension in SECTION B-B detail
   B. Observe **3' CRUSHED AGGREGATE BASE COURSE** and **12'** Dimensions in SECTION A-A detail
3. acad-annotatn-02 filetab
   A. **Ribbon > Annotate tab > Dimensions panel > Dimension Style dropdown > 070-PLAN-CONVENTIONAL**
   B. Dim Layer Override = Use Current
   C. **Ribbon Home tab > Layers panel > Layer dropdown > P_MISC**
   D. **Ribbon > Annotate tab > Dimensions panel > Dimension type dropdown > Linear**
   E. Linear
       I. **SPECIFY FIRST EXTENSION LINE ORIGIN**
          a. Left end of arc in SECTION B-B
       II. **SPECIFY FIRST EXTENSION LINE ORIGIN**
          a. Right end of arc in SECTION B-B
       III. **SPECIFY DIMENSION LINE LOCATION**
          a. Above arc

4. acad-annotatn-end filetab
   A. Double click **20'-0" V.C.** Dimension
      I. Observe that all text in cell is highlighted

> **ℹ Info:** The highlighted text in a Dimesion is automatically generated based on the geometry of the Dimension along with the Dimension Style. It can include a prefix or suffix such as "ft" etc. among other things

Dimension styles

> Exercise files: acad-annotatn-data-c3d16.zip
>
> Continue with acad-annotatn-02.dwg
>
> acad-annotatn-07.mp4 5:24

1. Continue with both acad-annotatn-02.dwg and acad-annotatn-end.dwg
2. acad-annotatn-02 filetab
   A. Select **20.00'** Dimension
      I. **Properties palette > Misc**
         a. Observe Dim Style = 070-PLAN-CONVENTIONAL
      II. **Ribbon > Annotate tab > Dimension Style Manager**

      III. Styles
         a. Select 070-PLAN-CONVENTIONAL
            i. Set Current
      IV. New...
         a. Continue
         b. New Dimension Style dialog
            i. Primary Units tab
               1. Unit format = Engineering
               2. Precision = 0'-0"
               3. Suffix = V.C.
         c. OK
      V. Close
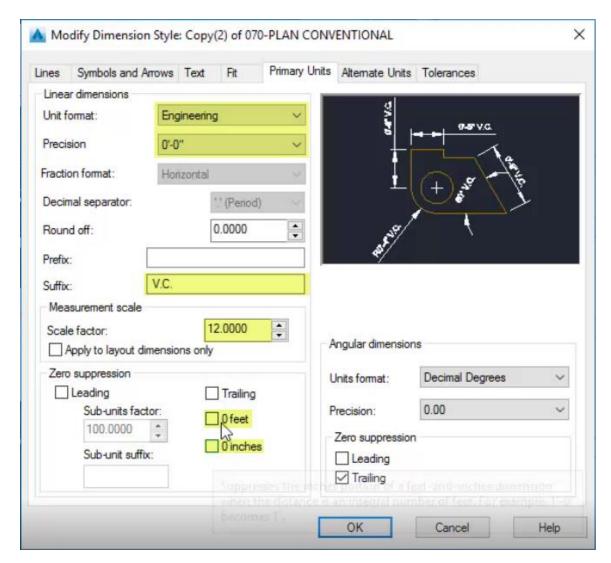
        A. Primary Units tab

            I. Scale factor = 12

            II. Place a space before V.C.

            III. Toggle off all Zero suppression boxes

        B. OK

        C. Close

3. Select ***20.00'*** Dimension

        A. Properties palette > Misc

            I. Dim Style = Copy(2) of 070-PLAN CONVENTIONAL

4. **Ribbon > Annotate tab > Dimensions panel > Dimension Style Manager**

        A. Select ***Copy(2) of 070-PLAN CONVENTIONAL*** Dimension Style

        B. Modify

            I. Primary Units tab

                a. Linear dimensions

                    i. Scale factor = 12

                b. Zero suppression

                    i. 0 feet = unchecked

                    ii. 0 inches = unchecked

C. OK
D. Close

Additional Dimension Tools

Exercise files: acad-annotatn-data-c3d16.zip

Continue with acad-annotatn-02.dwg

acad-annotatn-08.mp4 4:38

1. Continue with both acad-annotatn-02.dwg and acad-annotatn-end.dwg
2. acad-annotatn-end filetab
   A. Observe dimensions for SECTION A-A

3. `acad-annotatn-02` filetab
4. **Ribbon > Annotate tab > Dimensions panel > Dimension Style dropdown**
   A. Select *Copy of 070-PLAN CONVENTIONAL*
5. **Ribbon > Annotate tab > Dimensions panel > `Linear`**
   A. SPECIFY FIRST EXTENSION LINE ORIGIN
      I. Left endpoint of pavement in SECTION A-A
   B. SPECIFY SECOND EXTENSION LINE ORIGIN
      I. Crown endpoint of pavement in SECTION A-A
   C. SPECIFY DIMESION LINE LOCATION
      I. Above SECTION A-A detail
6. **Ribbon > Annotate tab > Dimensions panel > `Continue`**
   A. SPECIFY SECOND EXTENSION LINE ORIGIN
      I. Right endpoint of pavement in SECTION A-A
      I.
   B. SPECIFY SECOND EXTENSION LINE ORIGIN
      I. Right endpoint of SECTION A-A Crushed Aggregate Shoulder
      II. `enter`
7. Select previously drawn Dimensions
8. `delete`
9. **Status bar > Selection cycling = on**
10. **Ribbon > Annotate tab > Dimensions panel > `Quick`**
    A. SELECT GEOMETRY TO DIMENSION
       I. Select Lines on top of SECTION A-A Pavement
       II. `enter`
    B. SPECIFY DIMENSION LINE POSITION
       I. Above SECTION A-A detail
11. **Ribbon > Annotate tab Dimension panel > `Continue`**
    A. SPECIFY SECTION DIMENSION LINE ORIGIN
       I. Right endpoint of SECTION A-A Crushed Aggregate Shoulder
12. **Ribbon > Annotate tab > Dimension panel > `Linear`**
    A. SPECIFY FIRST EXTENSION LINE ORIGIN
       I. Left endpoint of SECTION A-A Crushed Aggregate Shoulder
    B. SPECIFY SECOND EXTENSION LINE ORIGIN
       I. Left endpoint of pavement in SECTION A-A
13. Double click *3'* Dimension
    A. Place cursor after auto-generated Dimension text
    B. Type *CRUSHED AGGREGATE BASE COURSE SHOULDER*
14. Repeat step 13 for other *3'* Dimension
15. Select *3' CRUSHED AGGREGATE BASE COURSE SHOULDER* Dimension
    A. Hover cursor over text Insertion Grip
       I. `Move Text Only`
       II. Relocate Dimension text beside outer Dimension extension line
16. Repeat step 15 for other *3' CRUSHED AGGREGATE BASE COURSE SHOULDER* Dimension
17. Select *3' CRUSHED AGGREGATE BASE COURSE SHOULDER* Dimension
    A. Reset width to 12 units

18. Repeat step 17 for other *3' CRUSHED AGGREGATE BASE COURSE SHOULDER* Dimension

Annotative scale

Last updated: 2017-12-01

Total video time: 17:15

Annotative scaling is a way to control display and scaling of certain annotation-related AutoCAD objects when setting up a sheet layout to plot. The purpose of this scaling is to maintain readability of your plan sheet regardless of the sheet scale. For instance, you may want to label individual property parcels on a 1 IN:40 FT scale, but omit the parcel labels at a 1 IN:200 FT scale since they would not be readable. You may want to label street or highway names at a constant plotted text height on both a 1 IN:40 FT scale sheet and a 1 IN:200 FT sheet. You can accomplish both of these scenarios without creating duplicate text objects and Layers for different sheet sizes. It should be noted that Civil 3D objects will be labeled automatically based on their Label Style and these Labels will automatically scale similarly to AutoCAD objects affected by Annotative scaling.

Any object that will be affected by Annotative Scaling is said to be Annotative. AutoCAD objects available to be Annotative include Multiline Text, legacy single line Text, Blocks, Hatch objects, Dimensions and Multileaders. Many of the text-related WisDOT Styles (Multiline Text, Dimension and Multileader Styles) are already set up to be Annotative. You can also change any Non-annotative Multiline Text, legacy single line Text, Block, Hatch object, Dimension or Multileader to be Annotative through the Properties Palette.

This training module will familiarize you with basic sheet Layout concepts necessary to understand Annotative Scaling, how Annotative Scaling works and tools/best practices for managing Annotative objects. More detailed information on sheet Layouts and plotting will be covered in other training modules.

Model vs paper, layouts & viewports

Exercise files: acad-annotatv-scl-data-c3d16.zip

Start with acad-annotatv-scl-begin.dwg
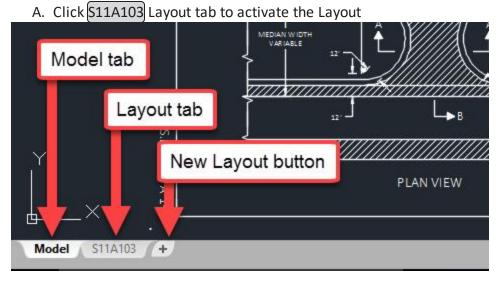
acad-annotatv-scl-01.mp4 5:02

This exercise will introduce you to the concepts of Model space vs Paper space, Layouts, Viewports, and Viewport Scales. Model space is the interface you will design your Civil 3D model in. It includes all of the Civil 3D and AutoCAD objects you will create to represent your modeled
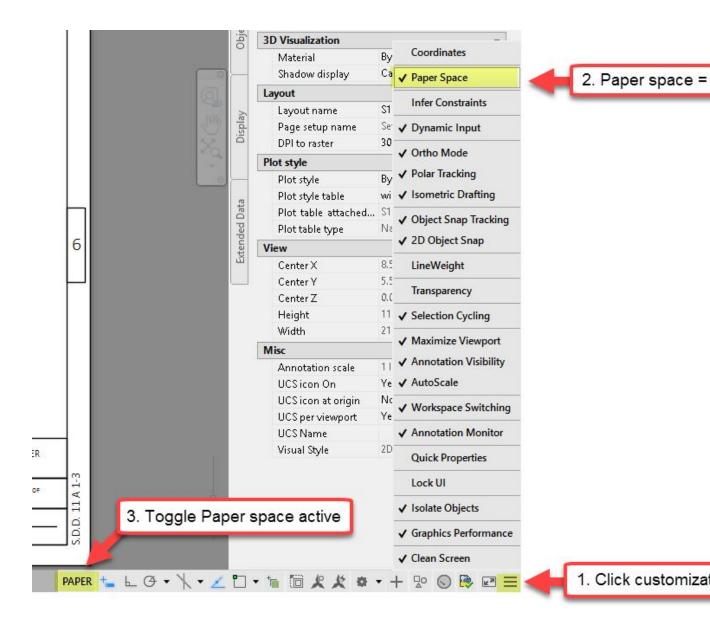
design. You can switch from Model space to a Layout interface where you will set up what your plotted plan sheet will look like. In a Layout, you can either draw objects in Paper space, which will not affect Model space, or have a Viewport object that acts as a window looking into Model space. You will learn how to switch between Model space and a Layout, how to work in Paper space and Model space within a Layout, and how to create a Viewport and work with the Viewport scale.

1. Open acad-annotatv-scl-begin.dwg
2. Observe the Model tab and Layout tab in the bottom left of your interface
   A. Click S11A103 Layout tab to activate the Layout

3. Status Bar
   A. Customization
      I. Paper space = checked
   B. Paper space active

The screenshot shows a Properties panel and a Status Bar customization menu with the following annotations:

- **2. Paper space =** (pointing to checked "Paper Space" in the menu)
- **3. Toggle Paper space active** (pointing to the PAPER button at the bottom left)
- **1. Click customiza[tion]** (pointing to the menu icon at the bottom right)

Properties panel contents:

3D Visualization
- Material — By
- Shadow display — Ca

Layout
- Layout name — S1
- Page setup name — Se
- DPI to raster — 30

Plot style
- Plot style — By
- Plot style table — wi
- Plot table attached... — S1
- Plot table type — Na

View
- Center X — 8.5
- Center Y — 5.5
- Center Z — 0.0
- Height — 11
- Width — 21

Misc
- Annotation scale — 1 I
- UCS icon On — Ye
- UCS icon at origin — No
- UCS per viewport — Ye
- UCS Name
- Visual Style — 2D

Customization menu items:
- Coordinates
- ✓ Paper Space
- Infer Constraints
- ✓ Dynamic Input
- ✓ Ortho Mode
- ✓ Polar Tracking
- ✓ Isometric Drafting
- ✓ Object Snap Tracking
- ✓ 2D Object Snap
- LineWeight
- Transparency
- ✓ Selection Cycling
- ✓ Maximize Viewport
- ✓ Annotation Visibility
- ✓ AutoScale
- ✓ Workspace Switching
- ✓ Annotation Monitor
- Quick Properties
- Lock UI
- ✓ Isolate Objects
- ✓ Graphics Performance
- ✓ Clean Screen

C. Draw a Circle on your Layout in Paper space
4. Click Model tab to activate Model space
    A. Observe no Circle displayed in Model space
5. S11A103
    A. Delete the Circle drawn in step 3.C
6. Status Bar
    A. Model space active

> **ℹ Info:** Activating Model space by toggling the Status Bar PAPER/MODEL button allows you to work in Model space through your Layout Viewport. This is not the same as switching to Model space by clicking the Model tab in the bottom left of your interface.
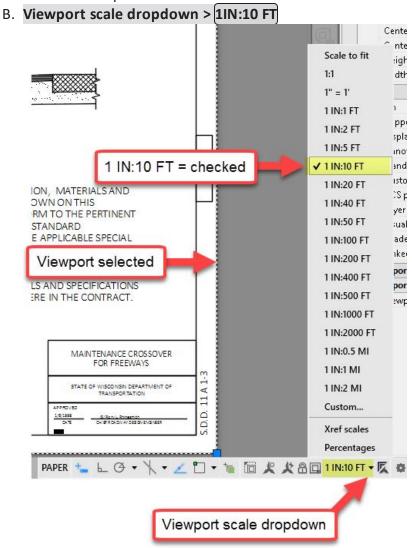
B. Draw a Circle on your Layout in Model space

7. `Model`

A. Observe Circle displayed in Model space

8. `S11A103`

A. Delete the Circle drawn in step 6.B

> **ⓘ Info:** Double-click in grey area outside your Viewport as an alternative method to activate Paper space. Double-click in area inside a Viewport as an alternative method to activate Model space.

9. Select Viewport

A. `delete`

B. Observe Model space objects not displayed

10. **Ribbon > Home tab > Layers panel >** `Layer Properties`

A. Filters

I. **All** = checked

B. **P_MISC_NoPlot** = Current

11. **MVIEW**

A. `enter`

B. **SPECIFY CORNER OF VIEWPORT: 0,0**

I. `enter`

C. **SPECIFY OPPOSITE CORNER: 17,11**

I. `enter`

12. Select Viewport created in step 11
    A. Observe Viewport scale ≠ 1IN:10 FT
    B. **Viewport scale dropdown >** 1IN:10 FT

13. Status bar
    A. Lock Viewport scale

    B. Zoom in/out
        I. Observe Viewport scale unchanged
14. Status bar
    A. Unlock Viewport scale
    B. Double-click inside Viewport to activate Model space

C. Zoom in/out
    I. Observe Viewport scale changed
D. Undo Zoom command to reverse Viewport scale change

Scaling factor, display options & object scales list

Exercise files: acad-annotatv-scl-data-c3d16.zip

Continue with acad-annotatv-scl-01.dwg
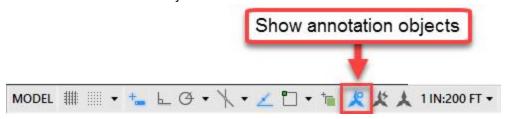
acad-annotatv-scl-02.mp4 6:23

In this exercise you will learn how Annotative Scale factors are applied based on the currently set Annotative Scale (aka Viewport Scale). Annotative objects have a constant Paper space size and a Model space size that depends on the current Annotative Scale. After completing this exercise, you will learn how to manually add scales to an Annotative Object's scales list to enable Annotative Scaling of the object. Additionally, you will learn how to utilize Annotative scaling Status Bar options to control when Annotative Objects are displayed and whether scales are added to Annotative Objects automatically.

1. Continue working in acad-annotatv-scl-01.dwg
2. Select *S.T.H. 25* Annotative Mtext near 557+00
    A. **Properties Palette > Text**
        I. Observe Paper Text Height = 0.1250, Model Text Height = 5.0000
3. Status Bar
    A. Observe current view Annotative Scale = 1 IN:40 FT

> **ⓘ Info:** For Annotative Objects, the Paper size is set manually or by the object Style. The current view Annotative Scale is set manually by selecting from a dropdown list on the Status Bar. The Model size is set automatically and is a product of the Paper Size and the current Annotative Scale (ie Model Text Height = Paper Text Height x Annotative Scale = 0.1250" x (40'/1") = 5.0000'

4. Click 1IN_40FT - 4 Layout tab
5. Verify Paper text height
    A. **DIST**
        I. enter
    B. **SPECIFY FIRST POINT**
        I. Left-click near bottom of *S.T.H. 25* Mtext
    C. **SPECIFY SECOND POINT**
        I. Move cursor near top of *S.T.H. 25* Mtext
        II. Observe tooltip displaying approx. 0.1250
        I. esc
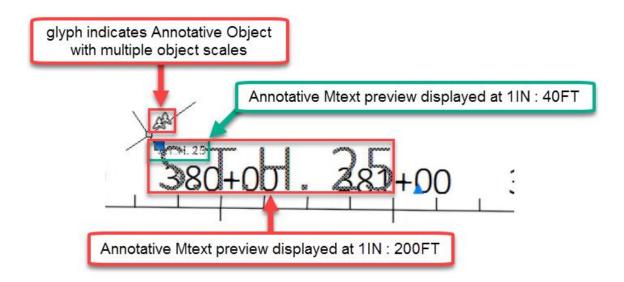
6. Verify Model text height
  A. Double-click inside plan Viewport
  B. Repeat steps 5.A - 5.C.I
    I. Observe tooltip displaying approx. 5.0000
  C. esc
7. 1IN_200FT - 1
8. Status Bar
  A. Show annotation objects = on

Turning "Show annotation objects" on allows all Annotative objects to be displayed regardless of whether they have the current view Annotative Scale added to their object Scales List or not. If objects do have the current view Annotative Scale added to their object Scales List, they will be scaled using the current view Annotative Scale. If not, they will be displayed using the original Annotative Scale added to their scales list.
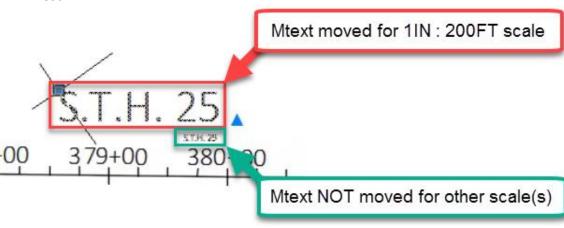
  B. Observe all Annotative Objects displayed in plan view Viewport
9. Select one of the **S.T.H. 25** Mtext objects
  A. **Properties > Text**
    I. Observe Annotative scale = 1IN:40 FT
  B. **Right-click menu > Annotative Object Scale > Add/Delete Scales**
    I. Add
      a. 1 IN:200 FT
      b. OK
    II. OK
10. Select **S.T.H. 25** Mtext from step 9
  A. **Properties > Text**
    I. Observe Annotative scale = 1 IN:200 FT
    II. Observe multiple scale previews displayed

glyph indicates Annotative Object with multiple object scales

Annotative Mtext preview displayed at 1IN : 40FT

Annotative Mtext preview displayed at 1IN : 200FT

B. Use insertion grip to move Mtext
   I. Observe only the display of the 1IN:200 FT scaled Mtext is moved

> **Info:** When an Annotative Object has multiple scales, you have different locations for the display of the object at each scale. Do this by setting the scale of the display you want to move as the current Annotative Scale, then use the displayed Insertion Grip to move the object. The object will not be moved for the remaining object scales.

   II. esc

Mtext moved for 1IN : 200FT scale

Mtext NOT moved for other scale(s)

11. Select *4TH AVE* Mtext
    A. **Right-click menu > Annotative Object Scale > Add Current Scale**
12. Select *4TH AVE* Mtext
    A. Use insertion grip to move Mtext for readability
13. Status Bar
    A. Show annotation objects = off
    B. Observe annotative objects lacking the current Annotation Scale in their object scales list no longer displayed

Use cases & scales list best practices

Exercise files: acad-annotatv-scl-data-c3d16.zip

Continue with acad-annotatv-scl-01.dwg

acad-annotatv-scl-03.mp4 5:50

In this exercise, you will learn best practices for Annotative object management including how to use the Annotative Scaling Status Bar options, strategies for object Scales List management, how to clean up multiple insertion points for objects with multiple object scales.

1. Continue working in acad-annotatv-scl-01.dwg
2. Click Model tab
3. Status bar
   A. Add scales to annotative objects when the annotation scale changes = on
   B. Note that the above Status bar option is commonly referred to as "Add scales auto-matically" or similar
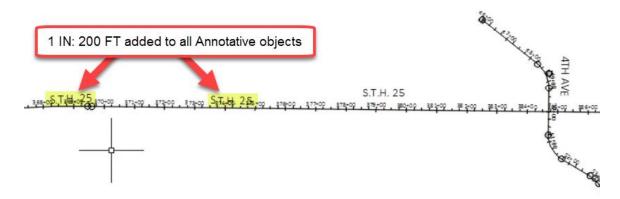
4. **Status bar > Annotation scale dropdown > 1 IN:200 FT**
   A. Observe scaling of both AutoCAD Annotative objects and Civil 3D Labels

   > **Info:** When the "Add scales automatically" Status Bar option is turned on and you change the current view Annotative scale, the new Annotative scale will be automatically added to all Annotative object Scales lists in the drawing.

   > **Warning:** If you find yourself switching the current view Annotative scale often, it is best to leave the "Add scales automatically" Status Bar option turned off. This will prevent you from adding extraneous object scales to Annotative objects unintentionally. You may not want all Annotative objects displayed at a given scale and thus should be more selective about adding Annotative Scales to object Scales lists. Additionally Civil 3D must read all object Scales for display generation and this can become a significant resource drain if the number of object scales is too great.

5. Select one of the *S.T.H. 25* Mtext objects
   A. **Properties palette > Text**
      I. Observe Annotative scale = 1 IN:200 FT

6. 1IN_200FT - 1
   A. Observe all Annotative objects now displayed at 1 IN:200 FT scale

1 IN: 200 FT added to all Annotative objects

7. Model
   A. **Status bar > Annotation scale dropdown >** 1 IN:40 FT
8. Select all Annotative Mtext objects
   A. **Right-click menu > Annotative Object Scale >** Add/Delete Scale
      I. List all scales for selected objects = checked
      II. 1 IN:200 FT
         a. Delete
      III. OK
9. Status bar
   A. Add scales automatically = off
   B. **Current view Annotative Scale dropdown >** 1 IN:200 FT
10. Select *4TH AVE* Mtext and *S.T.H. 25* Mtext near 380+00
    A. **Right-click menu > Annotative Object Scale >** Add Current Scale
11. Select the Mtext from step 10
    A. Relocate respective insertion points for readability
    B. esc

1 IN: 200 FT Mtext insertion points moved

12. Select **4TH AVE** Mtext
    A. **Right-click menu > Annotative Object Scale >** Synchronize multiple scale positions

   ℹ **Info:** When running Synchronize multiple scale positions, the insertion point location used for synchronization is that associated with the current view Annotative Scale. Conveniently, this will be this insertion point whose Grip is displayed.

Text styles - fonts

Last updated: 2016-03-11

2016 fonts
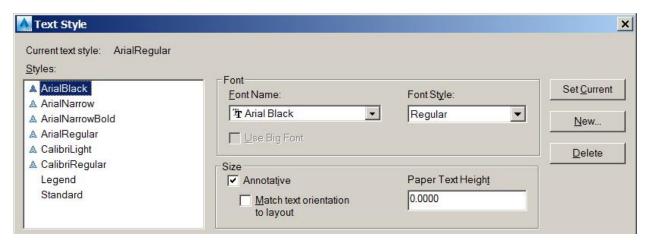
All of the custom DOT-fonts and DOT .shx font files are being retired as of the Civil 3D 2016 release. WisDOT Civil 3D 2016 standard fonts are now all Windows True-Type fonts.

The old fonts will be provided for legacy purposes during the transition from Civil 3D 2014 to Civil 3D 2016, but should not be used going forward. The legacy text styles that use the DOT fonts are not included in the 2016 startup templates or sheet templates. The following is a list of the new 2016 Text Styles with corresponding fonts.

Style Name	Font Name	Font Style	Annotative
ArialBlack	Arial Black	Regular	Yes
ArialNarrow	Arial Narrow	Regular	Yes
ArialNarrowBold	Arial Narrow Bold	Bold	Yes
ArialRegular	Arial Regular	Regular	Yes
CalibriLight	Calibri Light	Regular	Yes
CalibriRegular	Calibri	Regular	Yes
Legend	Calibri	Regular	No
Standard	Arial	Regular	No

Annotative text styles

The default for all but two of these Text Styles is Annotative. The text height is set to 0.00 in each style. The size of text should be addressed at the Civil 3D style level or annotation tool level and not at the Text Style level. This allows to leverage the civil annotation tools without the need for multiple styles with different sizes. To maintain typical WisDOT production standards it is unnecessary to develop any other Text Styles.

Legacy text styles & DOT fonts vs. Civil 3D 2016 text styles

The default for all but two of these Text Styles is Annotative. The text height is set to 0.00 in

each style. The size of text should be addressed at the Civil 3D style level or annotation tool level and not at the Text Style level. This allows to leverage the civil annotation tools without the need for multiple styles with different sizes. To maintain typical WisDOT production stand-ards it is unnecessary to develop any other Text Styles.

Legacy C3D Text Style	2016 C3D Text Style	Legacy DOT Font	2016 C3D Text Style
080	CalibriLight	DOT_FONT_5	CalibriLight
100	CalibriLight	Dot_Font_10	CalibriLight
120	CalibriLight	dot_font15	ArialRegular
140	CalibriLight	dot_font20	CalibriLight
175	CalibriLight	dot_font25	TBD
200	CalibriLight	dot_font35	ArialBlack
350	CalibriLight	dot_font44	TBD
TPP_240	ArialRegular	dot_font45	ArialRegular
TPP_280	ArialRegular	dot_font49	TBD
TPP_400	ArialRegular	dot_font55	CalibriRegular
TPP_500	ArialRegular	dot_font125	TBD
TPP_525	ArialRegular		

Light drafting techniques

Last updated: 2017-06-06

Total video time: 5:31

Exercise files: acad-lit-drfting-data-C3D16.zip

acad-lit-drfting.mp4 5:31

Light drafting technique
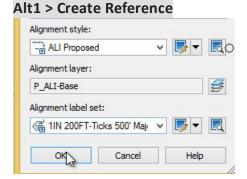
1. **c3d > 12345678 > Design > AliProfs**
2. Open file AliProf-Sth-15-Alt3.dwg
3. Scroll down to **Data Shortcuts**
    A. **Right-Click on Data Shortcuts > Set Working Folder**
        I. Set to folder 2 folders above shortcut folder
            a. c3d and OK
    B. **Right-Click on Data Shortcuts > Set Data Shortcut Project Folder > choose pro-**
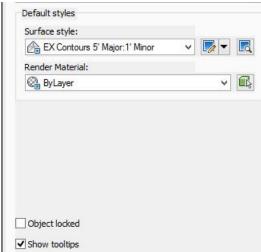
ject folder >
  I. OK

4. **Data Shortcuts pull down > Surfaces > right-click on Exist > Create Reference**
  A. OK
5. Double Click on wheel mouse to Zoom.
6. **Data Shortcuts pull down > Alignments > centerline alignments > right-click on 15-Alt1 > Create Reference**

  A. OK
7. **Left-Click on the surface > Modify panel > Surfaces Properties**
8. A. **Information tab > Surface style** = EX Contours 5'Major:1'Minor

  B. OK.
  C. ESC
9. **Draw panel of the Ribbon > Polyline**

  A. Starting from the left hand side and working to the right click a series of points.
  B. Enter
10. **Annotate tab of the Ribbon > Multiline Text**

11. Left-Click to create a text box.
12. Type in the box Passing lane 150' - widen 12'
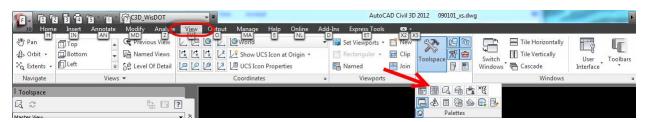
13. Left-Click to enter text box.
14. Click on text and enter SC in the command line.
15. Click on text and type in 10.
16. Enter

Using Design Center to transfer layouts from one dwg file to another

Last updated: 2015-04-17

Using Design Center to transfer layouts from one dwg file to another
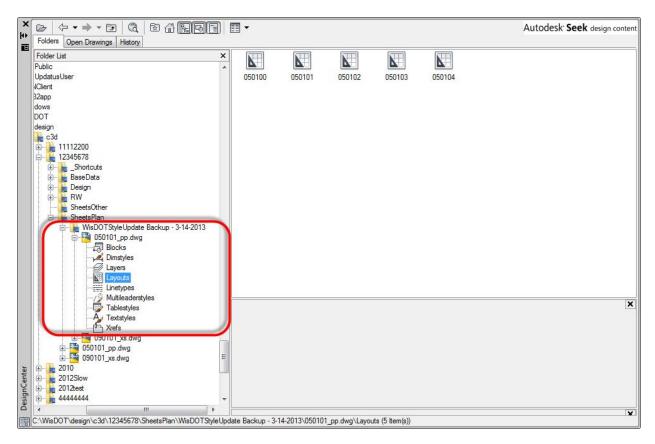
Open **Design Center**
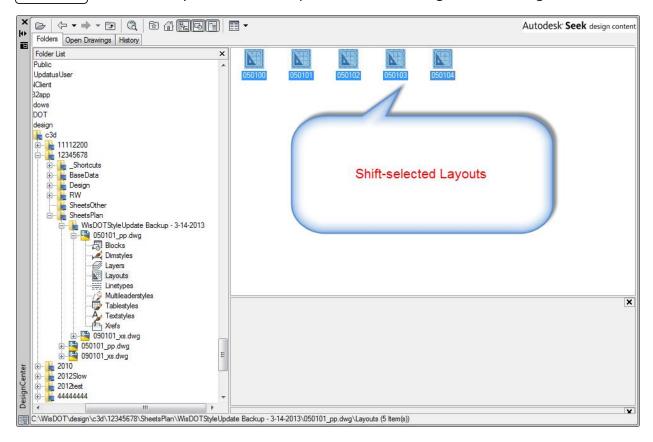
In the Design Center folder view, browse to the backup dwg file containing layouts, expand the backup file in folder view

Select layout category shown within file in Folder list

Shift select to select all layouts in the backup file shown on the right side of Design Center.

Right-click on the selected layouts, choose Add Layout(s) from the right-click menu

Layouts are now in the updated dwg file, save and close.

Linetype best practices

Last updated: 2014-10-05

Linetype best practices

Linetype scaling on or off with XREFs needs to be a wholesale choice. Turning it off in a file only impacts the view in that file. So unless you're going to have linetype scaling turned off in all the files you're going to use, it's not helpful in getting the real world linetypes to display correctly. Leave MSLTSCALE on always.

While not necessary, it may be easiest to keep all real world linetypes in files separate from associative linetypes. I wouldn't do this on mapping files, but it may simplify things for pavement marking and construction staging files.

Object linetype scaling needs to be identical for all of the real world linetypes that you intend to use together. The reason for this is the global effect of LTSCALE and not being able to differentiate LTSCALE for different XREFs. For simplicity sake, I would recommend having the object linetype scaling being identical across a project. You could have it as something like 1 inch: 1 ft to keep object linetype scale as 1 on all of the objects, but associative linetypes would look awful in modelspace. So I would recommend going with something like 1 inch: 100 ft and then for real-world linetype files, set CELTSCALE to 0.01 so that all objects you create inherent that LTSCALE.

It is possible to create sheets with the different scales than the default scale you choose with real world linetypes. To do so, XREF in the real world linetype files that you need and change the LTSCALE of the sheet file you're working in. For example, if you set your default scale to 1 inch:100 ft and you want to create sheets at 1 inch: 50 ft, set the LTSCALE for the 1 inch: 50 ft. file to 0.5.

You cannot create a single file with layouts that have different scales and get real world linetypes to look correct in all the layouts. This is an okay workflow if you only have associative linetypes.

WisDOT linetypes

Last updated: 2014-10-05

This document will describe the changes to the WisDOT custom linetypes; the changes in the drawing template settings; and outline the workflows for both true size and annotation scales in the new template. Linetypes that are true size such as pavement markings and barrels will need

to be scaled using the objects properties. The rest of the linetypes such as easement lines and utilities will automatically adhere to the annotation scale in the layouts.

Linetype scale reference

There are three linetype settings to consider when setting up your drawings: **LTSCALE**, **PSLTSCALE**, & **MSLTSCALE**.

Linetype scale

LTSCALE controls the dash spacing and symbol size in linetypes. For WisDOT new linetypes the default scale factor will be set 1.00. A value larger than 1 will scale the linetype up and a value less than 1 will scale the linetype down. The Linetype scale is an absolute value and not relative value.

MSLTSCALE

Model Space Line Type Scaling only has two options ON or OFF. Setting **MSLTSCALE** to 1 (ON) is the default setting.

Setting MSLTSCALE to **1 (ON)** will cause the Line type scale of any geometry in model space to be scaled by the Annotation scale. This allows you to have a preview of how the line type scale might look when seen through a scaled viewport.

MSLTSCALE Overrides LTSCALE in Modelspace, but it doesn't effect Paperspace, so it won't change how your geometry looks inside your viewports.

Using MSLTSCALE is a really good way of checking that your linetypes are going to look as you expect them to, without having to 'Flick' back and forth between Paperspace and Modelspace.

Setting MSLTSCALE to **0 (OFF)** will cause the Linetypes displayed on the Model tab to be not scaled by the annotation scale.

PSLTSCALE

This variable controls the linetype scaling of geometry displayed in paper space viewports – Paper Space Line Type Scale.

This variable only has two settings. Setting **PSLTSCALE** to **0 (Off)** will mean that the linetype scale factor of your modelspace geometry will not be effected by the scale of your viewport.

Setting PSLTSCALE to **1 (On)** means that the line type scale of your modelspace geometry will be scaled to match the viewport scale.

If you use paper space layouts, turning paper space line type scaling on ensures that all your geometry will have the correct line type scale, no matter what the viewport scale is.

CELTSCALE

Sets the current object linetype scaling factor. The linetype scaling for any new objects placed in the drawing file will be relative to the LTSCALE command setting.

A line created with CELTSCALE = 2 in a drawing with LTSCALE set to 0.5 would appear the same as a line created with CELTSCALE = 1 in a drawing with LTSCALE = 1. The default value is set to 1.

Working with existing files

If your drawing is nearing completion and linetypes are working with your project there should be no need to update your drawing from the new template. To determine if your drawing file has the old linetypes, type LTSCALE at the command line. If it is set to 0.005 then you are using the old template with the older linetypes.

Settings for previous templates

Prior to August 2013 all WisDOT drawing templates had the following settings.

LTSCALE = 0.005

CELTSCALE = 1.0
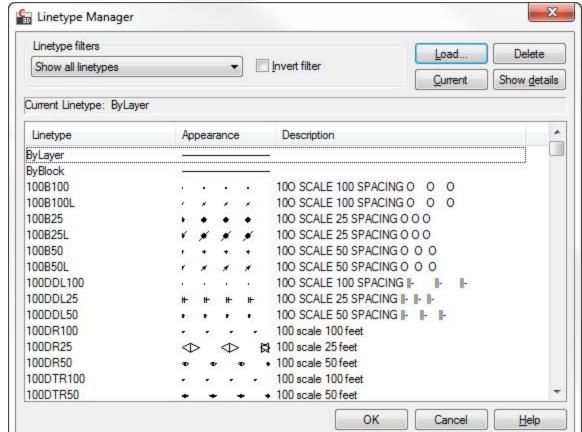
PSLTSCALE = 1

MSLTSCALE = 1

Importing older linetypes into older drawings
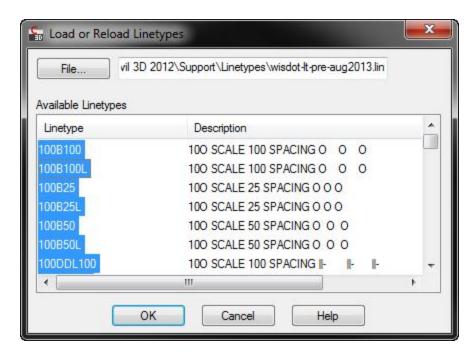
When you need to update your old drawing with compatible linetypes follow these steps.
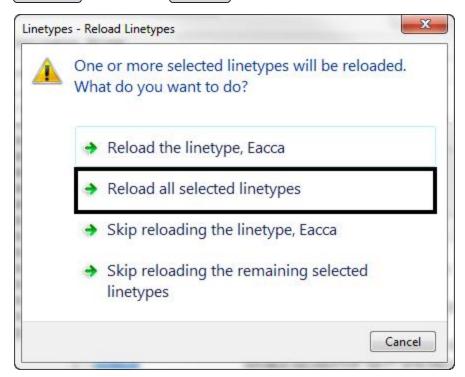
1. In the command line type **`LINETYPE`**. The *Linetype Manager* dialog will appear.

2. In the Linetype dialog click the Load button. The *Load or Reload Linetypes* dialog will appear.
3. From the Load or Reload Linetypes dialog click the File button. The Select Linetype File dialog will appear.
4. Path to **C:\Program Files\Autodesk\AutoCAD Civil 3D 2012\Support\Linetypes** and select the file wisdot-lt-pre-aug2013.lin click Open. The linetypes will be loaded into the Load or Reload Linetypes dialog.

5. Select the linetype(s) you wish to add and then click the OK button. The Linetypes – Reload Linetypes dialog will appear.

- You can hold down Ctrl to select several linetypes
- SHIFT to select a range of linetypes
- Right click popup menu Select All
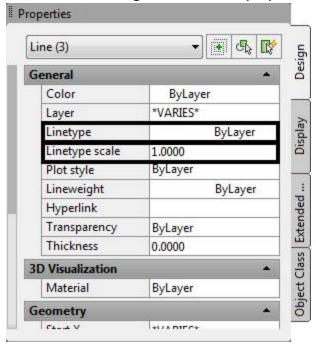
6. From the Linetypes – Reload Linetypes dialog select Reload all selected linetypes. The new linetypes will be added to the drawing file.
7. Click the OK button in the Linetype Manager dialog. The dialog will close.
8. **REGEN** your drawing to see the change in scales.

Workflow for updating new linetypes into older drawings

If you have an old drawing and you can take advantage of updating your drawing with the new linetypes follow these steps.
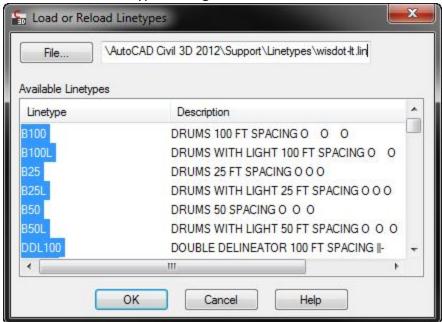
1. Prior to importing the linetypes verify the following variables are set. To read and set these, type the variable name at the command line.
   - LTSCALE = 1.0

   - CELTSCALE = 1.0

   - PSLTSCALE = 1

   - MSLTSCALE = 1

2. If any object overrides are applied to your line work the following steps will not show the updated linetypes. Select all line work in the drawing file and verify ALL Linetype properties in the drawing file are set to ByLayer and the Linetype scale is set to 1.
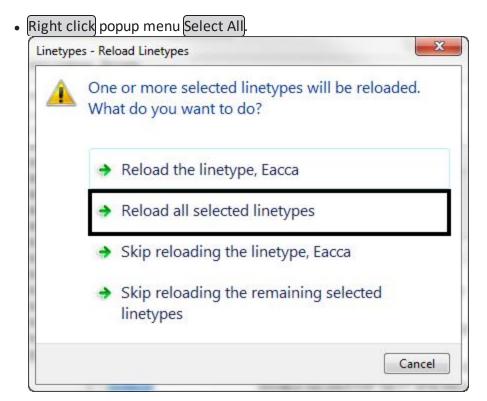
3. In the command line type **LINETYPE**. The *Linetype Manager* dialog will appear.
4. In the Linetype dialog click the Load button. The *Load or Reload Linetypes* dialog will appear.

5. From the Load or Reload Linetypes dialog click the File button. The **Select Linetype File** dialog will appear.
6. Browse to the new linetype file
   - For Civil 3D 2012 path to **C:\Program Files\Autodesk\AutoCAD Civil 3D 2012\Support\Linetypes** and select the file wisdot-lt.lin click Open. The linetypes will be loaded into the Load or Reload Linetypes dialog.
   - For Civil 3D 2014 path to **C:\WisDOT\Stnd\c3d2014\Support\Linetype** and select the file wisdot_2014.lin click Open. The linetypes will be loaded into the Load or Reload Linetypes dialog.

7. Select All the linetypes and then click the OK button. The Linetypes – Reload Linetypes dialog will appear.
   - You can hold down Ctrl to select several linetypes
   - SHIFT to select a range of linetypes

- Right click popup menu Select All.
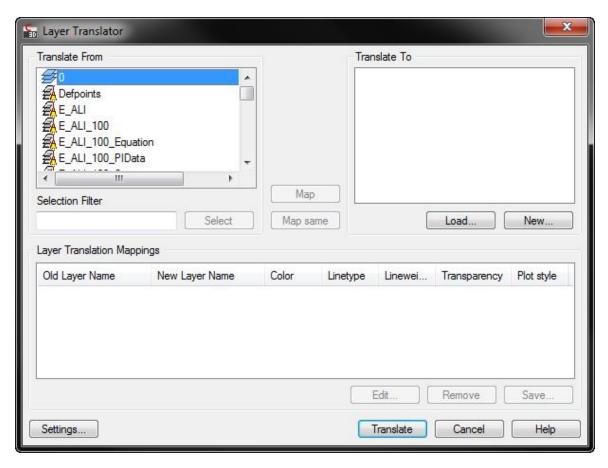
8. From the Linetypes – Reload Linetypes dialog select Reload all selected linetypes. The new linetypes will be added to the drawing file and the old linetype definitions will be changed to match the new definitions.
9. Click the OK button in the Linetype Manager dialog. The dialog will close.
10. Regen your drawing to see the change in scales.
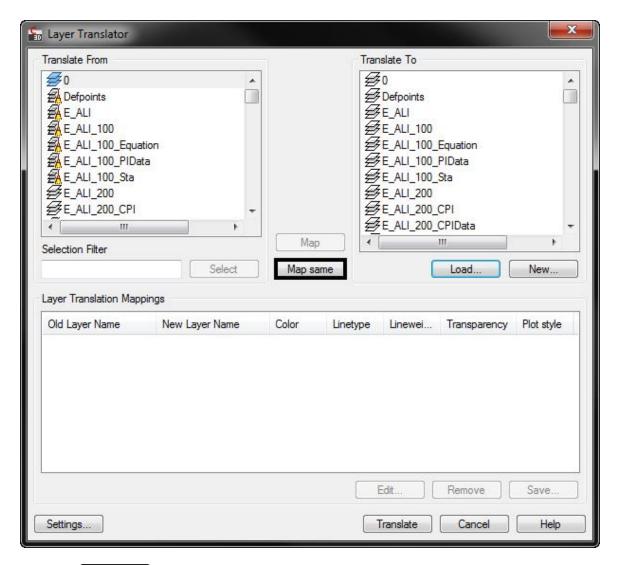
Updating layers with new ByLayer symbology

The linetypes are now in the design file but the layer definitions need to be updated to reflect the new linetype names.
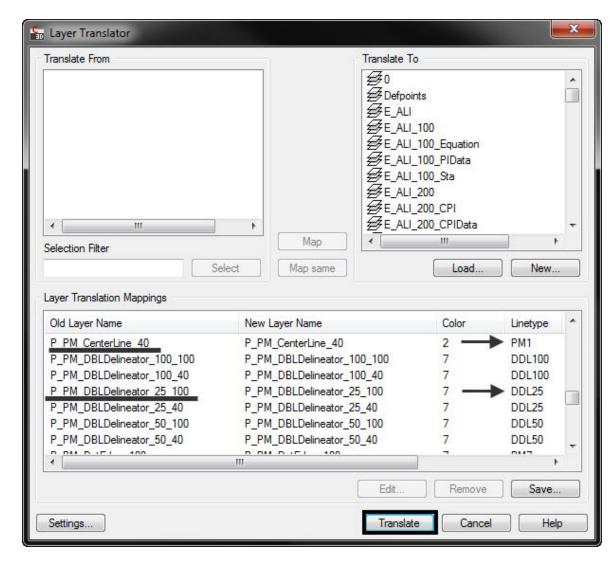
1. From the ribbon **Manage tab > CAD Standards panel > Layer Translator**. The *Layer Translator* dialog will appear.
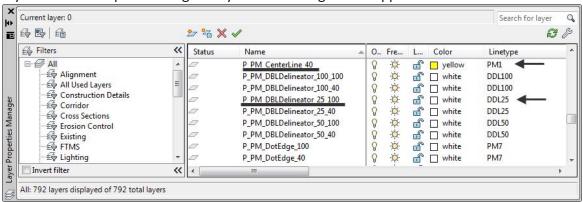
2. Pick the Load button from the *Translate To* section of the dialog.
3. Change the *Files of type* to *Drawing Template (*.dwt)*
4. Path to the WisDOT templates and select wisdot12.dwt or wisdot14.dwt depending on the version you are using, and click Open. The Layers will be loaded in the *Translate To* section of the dialog.

5. Click the Map Same button. The layers will be added to the *Layer Translation Mappings* section of the dialog.

6. Click the Translate button. An alert box will appear asking if you want to save the mapping information. Click Translate Only. The layers will be translated to the new layer scheme.

7. Verify the layers are correct by opening the Layer manager and checking a couple P_PM layers. For a complete listing of Layers that changed see Appendix A.

8. In the command line type **PURGE**. Purge all unused linetypes from the drawing file.
9. Save the drawing file.

Workflow to update Xref files with old linetypes

If your file has an xref file using the old linetypes you will need to update the linetypes and the properties of the xref-dependent layers.

1. Open each Xref design file that is attached to a host file and follow the workflow above named Workflow for Updating New Linetypes into Older Drawings.
2. After each xref file is updated then open each Host file (the drawing file that is consuming the external referenced drawings).
3. In the command line type **VISRETAIN=0**.

> (i) **Info:** Note: Setting Visretain to 0 will allow each xref to be reloaded and the layer table, as stored in the reference drawing (xref), will take precedence.

4. Click **View tab > Palettes panel > External References Palette**
   - Command: **XREF**
5. Select each xref to be reloaded and Right click. From the menu select Reload. The reference will be reloaded and the new layer properties will be updated.
6. In the command line set **VISRETAIN** back to *1*.
7. Save the host file and Exit.

Working with the new template

After August 2013 all WisDOT drawing templates have the following settings.

LTSCALE = 1.0

CELTSCALE = 1.0

PSLTSCALE = 1

MSLTSCALE = 1
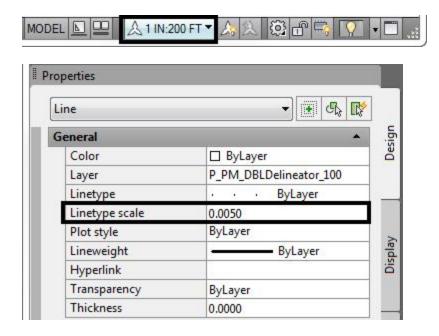
Workflows for true size linetypes

Objects using the True Size linetypes must be scaled by changing the linetype scale of the object.

1. Select the objects whose linetype scale you want to change.
2. Click **Home tab > Palettes panel > Properties**.
3. On the *Properties* palette, click the *Linetype scale* control.
4. Change the linetype scale that you want to assign to the objects.

Layout scales = Linetype scale

When LTSCALE is set to 1 use the equation (linetype scale = (1/Desired Scale) to determine the linetype scale.

Below is a list of common Linetype scale settings.

Viewport ScaleLinetype Scale

1IN:10FT = 0.10

1IN:20FT = 0.05

1IN:40FT = 0.025

1IN:50FT = 0.02

1IN:100FT = 0.01

1IN:200FT = 0.005

In a drawing that contains a vast majority of objects using the True size linetypes, it is a good practice to set MSLTSCALE to 0 (zero). MSLTSCALE sets whether the objects linetypes are affect by the annotation scale in the Model tab. 0 = Off and 1 = On. Setting MSLTSCALE off will display the objects linetypes as true size. The same way it will be displayed in the Layout viewport.

Annotative linetypes
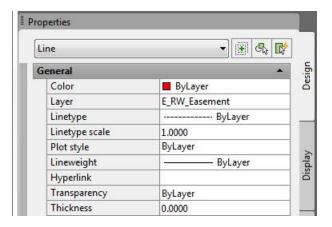
To change the linetype of an object, to use the layout's annotation scale.

1. Verify that LTSCALE is set to 1, PSLSCALE is set to 1 and MSLTSCALE is set to 1.
2. Select the objects whose linetype scale you want to use annotation scale.

3. Click **Home tab > Palettes panel > Properties**.
4. On the *Properties* palette, click the *Linetype scale* control.
5. Change the linetype scale to 1.0.

WisDOT annotate tool

Last updated: 2016-03-09

Total video time: 02:37

acad-wisdot-anno-tl-01.mp4 02:37 - This video contains the training for this entire module.

Info: The WisDOT Annotate Tool is used to quickly set current a textstyle and text height. The tool can then be used to switch to the AutoCAD Annotate ribbon to place or edit text.

Ribbon location

The *WisDOT Annotate Tool* is located on the *WisDOT Sheets* ribbon, in the *Sheet Utilities* panel. Select Set Textstyle & Size to reveal the tool.

Using the tool
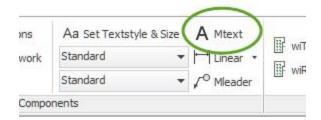
The tool launches a floating window.

- Select a textstyle from the dropdown
- Select a text height from the dropdown
- There is no Apply or OK button. The values are immediately set as the current textstyle and text height.

The Mtext tool is located right next to the Set Textstyle & Size button on the WisDOT Sheets ribbon. If the WisDOT Annotate dialog is left open, then the Mtext tool will need to be pressed twice, even if the Mtext button on the Annotation ribbon is used.

The user is provided the option to select the Open Annotate Ribbon button to quickly switch to the Annotate ribbon. Note that the current textstyle and text height on the annotation ribbon has been set by the WisDOT Annotation tool.

Exiting the tool

The WisDOT Annotate Tool window can be left open and will not interfere with any other commands. The window floats over the application area and can also be moved to another monitor. Pressing the Exit button will dismiss the window.

Points

Civil 3D point basics

Last updated: 2017-06-06

Total video time: 04:21

Exercise files: pnt-basc-data-c3d16.zip

pnt-basc-01.mp4 4:21

Point basics

Three types of points in Civil 3D

- AutoCAD Point aka "Node"
- COGO Point
- Survey Point

Definitions

AutoCAD Point

- Very basic traditional AutoCAD point object with limited attributes beyond Cartesian coordinates (XYZ)
- Not used for most Civil 3D workflows
- Limited selection of symbols using PTYPE System Variable. All points in drawing share same symbol.
- Limited display control; only Layers

COGO Points

- Smart object that contains many properties such as name, number, raw description, full description, coordinates, etc.
- Typically used for proposed construction staking points, not existing survey data.
- Appearance is controlled by Civil 3D Styles with Description Key Set. Point Style for the symbol, Point Label Style for the text.
- Text and symbol are one object, not separate entities.

Survey Points

- Smart object that's nearly identical to COGO points except it cannot be moved on the screen and is generated through a Survey Database
- Typically created by importing existing topographic survey data
- Uses Civil 3D Styles with Description Key Set in the same way as COGO Points

- Can be inserted into drawing from Survey Database with survey Template
- Should not typically be inserted in drawings other than by survey department

Point Groups

- Used to control the display of points in mass, or to easily reference a group of points with a common characteristic.
- Referenced points share a common property. For example, all Electrical Utility shots or all shots brought in from the same point file.

Description Key Set

- A set of field codes, Styles, Layers, and other properties.
- When a point is imported/created, Civil 3D checks to see if there is a code matching the Raw Description. If so, the point will take on the properties defined in the Description Key Set. Exception to this is when there is an overriding Point Group. This will be discussed in detail in later training.

Survey Databases

- Stores and manages raw survey data, which is then inserted into a drawing
- Works in conjunction with Equipment Database, Figure Prefix Database and Linework Code Set. These files are stored outside the drawing.
- Primary toolset for Automatic Linework functionality

Accessing Civil 3D points

Last updated: 2017-06-06

Total video time: 03:39

> Exercise files: pnt-basc-data-c3d16.zip
>
> pnt-accss-01.mp4 3:39

Point Access

Civil 3D Points and related tools can be accessed through the Ribbon, Toolspace and Model Space. Point properties can quickly be viewed through the Properties Palette

Ribbon

Access Point creation, conversion and modification tools through the Ribbon

Point creation and conversion

1. **Home tab > Create Ground Data panel > Points dropdown**

Point Contextual Ribbon Tools

1. **Modify tab > Ground Data panel > Points**

Toolspace

Access Points and Point Groups through the Toolspace Prospector tab and Item View. When Points or Point Groups are selected in the Prospector tree, detailed information is displayed in Item View.

Points

1. **Toolspace palette > Prospector tab > Points**
   A. **Left-click > Points** populates Item View
   B. **Right-click > Points** for contextual functions

Point Groups

1. **Toolspace palette > Prospector tab > Point Groups**
   A. **Left-click > Point Groups** populates Item View
   B. **Right-click > Point Group** for contextual functions
      I. Properties to set hierarchy
   C. Expand Point Group list
      I. **Right-click > Point Group name** for contextual functions

> **Info:** Right click a column heading in Item View to customize the data displayed. Left click a column heading to sort rows by selected column heading. Right click a row in Item View for contextual functions

> **Tips:** Use familiar Ctrl-A, Shift-Select and Ctrl-Select macros then right click to apply contextual functions to a group of objects in Item View

Modelspace

Directly selecting a COGO or Survey Point in Modelspace opens the respective Contextual Ribbon. Once selected you can right-click for contextual functions. A Contextual Ribbon is not available when multiple Survey Points are selected.

Properties Palette

Regardless of how you select a Point or multiple Points, you can see detailed information and make limited modifications in the Properties Palette. Properties shown in grey tone are not available for edit within the Properties Palette, such as with Survey Points.

> **Warnings:** Modifying properties within the Properties Palette sets object level overrides to properties that can be difficult to track and thus are often best set elsewhere. For example, a Point Style, Point Label Style and Layer is best dictated by a Description Key Set and Point Raw Description.

Point groups and styles

Last updated: 2017-06-06

Total video time: 07:45

> Exercise files: pnt-grp-styl-data-c3d16.zip
>
> pnt-grp-styl-01.mp4 3:00
>
> pnt-grp-styl-02.mp4 4:45

Point groups and styles

Point display is largely set by the Point Style, Point Label Style and Layer properties assigned to a Point. These properties can be controlled on an object level during Point creation by assigning a Raw Description code referencing a Description Key Set stored in the current drawing.

Point Groups can also be created and set to filter which Points are displayed and apply over-rides to properties set by a Description Key Set.

Point Tables can be generated from any drawing containing Points for display in the drawing or export to other file formats. By default, Point tables update dynamically with changes to included Point properties.

> **Info:** When Point Styles or Point Label Styles are not dictated by a Description Key Set, Civil 3D looks to applicable Point Groups for Point Style and Point Label Style application. One example of this is when a Point Raw Description does not match the Description Key Set or when an individual Point Style is not defined in the Description Key Set.

Definitions

Point Style

Marker used to display the Point. These are defined by AutoCAD Blocks, or other basic symbols.

Point Label Style

Controls the display and arrangement of text properties associated with a Point.

Layer

Controls display and plot behavior of Points set to display By Layer

Raw Description

Code referencing a Description Key Set to assign display properties to a Point

Description Key Set

An applicable Description Key Set will be set up and included in a template to set Point display properties upon Point creation. It defines the Point Style, Point Label Style, Layer and other properties given to a Point based on a matching Raw Description Code. A Description Key Set is only available if it has been built in the template used to start a drawing.

Point Group

Points in a drawing are queried based on assigned Point properties (ie Raw Description, Full Description, Point Number, Point Name, Elevation) . Point Groups are used to filter the display and plotting of Points in a drawing based on a point group hierarchy. They can also assign Point Styles and Point Label Styles when they are not dictated by a Description Key Set or when Point Group overrides are set.

Point creation tools

Last updated: 2017-06-06

Total video time: 04:06

Exercise files: pnt-creat-tl-data-c3d16.zip

pnt-creat-tl-01.mp4 4:06

Point Creation Tools

Many tools are available to specify location and/or elevation while manually creating COGO Points in your drawing. The various tools available can reference objects such as existing Points, Alignments, Surfaces, Corridors, Lines/Polylines/Arcs, Parcels, etc. You can use typical surveying techniques such as referencing a bearing or azimuth angle, lattitude/longitude or northing/easting for example as well. There is a great deal of flexibility and functionality built into these tools that warrants exploration.

Manual Point Creation Tools

All manual Point creation tools will generate a COGO Point as specified through unique command prompts for each respective tool. The differences between the tools lie in the techniques used to specify Point coordinates. Two ways to access point tools:

1. **Ribbon > Home tab > Create Ground Data > Points dropdown > Point Creation Tools**
   A. **Create Points toolbar> Point command category dropdown > Point command**

1. **Ribbon > Home tab > Create Ground Data > Points dropdown > Create Point - ******** flyout**
   A. Choose Point command

> 💡- **Tip:** Hover over a Point command category or Point command for a quick brief description of the tool. This is a quick way to determine the appropriate coordinate specification technique for your situation

Commands Categories Available

- Miscellaneous - Coordinates specified using a variety of techniques including reference to line, polyline, survey resection etc. Conversion from AutoCAD Points also available.
- Intersection - Distance and/or direction from existing Points or objects (ie line, arc) used to specify intersection coordinates.
- Alignment - Coordinates specified based on reference to alignment such as Station/Offset.
- Surface - Various horizontal coordinate specification with elevation pulled from specified Surface at Point location.
- Interpolate - Coordinates interpolated from two known Points or object locations.
- Slope - Coordinate specifed by distance or vertical displacement at given slope from a know Point.

> 💡- **Tip:** Transparent commands can be used within Point Creation commands while specifying coordinates. These will be discussed in detail in a later training module.

Importing points from a file

Last updated: 2017-06-06

Total video time: 04:08

> Exercise files: pnt-imprt-frm-fil-data-c3d16.zip
>
> pnt-imprt-frm-fil-01.mp4 4:08

Import Points From File

Point data can be transferred between applications and/or organizations by exporting and importing Point Files. Point files are simple text files that Civil 3D can read and use to generate COGO points.

Display of imported Points is controlled by a Description Key Set and/or Point Group in the same way as with other Point creation methods.

> ℹ️ **Info:** Various file extensions can be given to Point Files depending on the application used to export/generate the Point File.

> ⛔ **Warning:** Design staff should NOT import survey data point files into design draw-ings. Contact your Survey Data Coordinator for survey data workflows

Point Import Workflow

1. Open drawing from the WisDOT Survey Template
   A. **Application dropdown > New > wisdot16-survey.dwt**
   B. Save drawing
2. Import Point File
   A. **Ribbon > Insert tab > Import panel >** Points from File
      I. Browse to file
      II. Select correct File Format (ie. PNEZD - Point Number, Northing, Easting, Elevation, Description)
      III. Toggle Add Points to Point Group On/Off
      IV. OK

Editing points

Last updated: 2017-06-06

Total video time: 4:42

Exercise files: pnt-edit-data-c3d16.zip

pnt-edit-01.mp4 4:42

Editing Points

After creating or inserting Points into your drawing, you may need to edit location or attribute data. Point editing tools are available when selecting a Point in modelspace, through Toolspace Prospector and through the Contextual Ribbon.

COGO Points and Survey Points exhibit different editing behavior. When inserted into a drawing from a Survey Database, Survey Points are locked and thus cannot be edited beyond simple label movement and display changes. Contact your Survey Data Coordinator for workflows deal-ing with Survey Points. COGO Points are unlocked and available for edit by default. They can be locked/unlocked within a drawing as needed.

Modelspace

Select a COGO Point directly in your Modelspace canvas to activate grip editing functions. Hover over the Marker Grip or Label Grip to see a menu of respective movement and rotation edit functions.

- **Move Point** - Reset Point location with mouse or applicable Transparent Commands (covered in later training module)
- **Rotate label and marker** - Rotate marker and label about horizontal Point location. Label remains readable by flipping vertically as needed.
- **Rotate marker** - Rotate marker only about horizontal Point location.

Label Grip Edit

- **Move label** - Reset location with mouse or applicable Transparent Commands (covered in later training module)
- **Rotate label** - Rotate label only about horizontal Point location. Label remains readable by flipping vertically as needed.
- **Toggle sub-item grips**- Activate additional grips to move label rows independently.

> **Tips:** Options to reset label or reset all (marker rotation and label) are available after applicable edits are performed. Point (marker) location cannot be reset this way.

Toolspace Prospector

Open the Point Editor Panorama through the right-click contextual menu. Choose specific Points for inclusion in the Panorama by Point Group or selection from the Item View pane.

COGO Points can be renumbered, locked/unlocked for edit and/or have elevations edited based on row selection within the Point Editor Panorama.

When Points are unlocked, attribute overrides can be directly entered into cells within the Panorama as well.

Renumber Points

1. **Toolspace > Prospector tab > Right-click** Points or Point Group Name or selection from Item View
   A. Select row(s) from Panorama
      I. **Right-click > Renumber**
      II. **ENTER ADDITIVE FACTOR** (Overwrite or Next option if specified number already in use)

Change Elevations by Factor

1. **Toolspace > Prospector tab > Right** Points or Point Group Name or selection from Item View
   A. Select row(s) from Panorama
      I. **Right-click > Datum**
      II. **ENTER CHANGE IN ELEVATION** (or use Reference option)

Assign Elevations from Surface

1. **Toolspace > Prospector tab > Right** Points **or** Point Group Name **or** selection from Item View
    A. Select row(s) from Panorama
        I. **Right-click > Elevation From Surface**
            a. **Select Surface dialog box > Surface dropdown > Surface Name**
            b. OK

> ⓘ **Info:** Most Point editing functions are available through Modelspace right click menu and Contextual Ribbon upon selection as an alternative to the Point Editor Panorama

Transparent commands for points

Last updated: 2017-06-06

Total video time: 04:38

> Exercise files: pnt-trnsprnt-cmnd-data-c3d16.zip
>
> pnt-trnsprnt-cmnd-01.mp4 4:38

Transparent Commands

Transparent Commands are tools available to aid in specifying location when prompted within another command. They can only be used once another command is started (ie start Polyline command, then start Transparent command of choice to specify vertex coordinates). A Transparent Commands toolbar is available from which to chose commands. Alternatively, you can enter the command alias into the command line.

Reference Existing Points

There are a variety of Transparent Commands available for use in Civil 3D, some of which reference existing Point coordinates when prompted for a location within a command. These can be useful for preliminary Alignment layout or whenever you would like to reference existing Point locations to build an Entity.

Transparent Command Aliases

Enter one of these options to use known Point coordinates when prompted for a location within a command

- **Point Number**: **' PN** - Specify Point Numbers individually, by range, by list or by a combination of these (ie 1 or 1-3 or 1,2,3 or 1-3,5). Point Numbers called out need not be consecutive or sequential.

- **Point Name**: `'PA` - Specify Points Name sequentially
- **Point Object**: `'PO` - Select desired Points in Modelspace sequentially

Transparent Commands Toolbar

Pick from the Transparent Commands Toolbar. If it is not visible in your interface:

1. **Ribbon > View tab > Interface panel > Toolbars dropdown > Civil >** Transparent Commands

Best Fit Alignment Example Workflow

This example workflow uses COGO Points and the Point Number Transparent Command in Pnt-Trnsprnt-Cmnd-begin.dwg to generate a preliminary Alignment.

1. **Ribbon > Home tab > Create Design panel > Alignment dropdown >** Create Best Fit Alignment
   A. Within *Create Best Fit Alignment* dialog box click object selection icon next to *Path 1 point group*
      I. Select Point Number icon from Transparent Commands Toolbar or enter `'PN` in the command line
      II. Enter Point Number range **1-11**
      III. Esc once to end Transparent Command
      IV. Enter or Right-click to end object selection
   B. Leave all other *Create Best Fit Alignment* dialog box options as default
   C. OK
   D. Review *Best Fit Report* and close dialog box

Points from Alignment

Last updated: 2017-06-06

Total video time: 6:00

Points from Alignment

> Exercise files: pnt-frm-ali-data-c3d16.zip
>
> pnt-frm-ali-01.mp4 6:00

COGO Points can be created with horizontal location, elevation and description data generated automatically from a specified Alignment and Profile within a drawing. Point data can then be exported to a number of file formats (ie CSV) and uploaded to a survey data collector in preparation for staking work.

> **ⓘ Info:** Civil 3D Alignments and Profiles can also be uploaded directly to a survey data collector in preparation for staking work.
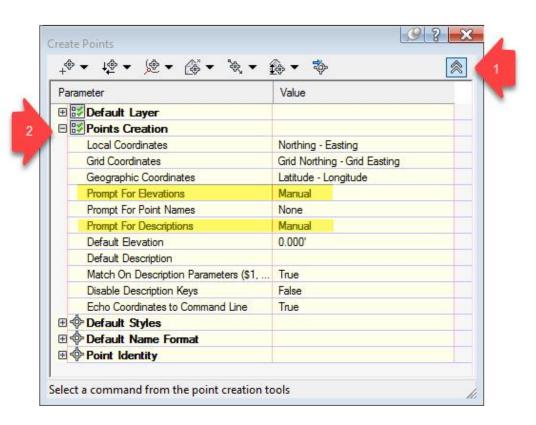
Points from Alignment

Create Points from Alignment

In the following workflow you will create typical COGO Points for staking including those at even stationing, horizontal geometry points and profile geometry points. You will then edit COGO Points with elevation 0.000' to pull elevation data from a surface and export Point data to a CSV file.

Create Points

1. **Ribbon > Home tab > Create Ground Data panel > Points dropdown > Point Creation Tools**
   A. Expand settings chevron
   B. Expand **Points Creation**
      I. **Prompt For Elevations** = Automatic
      II. **Prompt For Descriptions** = Automatic - Object

   C. Collapse settings chevron

D. **Create Points - Alignment dropdown >** Measure Alignment
   I. Pick Alignment **25**
   II. Select Profile **25-Prop** from dropdown
   III. OK
   IV. Enter for default Starting Station
   V. Enter for default Ending Station
   VI. Enter for default Offset
   VII. **SPECIFY INTERVAL: 50**Enter
E. **Create Points - Alignment dropdown >** At Geometry Points
   I. Pick Alignment **25**
   II. Select Profile **25-Prop** from dropdown
   III. OK
   IV. Enter for default Starting Station
   V. Enter for default Ending Station
F. **Create Points - Alignment dropdown >** Profile Geometry Points
   I. Pick Alignment **25**
   II. Select Profile **25-Prop** from dropdown
   III. OK
   IV. Enter for default Starting Station
   V. Enter for default Ending Station

Edit Points

Toolspace > Prospector tab > Right Click Points **>** Edit Points
1. Click Point Elevation column header to sort numerically
2. Shift-select all 0.000' elevation fields
3. **Right-click > Elevations from Surface...**
   A. Choose **Exist** Surface from dropdown
4. Close *Point Editing* Panorama

Export Points to File

Ribbon > Output tab > Export Points
1. **Format** = PNEZD (comma delimited)
2. Browse to Destination File path desired
3. Save as 25 Align.csv
4. Open with text editor or Microsoft Excel to view/sort/etc as needed

Surfaces

Accessing Civil 3D surfaces

Last updated: 2017-06-06

Total video time: 4:52

Exercise files: srfc-accs-data-c3d16.zip

Start with 12345678\Design\Surfaces\srfc-accs.dwg

srfc-accs.mp4 4:52
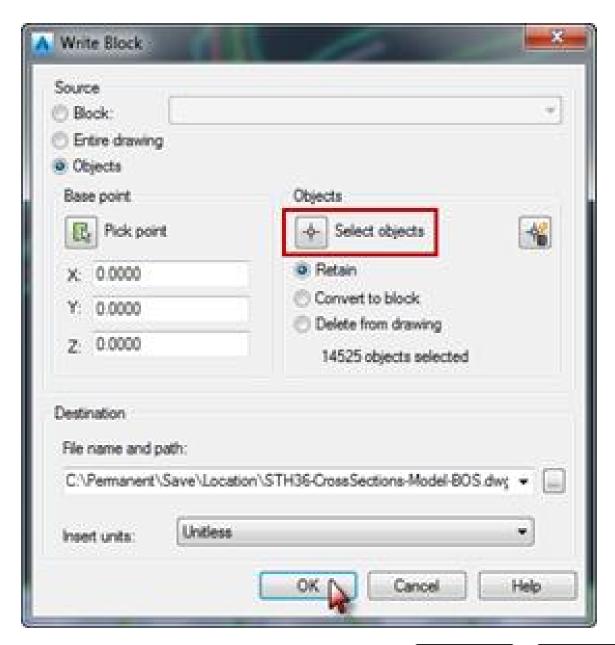
Accessing Civil 3D surfaces

Surfaces and many of the editing and analysis tools available for working with them can be access via the Standard Ribbon, Toolspace Prospector and Modelspace.

Standard ribbon

Surface creation tools can be found on the Standard Ribbon. You can either create an empty Surface and proceed to add data or Create a Surface from existing data (ie from external DEM file or Point Cloud within current drawing). Most of these tools will generate a TIN Surface

1. **Ribbon > Create Data panel > Surfaces dropdown > Create Surface or Create Surface from ******

Toolspace prospector

Several Surface creation, export and editing options are available through Right-Click menus at various levels of Prospector tree expansion.

1. **Toolspace palette > Prospector tab > Right-click Surfaces**
   A. Access to:
      - Create Surface
      - Create Surface from DEM
      - Create Surface from TIN
      - Export to DEM
      - Export LandXML

1. **Toolspace palette > Prospector tab > expand Surfaces > right click *Exist***
   A. Access to:
      - Surface Properties
      - Edit Surface Style
      - Rebuild tools
      - Snapshot tools
      - Add Label (ie Contour, Slope, Spot/Grid Elevations)
      - Export tools

1. **Toolspace palette > Prospector tab > expand Surfaces > expand *Exist* > expand Definition**
   A. Access to:
      - Masks
      - Watersheds
      - Add Surface definition:
         - Boundaries
         - Breaklines
         - Countours
         - DEM files
         - Drawing Objects

- Edits
- Point Files
- Point Groups
- Point Survey Queries
- Figure Survey Queries
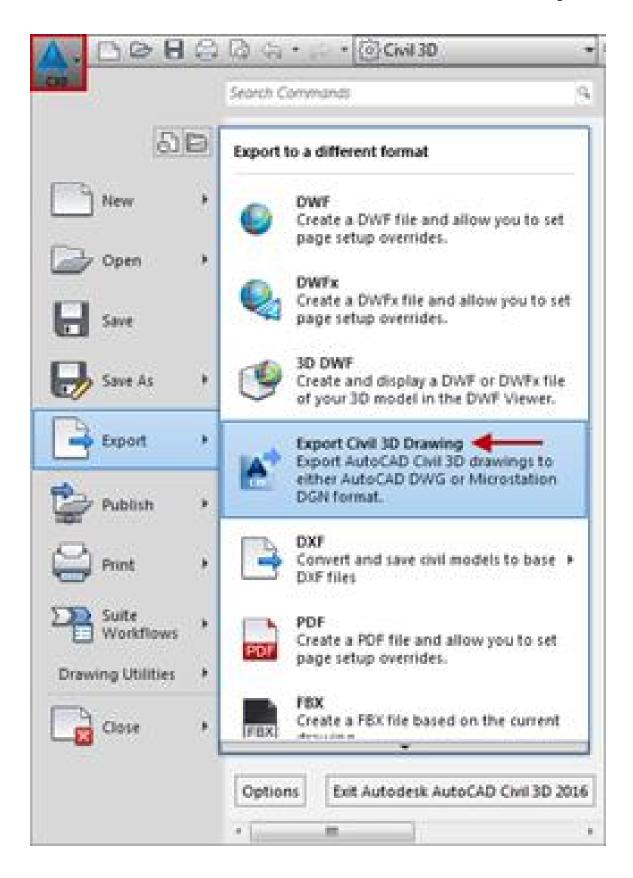
1. **Toolspace palette > Prospector tab > expand Surfaces > expand *Exist* > expand Definition> right-click Edits**
   A. Access to Surface editing tools:
      - Line editing
      - Point editing
      - Minimize Flat Areas (based on tolerance inputs)
      - Raise/Lower Surface
      - Smooth Surface (adds data)
      - Paste Surface (make composite surface by pasting existing Surfaces "pieces" into one)
      - Simplify Surface (removes data)
      - Add Label (ie Contour, Slope, Spot/Grid Elevations)

Modelspace

Select a Surface in Modelspace to activate the Surface Contextual Ribbon. The properties palette will now be populated with Surface object data. In Modelspace, the right-click menu also provides access to Surface Properties and Edit Surface Style options.

Contextual ribbon

1. Select Surface
2. **Contextual Ribbon > Labels & Tables tab**
   A. Access to:
      - Add Surface Labels - spot/grid elevations, slopes, contours
      - Add Legends - these may correspond with a Surface style and analysis. For example Elevation ranges displayed in a range of solid colors.
3. **Contextual Ribbon > General Tools tab**
   A. Access to:
      - Inquiry - determine coordinates at a specified point or coordinates for and slope between two specified points on a Surface.
      - Object Viewer - rotate to isometric view of Surface
4. **Contextual Ribbon > Modify tab**
   A. Access to:
      - Surface Properties - change Style, Name, manipulate Definition Operations, perform analyses
      - Add Data - Boundaries, Breaklines
      - Edit Surface tools
      - Surface tools - Drape Image, Extract From Surface, Move to Surface
      - Launch Pad
5. **Contextual Ribbon > Analyze tab**
   A. Access to:
      - Water Drop - create 2D or 3D Polyline along downhill slope of TIN triangles until a low point is found
      - Resolve Crossing Breaklines
      - Visibility Check - check for visibility of a location or in all directions by specifying height of eye at a location
      - Catchment Area - creates catchment area from Surface for TR-55 time of concentration hydrology analysis
      - Volumes Dashboard - create Volume Surface and generate cut/fill reports
      - Stage Storage - generate stage-storage volume report (conic or average end area)
6. **Contextual Ribbon > Surface Tools tab**
   A. Access to:
      - Drape Image
      - Extract/ Move to Surface
7. **Contextual Ribbon > Launch Pad tab**
   A. Access to:
      - Quick Profile - temporary profile view of Surface lying beneath line, polyline, arc, parcel segment or feature line (Quick Profile view and data not saved with drawing)

- Data Shortcut
- Create Profile - create Profile object with surface elevation data Surface
- Grading Creation Tools

Surface styles

Last updated: 2017-01-10

Total video time: 4:12

Exercise files: srfc-styl-data-c3d16.zip

Start with 12345678\Design\Surfaces\srfc-styl-begin.dwg

srfc-styl.mp4 4:12

Surface styles

Surface Styles control the display of a Surface. Certain display features are only available with some styles. For instance, a style with Contours turned on is necessary to display Contour Labels. Further, certain styles will correspond with Surface Legend Tables and associated Surface analysis. Surface analysis will be discussed in detail in a later training module. Styles included with the template chosen can be accessed through Toolspace Settings, the Surface Contextual Ribbon or Surface Properties.

Change surface style
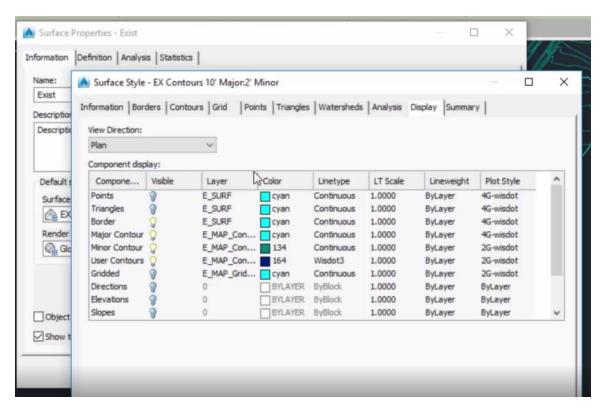
Use the following workflow to set the Surface Style after Surface is created. An initial Surface Style is specified in the Surface creation dialog.

1. **Select Surface from Modelspace or Toolspace Prospector > Right-Click menu > Surface Properties > Information tab**
   A. Select Surface Style from dropdown menu
   B. Edit Surface Style 📝 to view Surface Style definition
   C. OK
   D. OK

Review surface style definition

Open the Surface Style dialog box to review how a Surface Style is defined. This can be opened as described above or through Toolspace Settings.

1. **Toolspace palette > Settings tab > expand Surface > expand Surface Style > Right-click on Surface Style Name > Edit**
   A. **Display tab > View Direction dropdown > Select Plan, Model, or Section**
   B. Review respective Display definition
   C. OK
   D. OK

> ❌ **Warning:** Surface Styles should be used as built in the WisDOT template and not edited. This helps to maintain standardization.

Surface basics

Last updated: 2017-01-10

Total video time: 5:14

srfc-basc.mp4 5:14

Surface basics
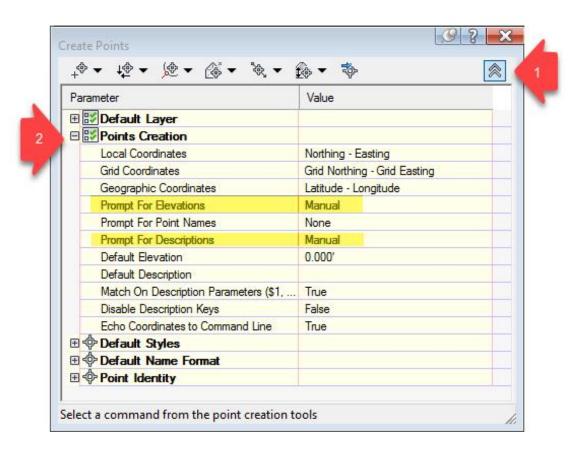
What is a Civil 3D surface

A Civil 3D Surface is a dynamic object representing elevation. One and only one elevation (Z) is assigned for a given location (X,Y) within the extents of the data used. A Surface representing existing conditions is typically built using topographical data gathered from Survey Points, Automatic Linework and/or Figures combined with LiDAR from an online data clearinghouse. A Surface representing proposed design is typically built from Civil 3D design objects such as Corridors, Grading Objects, and Feature Lines. A Surface can either be built as a TIN or Grid.

- Dynamic object representing elevation
- Only one Z per X,Y
- Existing Surface from Survey Linework, Figures, Points and LiDAR
- Design Surface from Corridor, Grading, Feature Lines

TIN surface

A TIN (Triangulated Irregular Network) Surface consists of a series of points and edges forming a series of interconnected triangles. Each point has unique elevation and location. Nearly all Surfaces you will encounter in design will be TIN Surfaces.

Surface basics

Grid surface

A Grid Surface consists of a series of adjacent equally sized grid squares, each with a unique elevation and central location. A Grid Surface is built based on a Digital Elevation Model (DEM) file available from an online data clearinghouse. Supported DEM file types are:
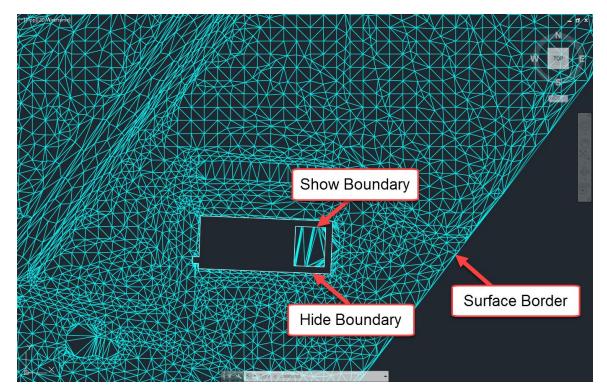
- ESRI Binary Grid (.adf)
- USGS DEM (.dem)
- GEOTIFF (.tif)
- ESRI ASCII Grid (.asc)
- ESRI ASCII Grid (.txt)

Boundary vs border

A *Surface Border* is automatically created based on the outer edge or TIN lines defined by the data used to build the Surface.

A *Surface Boundary* is data manually added by the user to specify limits. A Surface Boundary can be defined by a closed polygon such as closed Polyline or Parcel. Surface Boundary types are:

- Data - sets limits for data calculation
- Outer - sets outer display limits
- Hide - hide area inside Surface
- Show - show are inside a Hide Boundary

Breakline

A Breakline is added to a Surface to force new elevation data along the object used to define the Breakline. Objects that can be added to a Surface as a Breakline are 3D Lines/Polylines and Feature Lines as well as Survey Linework and Survey Figues.

Volume surfaces

A Volume Surface is actually a comparison of two Surfaces already in the drawing. These can then be used to automatically calculate cut and fill volumes.

Surface properties - General

Last updated: 2017-06-06

Total video time: 3:00

Exercise files: srfc-prprtis-gnrl-data-c3d16.zip

Start with 12345678\Design\Surfaces\srfc-prprtis-gnrl.dwg

srfc-prprtis-gnrl.mp4 3:00

Surface properties - General

The Surface Properties dialog box is split into four tabs: Information, Definition, Analysis and Statistics. This training module will focus on the Information and Statistics tabs.

1. **Modelspace > Select *Exist* Surface > Right-click menu or Contextual Ribbon > Surface Properties**
   1. Statistics or Information tab

or

1. **Toolspace palette > Prospector tab > Expand Surfaces > Right-click *Exist* > Surface Properties**
   A. Statistics or Information tab

Statistics tab

The Statistics tab is used to view statistical information about the Surface. This may be helpful to get a general idea of what makes up your Surface. Within the Statistics tab are General, Extended, and TIN listings.

General

Expand the General listing for statistics on Points, Coordinates, and Elevation
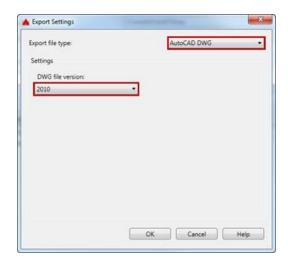
Extended

Expand the Extended listing for statistics on Surface area and Minimum/ Maximum/ Mean slope

TIN

Expand the TIN listing for statistics on the Quantity of and Minimum/ Maximum area/ length of the triangles making up the Triangulated Irregular Network

Information tab

Within the Information tab you can:

- Rename the Surface
- Add a Description to the Surface
- Select a Surface Style
- Preview or View Display properties of available Surface Styles
- Apply Render Material
- Lock/Unlock Surface object for editing
- Turn Tooltips On/Off

Tip: Turning Tooltips off can help remedy performance/ processing speed issues

Warning: Renaming a Surface after a Data Shortcut has been created from it can cause problems that may propagate to drawings with a Data Reference of the Surface. Repathing or recreating Data Shortcuts and Data References may be required.

Surface properties - Definition

Last updated: 2017-01-10

Total video time: 5:05

Page: 275

Published on: 2/15/2018
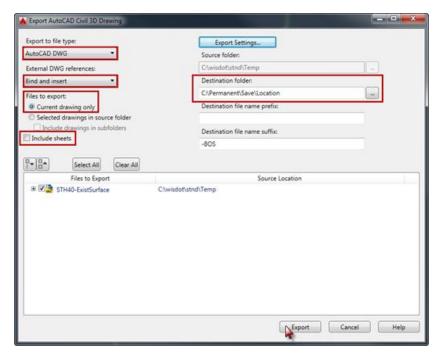
Exercise files: srfc-prprtis-def-data-c3d16.zip

Start with 12345678\Design\Surfaces\srfc-prprtis-def.dwg

srfc-prprtis-def.mp4 5:05

Surface Ppoperties - Definition

The Definition tab of the Surface Properties window provides access to the Definition Options table and the Operation Type table. Use the Definition Options table to view or change Surface definition settings. Use the Operation Type table to work with existing Surface operations.

Definition options

Expand Edit operations to toggle on/off (Use? Yes/No) all existing and future instances of any specific Edit Surface operation for the selected Surface.

Expand Data operations to toggle on/off (Use? Yes/No) all existing and future instances of any specific Add Data operation for the selected Surface.
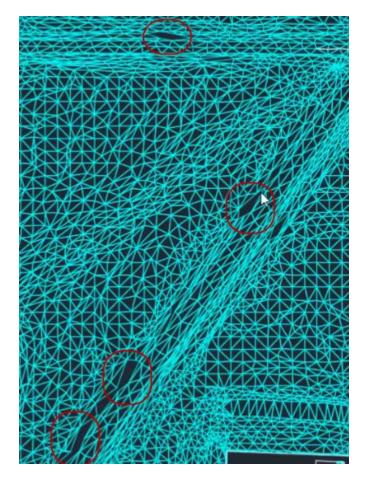
Expand Build to toggle on/off (Yes/No) and set values for unique Surface building operations. This training module examines *Use Maximum Triangle Length* and *Allow Crossing Breaklines* specifically.

Use maximum triangle length

Setting this Definition Option to Yes allows you to limit the length of the longest side edge of any given TIN triangle. This technique is used to eliminate long "sliver" triangles that add data without much affect on the Surface definition or shape. Eliminating them can improve drawing performance.

1. **Modelspace > Select *Exist* Surface > Right-click menu or Contextual Ribbon > Surface Properties**
   1. **Definition tab > Expand Build**
   2. **Use Maximum Triangle Length** = Yes
   3. **Maxium Triangle Length** = 50
   4. Apply
2. Dialog box > **Rebuild the surface**
3. Observe "holes" in Surface

> ⊗ **Warning:** Setting the Maximum Triangle Length value too low can create "holes" or interior boundaries in your Surface. The appropriate value may vary by Surface depending on the data used to build.

Allow crossing breaklines

Crossing Breaklines should be avoided when adding data such as Feature lines or Grading Objects to a Surface. An example of where you not be able to avoid crossing Breaklines is when Automatic Linework is generated along roadway centerline Survey Points when importing data to a Survey Database. When working with such a Surface, you will need to decide if Crossing Breaklines will be allowed.

Remeber, only one elevation (Z) is allowed at any given horizontal location (X,Y) for a Surface. If a Surface has Crossing Breaklines with different elevation at their intersection, there are two elevations at the same horizontal location. You must specify how to assign the elevation at this point.

Set to "No"

If the Allow Crossing Breaklines value is set to No, only one of the crossing Breaklines is used and the other is not added to the Surface.

Set to "Yes"

When the Allow Crossing Breaklines value is set to Yes, you must further specify how to assign the elevation at the crossing Breakline intersection:

- **Use first breakline elevation at intersection** - the elevation from the first crossing breakline listed under Operation Type is used
- **Use last breakline elevation at intersection** - the elevation from the last crossing breakline listed under Operation Type is used
- **Use average breakline elevation at intersection** - this option should not be used since it requires extra data processing and may cause performance problems or crashing.

1. **Modelspace > Select _Exist_ Surface > Right-click menu or Contextual Ribbon > Surface Properties**
   1. **Definition tab > Expand Build**
      1. **Allow crossing breaklines** = No
      2. **Under Operation Type, Add breakline** = checked
      3. Apply
   2. Dialog box > **Rebuild the surface**
   3. Observe Events notification indicating one breakline was not added

4. **Surface Properties Definition tab**
   1. **Allow crossing breaklines** = Yes
   2. **Elevations to use** = Use first breakline elevation at inter-
      section
   3. Apply
5. Dialog box > **Rebuild the surface**
6. Observe Events notification indicating the remaining breakline was
   added

Operation type

All of the Surface Operations (ie Add Data, Edit Surface, Snapshots) currently used to build the
Surface are listed in this table. Where all instances of a given Add Data or Edit Surface oper-
ation can be toggled in the Definition Options table, individual Surface building operations can
be toggled on/off or reordered in the Operation Type table. The order of Surface Operations
can and often will affect the end result of how a surface is built.

1. **Modelspace > Select *Exist* Surface > Right-click menu or Contextual Ribbon > Surface**
   Properties
   1. **Click Definition tab**
   2. Select an Operation Type

   3. Reorder build operation with up/down arrow buttons (ie ⬇)
   4. Apply
      1. Dialog box > **Rebuild the surface**
      2. Observe effect of Operation Type reordering

> 💡 **Tip:** Be cautious and observe individual changes whenever Surface operations are
> toggled on/off or reordered in the Operation Type table.

Surface breaklines

Last updated: 2017-06-06

Total video time: 6:22

Exercise files: srfc-brklin-data-c3d16.zip

Start with 12345678\Design\Surfaces\srfc-brklin.dwg

srfc-brklin.mp4 6:22

Surface breaklines

Adding a Breakline to a Surface forces new elevation and location along the object used as a

Breakline. Polylines, 3D Polylines and Feature lines as well as Survey Linework and Survey Figures can all be added to a Surface as Breaklines. New triangulation is forced for TIN triangles adjacent to any Breakline added. When adding a breakline you must specify the type of Breakline to add. You can choose from Standard, Proximity, Wall, Non-destructive and From File.

Standard

New TIN lines and verticies are forced along the Breakline object. All elevation and location data is pulled directly from the Breakline object.

1. **Toolspace Prospector > Expand Surfaces > Expand Exist > Expand Definition > Right-Click Breaklines > Add**
   A. **Add Breaklines dialog > Type dropdown > Standard**
   B. OK
2. Select polyline
3. Right-Click

Proximity

Elevation data is pulled from the existing TIN vertex closest to any given Breakline vertex. Adjacent triangulation is updated acordingly.

1. **Toolspace Prospector > Expand Surfaces > Expand Exist > Expand Definition > Right-Click Breaklines > Add**
   A. **Add Breaklines dialog > Type dropdown > Proximity**
   B. OK
2. Select polyline
3. Right-Click

Wall

An offset side of and vertical displacement from the Breakline is specified. The effect is a near-vertical wall in a Surface.

1. **Toolspace Prospector > Expand Surfaces > Expand Exist > Expand Definition > Right-Click Breaklines > Add**
   A. **Add Breaklines dialog > Type dropdown > Wall**
   B. OK
2. Select polyline

3. Specify offset side by clicking
4. Enter option for wall heights - **ALL**
5. Enter
6. Enter elevation difference for offset points - **1**
7. Enter

> **ⓘ Info:** A minimum offset (0.0001 drawing unit) is necessary to maintain unique Surface elevation (Z) values for every location (X,Y). Specifying All applies the vertical displacement to all Breakline verticies

Non-destructive
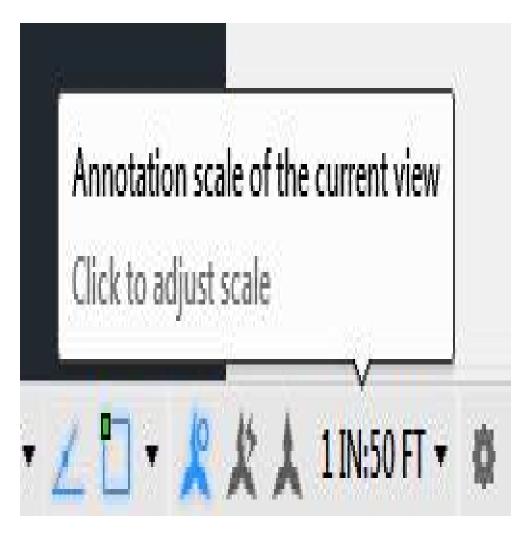
New Verticies and TIN lines are created along the Breakline, but Surface elevations remain unchanged.

1. **Toolspace Prospector > Expand Surfaces > Expand Exist > Expand Definition > Right-Click Breaklines > Add**
   A. **Add Breaklines dialog > Type dropdown > Non-destructive**
   B. OK
2. Select polyline
3. Enter

From file

This option imports Breakline data from an FLT file. You can choose to either maintain a dynamic link to the FLT file or break the link and write the data directly to the Surface definition in the drawing.

1. Open srfc-brklin-flt-begin.dwg
2. **Toolspace Prospector > Expand Surfaces > Expand From File flt > Expand Definition > Right-Click Breaklines > Add**
   A. **Add Breaklines dialog > Type dropdown > From File**
   B. **Add Breaklines dialog > File link options dropdown > Break link to file**
      I. Import Breakline File dialog
      II. Browse to EXIST.flt
      III. Open
      IV. Dismiss Events Panorama

Surface creation

Last updated: 2017-06-06

Total video time: 5:47

Exercise files: srfc-creat-data-c3d16.zip
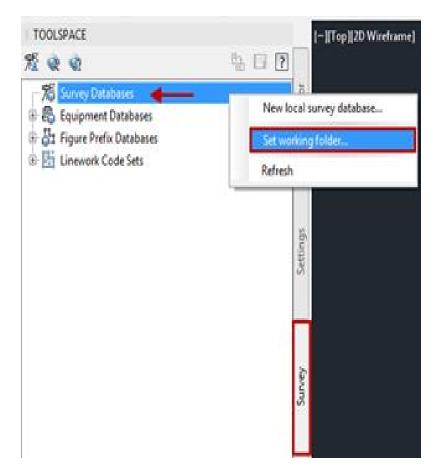
Start with 12345678\Design\srfc-creat-begin.dwg

srfc-creat.mp4 5:47

Surface creation

There are many approaches to Surface creation both from a Survey standpoint dealing with existing conditions and from a Design standpoint using dynamic Civil 3D tools. In either case, a Surface can either be created first with data then added afterword or created with available Surface definition data specified at the time of creation. Typically, existing conditon Surfaces are created from topo Survey data (Survey Points, Linework and Figures) and proposed design Surfaces are created largely from Corridors and Grading Object Featurelines. The workflow shown in this training module involves creating a Surface with no definition and subsequently adding data. Specifically, an external point file (.pnt) and external breakline file (.flt) will be used to add Surface definition data after creation.

Create surface

1. **Ribbon > Home tab > Create Ground Data panel > Surfaces dropdown > Create Surface**

A. Create Surface dialog: Layer
  I. Object Layer dialog: Layer
    a. **Layer** = E_SURF
    b. OK
  II. **Name** = Existing
  III. Style Ellipses
    a. Select Surface Style dialog
    b. ***EX Contours 10' Major: 2' Minor***
    c. OK

Add data

1. **Toolspace > Prospector tab > Expand Surfaces > Expand Definition > Right-click Point Files > Add**
   A. Add Point File dialog
     I. Browse to EXIST.pnt
     II. Open
   B. **Point file format** = PENZ (space delimited)
   C. OK
2. Zoom Extents
3. **Toolspace Prospector > Expand Surfaces > Expand From File flt > Expand Definition > Right-Click Breaklines > Add**
   A. **Add Breaklines dialog > Type dropdown > From File**
   B. **Add Breaklines dialog > File link options dropdown > Break link to file**
     I. Import Breakline File dialog
     II. Browse to EXIST.flt
     III. Open
     IV. Dismiss Events Panorama

Surface boundaries

Last updated: 2017-01-12

Total video time: 8:59

Surface boundaries - Data clip & outer

> Exercise files: srfc-bndry-data-c3d16.zip
>
> Start with 12345678\Design\Surfaces\srfc-bndry-begin.dwg
>
> srfc-bndry-01.mp4 4:24
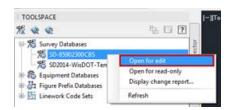
Surface Boundaries can be added to any Surface to set data processing and/or display limits. There are four available Surface Boundary types: Data Clip, Outer, Hide and Show. For all types

but Data Clip, you have the option to add the Boundary as a Non-destructive Breakline. Doing so interpolates Surface slopes and adds TIN lines and points so that the Surface is displayed exactly up to the limits of the object used as a Boundary. If the Non-destructive Breakline option is unchecked, the Surface will be displayed using only previously existing TIN lines and points completely within the limits of the polygon used as a Boundary.

Closed polygon objects such as 2D or 3D Polylines, Circles, Parcels and Survey Figures can all be used as a dynamic reference for a Surface Boundary. If a polygon is not closed, Civil 3D will define and force a closed polygon when adding a Boundary. If the object referenced to add a Surface Boundary contains arcs, TIN tessellation is generated based on the Mid-ordianate distance specified in the Add Boundaries dialog. The mid ordinate distance is the distance from the center of the chord connecting adjacent points along an arc perpendicular to the center of the arc. TIN lines are then generated along the chord after adding the Surface Boundary. A smaller mid-ordinate distance results in a "smoother" arc on a Surface Boundary.

The following section describes the Data Clip and Outer Boundary Types.

Data clip

A Data Clip Boundary is used to limit the area where new data will be processed when added. This can help improve drawing performance and utilize hardware resources more efficiently. Only data added after the Data Clip Boundary is added will be affected by the Data Clip Boundary. For this reason, it is a good idea to add any Data Clip Boundary during the initial steps of Surface creation.

Create surface and add data clip boundary

1. **Toolspace palette > Prospector tab > Right-click on Surfaces > Create Surface > Create Surface dialog**
   A. **Name** = Exist
   B. **Style** = EX Triangles
   C. OK
2. **Ribbon > Home tab > Draw panel > Activate Polyline command**
   A. Draw simple polygon around externally referenced (xref) mapping data
3. **Toolspace palette > Prospector tab > Expand Surfaces > Expand Exist > Expand Definition > Right-click Boundaries > Add > Add Boundaries dialog**
   A. **Name** = Data Clip
   B. **Type** = Data Clip

     C. OK
4. Select Polyline drawn in Step 2.1
5. **Toolspace palette > Prospector tab > Expand Surfaces > Expand Exist > Expand Definition > Right-click** *Point Files* **> Add > Add Point File dialog**
    A. **Add Point File dialog > Selected Files section >** ⊕ **> EXIST.pnt >** Open
    B. Specify point file format section
            I. **Point file format** = PENZ
    C. OK
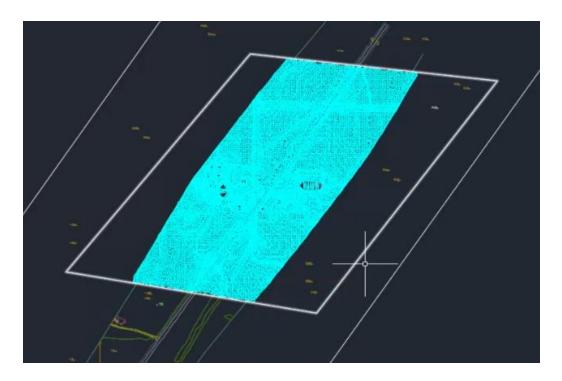
Outer

An Outer Boundary is used to define the outermost display limits of a Surface. Multiple Outer Boundaries may be added to a Surface, but only the most recently added Outer Boundary will be used during Surface rebuilding. If multiple Outer Boundaries have been added to a Surface, they may be toggled on/off in the Definition tab of the Surface Properties dialog.

Add outer boundary to surface

1. Complete the *Create Surface and add Data Clip Boundary* workflow
2. **Ribbon > Home tab > Draw panel > Activate Polyline command**
    A. Draw simple polygon within the Data Clip Boundary. Be sure to enclose all previously drawn "building pad" Polylines as these will be used in the next exercise
3. **Toolspace palette > Prospector tab > Expand Surfaces > Expand Exist > Expand Definition > Right-click** *Boundaries* **> Add > Add Boundaries dialog**
    A. **Name** = Outer
    B. **Type** = Outer
    C. Uncheck Non-destructive breakline
    D. OK
4. Select Polyline drawn in Step 2.

Surface boundary - Hide & show

Exercise files: srfc-bndry-data-c3d16.zip

Start with 12345678\Design\Surfaces\srfc-bndry-01.dwg

srfc-bndry-02.mp4 2:35

The following section describes the Data Clip and Outer Boundary Types.

Hide

A Hide Boundary is used to prevent display of an area inside an Outer Boundary. One example situation where a Hide Boundary may be useful is to prevent display of constant-elevation building pads. When a Hide Boundary type is specified and the Non-destructive breakline option is checked, another Surface may be selected as the reference object to define a Hide Boundary.

Add hide boundary to surface

1. Complete the *Add Outer Boundary to Surface* workflow or start from srfc-bndry-01.dwg
2. **Ribbon > Home tab > Layers panel > Activate LAYERFRZ (Layer Freeze) command**
   A. Select a TIN line on the Surface
3. Window select "building pad" Polylines
4. Shift+select to deselect the Polyline drawn inside one of the "building pad" Polylines.

5. **Toolspace palette > Prospector tab > Expand Surfaces > Expand Exist > Expand Definition > Right-click Boundaries > Add > Add Boundaries dialog**
   A. **Name** = Hide
   B. **Type** = Hide
   C. Check Non-destructive breakline
   D. OK

Show

A Show Boundary is used to allow display of an area inside a Hide Boundary or to build TIN lines and points within a gap on a single Surface. If the Show Boundary falls within a Hide Boundary, be sure to add any Show Boundaries after the corresponding Hide Boundary. Keep in mind any Add Data operations can be reordered in the Definition tab of the Surface Properties dialog.

Add show boundary to surface

1. Complete the *Add Hide Boundary to Surface* workflow
2. **Toolspace palette > Prospector tab > Expand Surfaces > Expand Exist > Expand Definition > Right-click Boundaries > Add > Add Boundaries dialog**
   A. **Name** = Show
   B. **Type** = Show
   C. Check Non-destructive breakline
   D. OK
3. Select "courtyard" Polyline (inside one of the "building pad" hide boundaries)

Surface masks

Last updated: 2017-06-06

Total video time: 4:20

Exercise files: srfc-msk-data-c3d16.zip

Start with 12345678\Design\Surfaces\srfc-msk-begin.dwg

srfc-msk.mp4 4:20
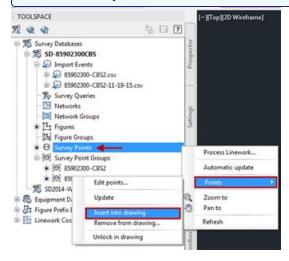
Surface masks

Surface Masks can be used to control the display of a Surface based on a closed polygon object. Many closed polygon objects can be used as reference objects for a Surface Mask including 2D or 3D Polylines, Survey Figures, Feature Lines, Parcels and other Surfaces. You can specify that a Surface Mask should affect Rendering only or not. Surface Rendering applies a Render Material available in the drawing template used (ie concrete or grass) as an aid in design visualization. This can be viewed in Object Viewer. You can specify to "mask" (not display) either the Surface inside or outside the polygon object used.

> **Info:** It is worth noting that Surface Masks differ from Hide or Show Boundaries in that they only affect graphic display and do not add TIN data to the Surface. Also, the ability to add Surface Masks is more limited than that of Surface Boundaries

Create surface mask

Inside mask

1. **Toolspace palette > Prospector tab > Expand Surface > Expand *Exist* > Right-click Mask > Create Mask**
2. Select Polyline around the intersection
3. Right-Click
   A. **Mask Type** = Inside
   B. OK
4. **Toolspace palette > Prospector tab > Expand Surface > Expand *Exist* > Expand Masks > Right-click Mask 1 > Mask Properties**
   A. **Mid-Ordinate Distance** = 1
   B. OK

> **Info:** Specifying Mask type as Inside prevents additional Masks from being created for the Surface. Changing the Mask type to Outside opens up the ability to add more Surface Masks.

Outside mask

1. **Toolspace palette > Prospector tab > Expand Surface > Expand *Exist* > Expand Masks > Right-click Mask 1 > Mask Properties**
   A. **Mask Type** = Outside
   B. OK
2. **Toolspace palette > Prospector tab > Expand Surface > Expand *Exist* > Right-click Mask > Create Mask**

3. Select previously drawn Polyline around the building pad
4. Right-Click
   A. **Mask Type** = Outside
   B. OK

> ℹ️ **Info:** You can select multiple closed polygons when creating a single mask, but you will be limited to Mask type = Outside and Render only = Yes

Change display order

While you can have multiple Outside type Surface Masks on a Surface, only the Mask at the top of the Display Order list will affect the rendered display.

1. **Toolspace palette > Prospector tab > Expand Surface > Expand *Exist* > Expand Masks > Right-click Mask 1 > Display Order**
   A. Mask Display Order
   B. Select Mask 2

Palettes
ON/OFF

   C. Move Mask 2 to top of list
   D. OK

Surface edits

Last updated: 2017-11-28

Total video time: 11:00

Surface edits - Add/delete lines & points

> Exercise files: srfc-edit-data-c3d16.zip
>
> Start with 12345678\Design\Surfaces\srfc-edit-begin.dwg
>
> srfc-edit-01.mp4 4:00

Many updates to Surfaces will be driven by dynamic links to smart Civil 3D objects such as Corridors or Grading Feature Lines (see the Corridor and Grading Objects training modules for more information on these types of dynamic Surface updates). For minor refinements, the Add Line, Delete Line, Add Point and Delete Point Surface editing tools can be useful.

> ⊗ **Warnings:**
> Add/Delete Lines & Points Surface edits should be applied conservatively as final minor refinement. They are manually applied and the workflow can become time intensive.

> ⊗ Surface edits in design should never be used to correct errors in corridors or gradings. They should only be used to fix incorrect triangulation in the surface.
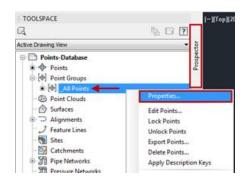
Refinement edits

Use Object Viewer to identify refinement editing needs. Use Delete Line, Delete Point and Add Line tools to perform final minor refinements to a Surface created from Grading Feature Lines.

Object viewer

1. Open srfc-edit-begin.dwg
2. Select *Driveway* and *Crdr-25* Surfaces in Modelspace
    A. **Multiple Surfaces Contextual Ribbon > Object Viewer**
        I. Pan and zoom to identify Surface refinement needs
        II. Close Object Viewer

Line & point edits

1. Esc
2. Select *Driveway* Surface
    A. **Surfaces Contextual Ribbon > Edit Surface dropdown > Delete Line**
        I. Select TIN lines to delete using Crossing Window
        II. Right-Click
        III. Esc
3. Select *Driveway* and *Crdr-25* Surfaces
    A. **Multiple Surfaces Contextual Ribbon > Object Viewer**
        I. Pan and zoom to identify Surface additional refinement needs
        II. Close Object Viewer
4. Select *Driveway* Surface
    A. **Right-Click > Surface Properties > Information tab**
        I. **Surface Style** = Rfnt-Edits
        II. OK
    B. **Surfaces Contextual Ribbon > Edit Surface dropdown > Delete Point**
        I. Select Surface points to delete using Crossing Window
        II. Right-Click

5. Reiterate steps 1-4 using Delete Line, Delete Point and Add Line until *Driveway* is finalized

Surface edits - Paste surface preparation

Exercise files: srfc-edit-data-c3d16.zip
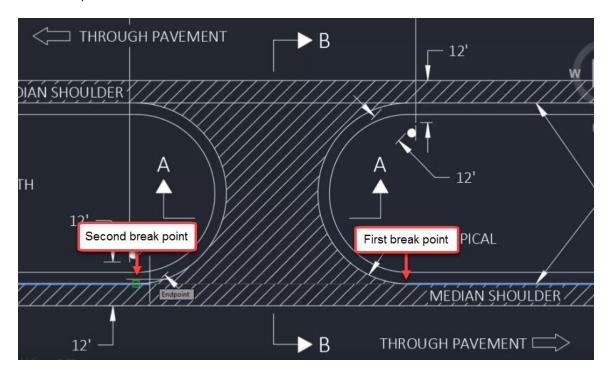
Start with 12345678\Design\Surfaces\srfc-edit-01.dwg

srfc-edit-02.mp4 1:07

A typical workflow to combine multiple component Surfaces into a single final proposed Surface involves creating Data Shortcuts of each component Surface (see Data Shortcuts Training Module for more information on setting up a Data Shortcut Working Folder).

Create component surface data shortcuts

1. Open srfc-edit-01.dwg
2. **Toolspace palette > Prospector tab > Verify that the Data Shortcuts Working Folder path has been set**
3. Save drawing
4. **Toolspace palette > Prospector tab > Right-click Data Shortcuts > Create Data Shortcut**
   A. Place check next to *Crdr-25* and *Driveway*
   B. If *Exist* Data Shortcut has not yet been created, place a check next to *Exist*
   C. OK

Surface edits - Paste surface

Exercise files: srfc-edit-data-c3d16.zip

Start with 12345678\Design\Surfaces\srfc-edit-02.dwg

srfc-edit-03.mp4 3:04

Once all desired edits to component Surfaces have been completed, you are ready to combine all Surfaces into a single final Surface. You will do this by creating a new Surface empty of data and using the Paste Surface Edit to add and combine component Surface data.

> ⊗ **Warning:** To avoid potential Surface referencing problems, use only one level of Surface Pasting. For example, do not Paste Surfaces 1 and 2 into Surface 3 then Paste Surfaces 3 and 4 into Surface 5. Rather, paste Surfaces 1, 2, 3 and 4 into Surface 5.

Paste surfaces
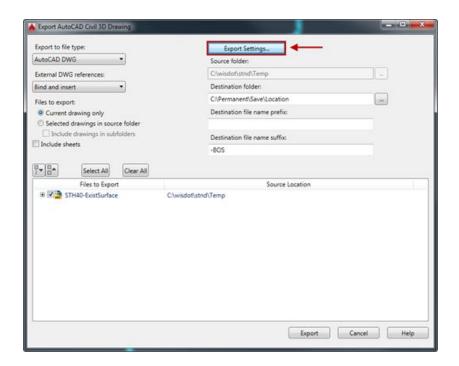
Create data references

1. Open srfc-edit-02.dwg
2. **Toolspace palette > Prospector tab > Expand Data Shortcuts > Expand Surfaces > Right-click on Crdr-25**
    A. Create Surface Reference dialog
    B. **Style** = _No Display
    C. OK
3. Repeat Step 2 for *Driveway* and *Exist* Surfaces

Create final surface & perform paste surface edit

1. **Toolspace palette > Prospector tab > Right-click Surfaces > Create Surface**
    A. Create Surface dialog
    B. **Name** = Final
    C. **Style** = P Triangles
    D. OK

2. **Toolspace palette > Prospector tab > Expand Surfaces > Expand Final > Expand Definition > Right-Click Edits > Paste Surface**
    A. Select *Exist*
    B. OK
3. Repeat Step 2 for *Crdr-25*
4. Repeat Step 2 for *Driveway*
5. Zoom Extents

Surface edits - Paste surface: survey

Exercise files: srfc-edit-data-c3d16.zip

Start with 12345678\Design\Surfaces\srfc-edit-03.dwg

srfc-edit-04.mp4 2:49

After a Surface built from survey data is delivered, a typical workflow is to incorporate the sur-
veyed area into the larger project limits by combining the survey Surface with a Surface built
from mapping data (DEM or LiDAR etc). This will result in an existing conditions Surface built
with survey level accuracy where feasible and LiDAR level coverage covering the remainder of
the project limits. Do this by creating a new, blank Surface and adding data by Pasting the map-
ping Surface and survey Surface in.

> ⊗ **Warning:** To avoid potential Surface referencing problems, use only one level of
> Surface Pasting. For example, do not Paste Surfaces 1 and 2 into Surface 3 then
> Paste Surfaces 3 and 4 into Surface 5. Rather, paste Surfaces 1, 2, 3 and 4 into
> Surface 5.

Paste survey and mapping surfaces into existing conditions surface

1. Open surf-edit-04.dwg
2. **Ribbon > Home tab > Create Ground Data panel > Surfaces dropdown > Create Sur-
   face**
   A. **Name** = Composite
   B. **Style** = EX Triangles
   C. OK
3. **Modelspace > Select Mapping Example Surface > Right-click > Surface Properties**
   A. Information tab
   B. **Surface Style** = _No Display
   C. OK
4. Repeat Step 3 for Survey Example Surface
5. **Toolspace palette > Prospector tab > Expand Surfaces > Expand Composite > Expand
   Definition > Right-Click Edits > Paste Surface**
   A. Select *Mapping Example*
   B. OK
6. Repeat Step 5 for *Survey Example*

Surface properties - Analysis

Last updated: 2017-06-06

Total video time: 5:13

Exercise files: srfc-prprtis-anlysis-data-c3d16.zip

Start with 12345678\Design\Surfaces\srfc-prprtis-anlysis-begin.dwg

srfc-prprtis-anlysis.mp4 5:13

Surface properties - Analysis
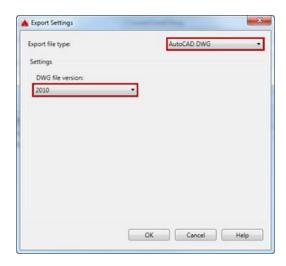
Several types of Surface Analyses can be performed in order to generate information helpful during design. Surface Analysis results can be displayed visually as a Surface Style and/or in tabular format as a Surface Legend. You will specify the number or ranges, range values (ie min and max) and corresponding display color. Surface Analysis display is turned on/off in the Display tab of a given Surface Style Editing window. The following Surface Analysis types are available in the Surface Properties window:

- Directions - TIN triangle color based on facing direction
- Elevation - TIN triangle color based on elevation range
- Slopes - TIN triangle color based on slope range (all values are positive)
- Slope Arrows - Direction arrow displayed at each TIN triangle. Color is based on slope range
- Contours - Contour color based on elevation range
- User-Defined Contour - Specify desired contour values and display based on elevation range
- Watersheds - Uses Surface Slope algorithm to analyze TIN triangles, draw Watershed boundaries and hatch according to type (ie Depression, Multi-Drain)

This training module will focus on Surface Slope Analysis. Specifically, you will analyze a proposed pavement Surface for drainage problem areas in flat or steep spots.

Generate and display surface slope analysis

Use a Surface Slope Analysis to identify potential problem areas in a proposed pavement Surface.
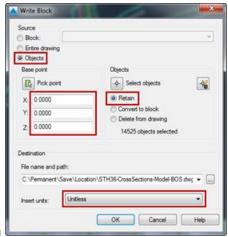
1. **Toolspace palette > Prospector tab > Expand Surfaces > Right-click Crdr-25> Surface Properties**
   A. **Analysis tab**
      I. **Analysis type** = Slopes
      II. **Legend** = WisDOT Standard
      III. **Ranges Number** = 2

      IV. Populate Range Details,
      V. **Range ID 1 Minimum Slope** = *default*, **Maxiumum Slope** = 0.29%
      VI. **Range ID 2 Minimum Slope** = 6.001%, **Maximum Slope** = *default*
      VII. **Range ID 2 Scheme (color)** = green
   B. **Information tab**

      I. Surface Style > Edit Current Selection
         a. **Display tab**
            i. Component display
            ii. Toggle Slopes Component to Visible
         b. OK
      II. OK
2. Pan and Zoom to see Surface Slopes Analysis displayed along **Crdr-25**
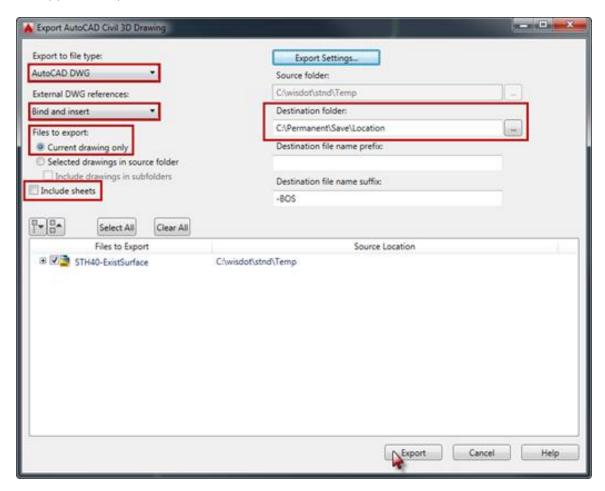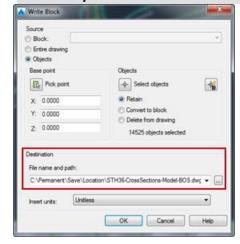
> 💡 **Tip:** To Display the "middle range" of Surface Slopes, specify 3 Slope ranges in the Surface Properties window Analysis tab. Set Slope range values and Scheme colors according to design criteria.

Modify profile to update corridor surface

1. Zoom to **PV-1** Profile View, Station 395+00
2. Observe 6.00% Slope on **25-Prop** Profile near Station 395+00
3. Select **25-Prop** Profile
4. **Profile Contextual Ribbon > Modify Profile panel > Geometry Editor**
   A. **Profile Layout Tools toolbar > Profile Grid View button**
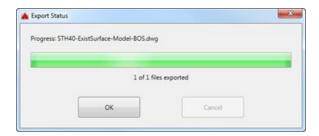
        I. Profile Entities panorama
- a. **Entity No 6 Grade Out** = 5.00%
- b. Enter
- c. Close Profile Entities panorama
- d. Close Profile Layout Tools toolbar

5. **Toolspace palette > Prospector tab > Expand Corridors > Right-click 25 > Rebuild**
6. Pan and Zoom to see updated Surface Slopes Analysis displayed along *Crdr-25*

> ℹ **Info:** See Profiles training module for more detailed information on Profiles and Profile editing

Add surface legend

1. **Ribbon > Annotate tab > Labels & Tables panel > Add Tables dropdown > Add Surface Legend Table**
   - A. Command Line: Enter (to pick from list)
     - I. Select *Crdr-25*
     - II. OK
   - B. Command Line: **S** (specify Slopes table type)
   - C. Enter
   - D. Command Line: **D** (specify Dynamic table type)
   - E. Enter
   - F. Click in Modelspace to insert table

Cropped surfaces

Last updated: 2017-06-06

Total video time: 2:56

> Exercise files: srfc-crop-data-c3d16.zip
>
> Start with 12345678\Design\Surfaces\srfc-crop-begin.dwg
>
> srfc-crop.mp4 2:56

Cropped surfaces

When working on a small area within a Surface which contains a large amount of data, it can be helpful to extract only the area of the Surface you need to work with. Do this with the Create Cropped Surface command. Using this command will create a new cropped Surface built from a source Surface. Edits can be pushed from the source Surface to the cropped Surface by saving the source drawing, rebuilding the cropped Surface Snapshot and rebuilding the cropped Surface. This workflow can conserve hardware resources, improve application performance and prevent drawing crashing.

Create cropped surface

1. Open srfc-crop-begin.dwg and srfc-crop-01.dwg
2. **Ribbon > Home tab > Create Ground Data panel > Surfaces dropdown > Create Cropped Surface**
    A. Click in Select crop area Value field
    B. Click ellipses
        I. Command Line: **P**
        II. [Enter]
        III. Draw polygon around desired area of Surface
        IV. Command Line: **C**
        V. [Enter]
    C. **Drawing for new surface** = Select an open drawing
    D. **Select an open drawing** = *srfc-crop-01.dwg
    E. **New surface name** = *Exist-crop*
    F. **Surface Style** = EX Triangles
    G. **Layer** = E_SURF
    H. [OK]
3. Make srfc-crop-01.dwg the active drawing
4. Zoom Extents

Update cropped surface

If you wish to apply edits from the source Surface to the cropped Surface, save the source drawing then Rebuild Snapshot of cropped Surface and Rebuild cropped Surface.

1. Save srfc-crop-begin.dwg
2. Make active or open srfc-crop-01.dwg
3. **Toolspace palette > Prospector tab > Expand Surfaces > Expand Exist-crop > Right-click Definition > Rebuild Snapshot**
4. **Toolspace palette > Prospector tab > Expand Surfaces > Expand Exist-crop > Definition > Rebuild Surface**

Subassemblies and assemblies

Subassembly elements

Last updated: 2018-02-14

Total video time: 04:56
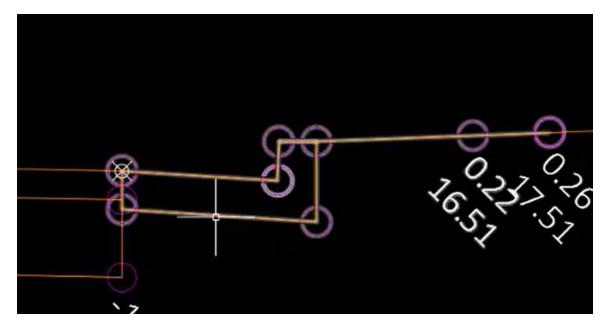
Subassembly elements

> Exercise files: sub-asmbly-data-c3d16.zip
>
> Start with CthE.dwg
>
> sa-sub-elemnt-01.mp4 04:56
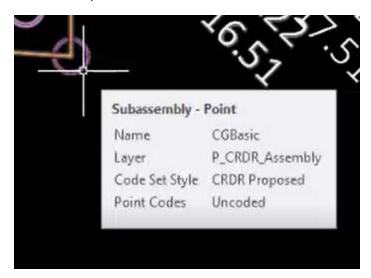
1. Hover over subassemblies to highlight
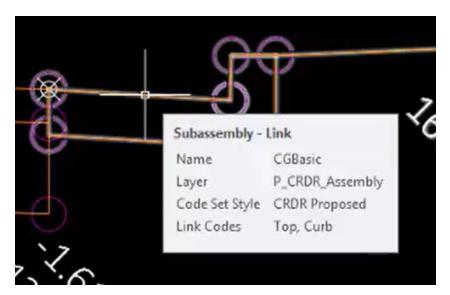
2. *Point Codes*
   - Hover over point codes for more information

3. *Links*
   - Hover over links for more information
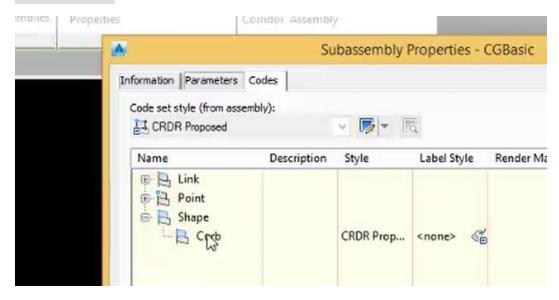
4. *Shape codes*
   - Left Click on *CGBasic*
   - **Contextual Ribbon>Subassembly Properties>Subassembly Properties dialog**

box>Codes tab

> 💡 **Tip:** To re-size point markers and labels, adjust drawing scale

Subassembly parameters

Last updated: 2018-02-14

Total video time: 04:56

Subassembly parameters

sa-sub-prmtr-01.mp4 04:56

Exercise files: sub-asmbly-data-c3d16.zip
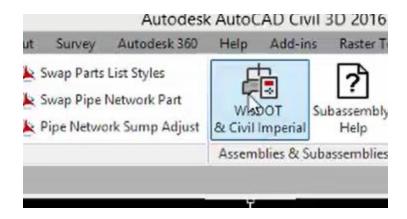
Start with CthE.dwg

sa-sub-prmtr-01.mp4 04:56

1. **WisDOT Design tab > Palettes On/Off > Assemblies & Subassemblies > WisDOT & Civil Imperial**
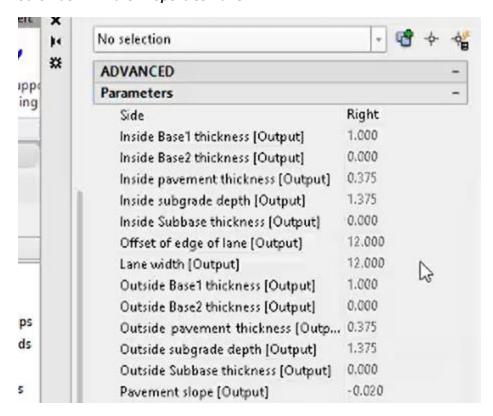
2. Select the **Lanes & Shoulders** tab of the Tool palette
3. Left Click on **LnExtendBase**

4. Scroll down in the **Properties Panel**

5. Make necessary changes to subassembly parameters
6. Left Click on Assembly marker
7. Esc

Corridor targets in subassemblies

Last updated: 2018-02-14

Total video time: 03:00

Corridor targets in subassemblies

Exercise files: sub-asmbly-data-c3d16.zip

Start with CthE.dwg

sa-sub-crdr-trgt-01.mp4 03:00

Subbassembly target types
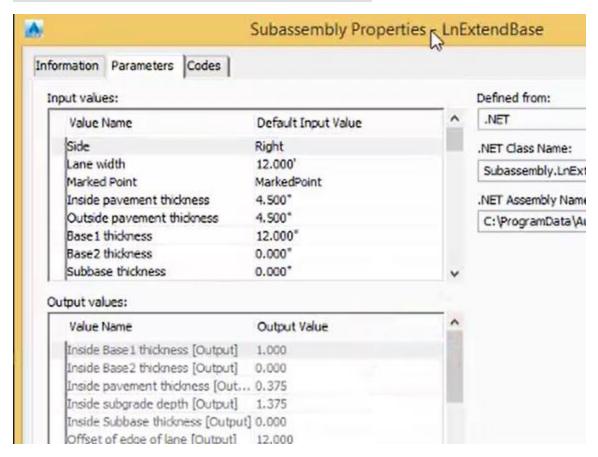
- Horizontal targets
- Vertical targets
- Surface targets

To view the default parameters for a subassembly

1. Left Click to select subassembly
2. **Contextual ribbon > subassembly Properties**

3. **Subassembly properties dialog box > parameters tab**

AutoDesk and WisDOT subassemblies

Last updated: 2018-02-14

Total video time: 02:59

Autodesk and WisDOT subassemblies

Exercise files: sub-asmbly-data-c3d16.zip

Start with CthE.dwg

sa-sub-adsk-wisdot-01.mp4 02:59
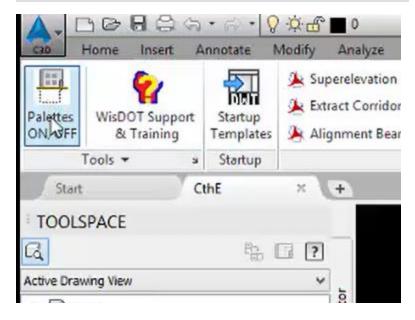
There are 2 set of subassemblies in the WisDOT template files

Autodesk subassemblies and WisDOT provided subassemblies
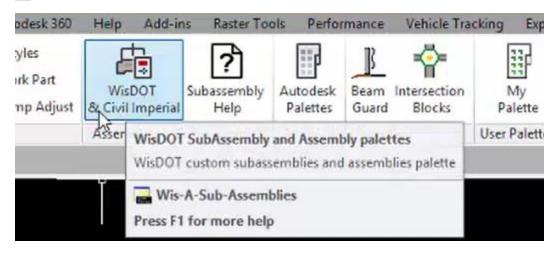
To access subassemblies

1. **Ribbon>WisDOT Design tab>Tools panel>Palettes ON/OFF**
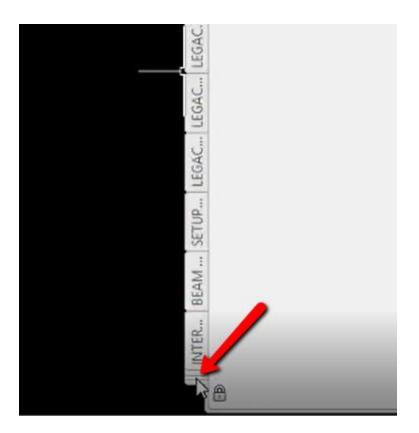
2. **Ribbon>WisDOT Desgn tab>Assemblies & Subassemblies panel>WisDOT & Civil Imperial**

3. Left Click on the bottom of the tabs on the tool palette

WisDOT Subassemblies are ALL CAPS

Do not mix WisDOT and Autodesk Lanes and Shoulders subassemblies

Subassemblies that superelevate

Last updated: 2018-02-14

Total video time: 03:47

Subassemblies that superelevate

Exercise files: sub-asmbly-data-c3d16.zip
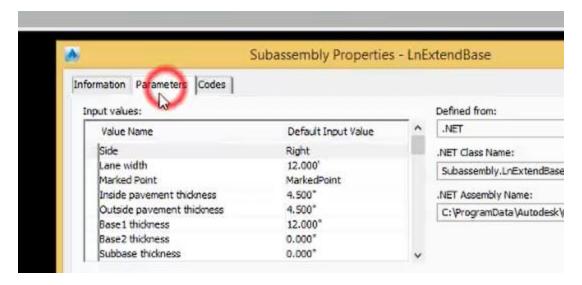
Start with CthE.dwg

sa-sub-supr-01.mp4 03:47
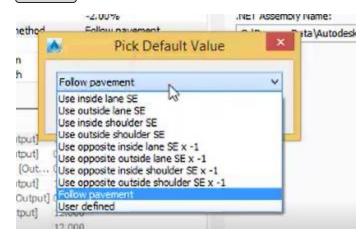
To view or modify the superelevation function of a subassembly

1. Left Click on **Subassembly**
2. **Contextual ribbon > Subassembly Properties > Subassembly properties dialog box > Parameters tab**

- Scroll down to superelevation data field
- Left Click in field to access **Pick Default Value dialog box**

- Select desired value
- Ok

Superelevation fields vary from subassembly to subassembly. Check parameters carefully and thoroughly.

Conditional subassemblies

Last updated: 2018-02-14

Total video time: 06:11

Conditional subassemblies Cut/fill targets

Exercise files: sub-asmbly-data-c3d16.zip

Start with CthE.dwg
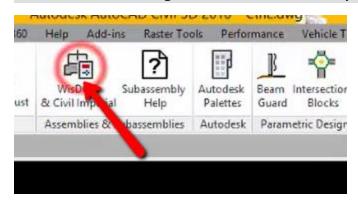
sa-sub-cndtnl-01.mp4 03:25

To access default conditional subassemblies

1. **Ribbon > WisDOT Design tab > Palettes ON/OFF**
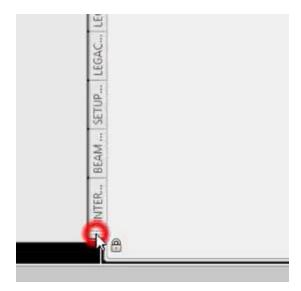
2. **Ribbon > WisDOT Design tab > WisDOT & Civil Imperal**

3. Left Click on bottom of tabs in *Tool Palette*
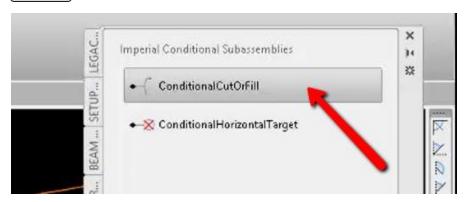
4. select **Conditional**

5. [Left Click] on *ConditionalCutFill* to access options for the subassembly
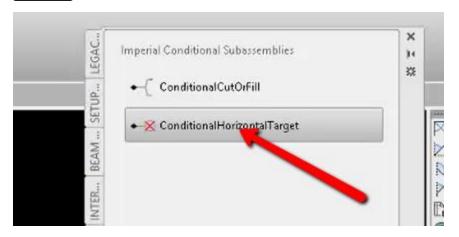
> **ⓘ Info:** The width and slope settings in the parameters of conditional subassemblies has no effect on the design. It is purely a visual reference.

Conditional subassemblies Horizontal targets

sa-sub-cndtnl-02.mp4 02:46

Left Click on **ConditionalHorizontalTarget** to access options for the assembly.

> ⓘ **Info:** The width and slope settings in the parameters of conditional subassemblies has no effect on the design. It is purely a visual reference.

Subassembly help files

Last updated: 2018-02-14

Total video time: 04:42

Subassembly help files

Exercise files: sub-asmbly-data-c3d16.zip

Start with CthE.dwg
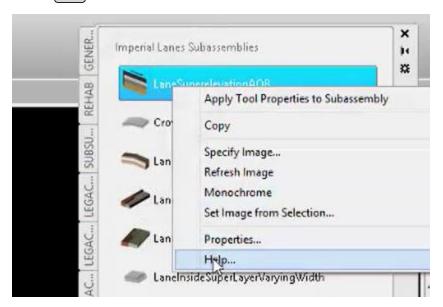
sa-sub-hlp-01.mp4 04:42

To access the subassembly help files

1. Navigate to desired **subassembly** in Tool Palette
2. Right Click on **subassembly**
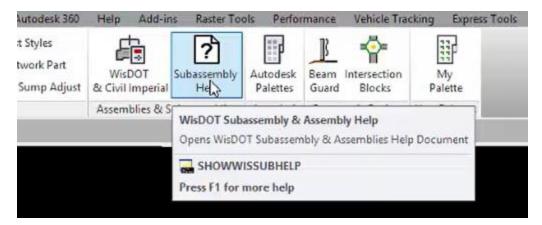
3. Select Help

Addituionally to access WisDOT subassembly help files

1. **Ribbon > WisDOT Design tab > Subassembly Help**

> 💡 **Tip:** You can also use the command `SHOWWISSUBHELP` to access WisDOT sub-assembly help files.

Assembly basics

Last updated: 2018-02-14

Total video time: 11:42

Assembly basics

Exercise files: sub-asmbly-data-c3d16.zip
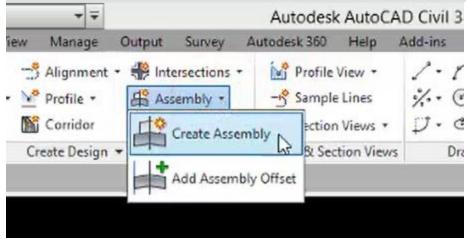
Start with CthE.dwg

sa-asmbly-basc-01.mp4 02:04

Create assembly

sa-asmbly-basc-02.mp4 03:39

1. **Home tab of ribbon > Create Design panel > Assembly drop down > Create Assembly**
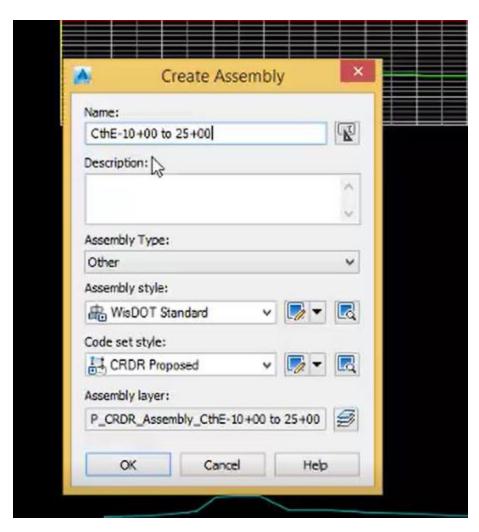
   A. Name: ***CthE-10+00 to 25+00***
   B. Assembly Type: **Other**
   C. Assembly Style: **WisDOT Standard**
   D. Code set style: **CRDR Proposed**

    E. OK
2. Left Click to place assembly
3. Double check label
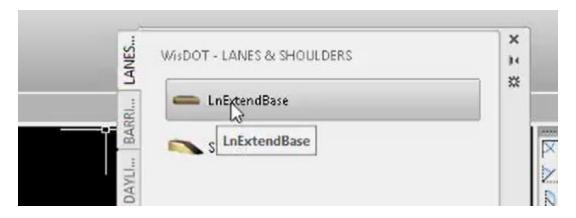
Connect subassemblies to assembly

sa-asmbly-basc-03.mp4 02:59

Ribbon > WisDOT Design tab > Palettes ON/OFF > WisDOT & Civil Imperial
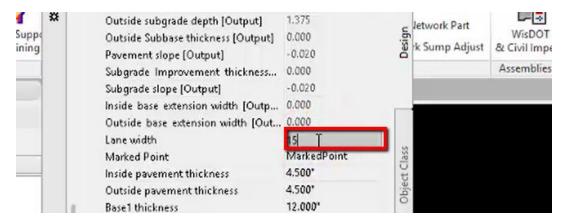
1. LANES tab of TOOL PALETTE
2. Left click *LnExtendBase*

3. PROPERTIES panel
   i. Lane width: **15**
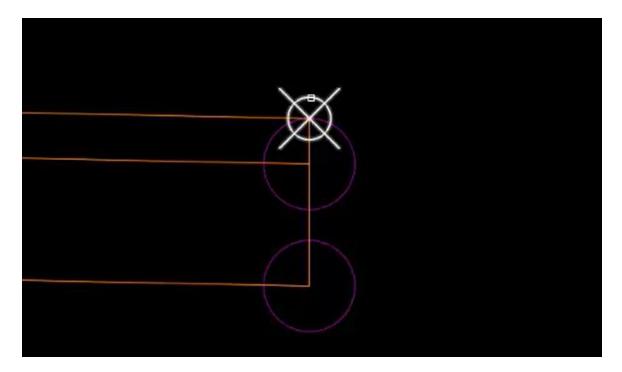
4. [Left click] on Assembly marker
5. [Left click] on ***ShldGeneric***

6. [Left click] on appropriate marker

Assembly basics
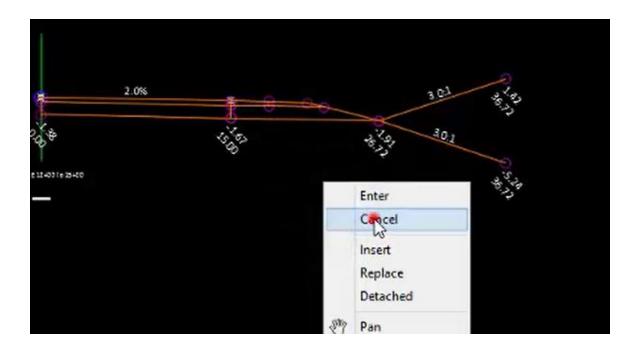
7. Select the DAYLIGHT tab of the tool palette
8. Left Click *DaylightProfileControlled* subassembly

9. Left click on appropriate marker
10. Right click and select Cancel

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Published on: 2/15/2018
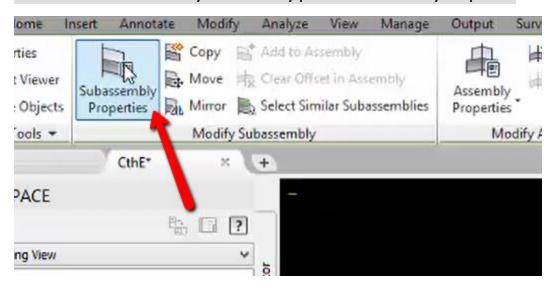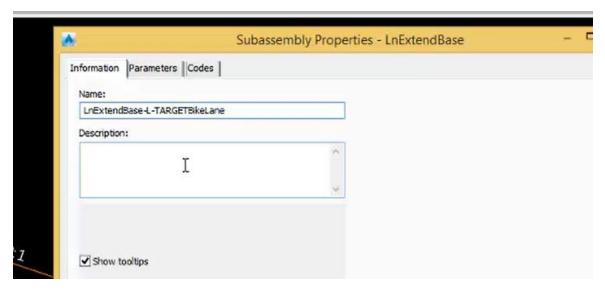
Naming subassemblies in an assembly

sa-asmbly-basc-04.mp4 01:36

1. Left Click on subassembly
2. **Contextual ribbon > Modify Subassembly panel > Subassembly Properties**

3. **Subassembly Properties dialog box > Information tab**
4. Name: ***LnExtendBase-L-TARGETBikeLane***
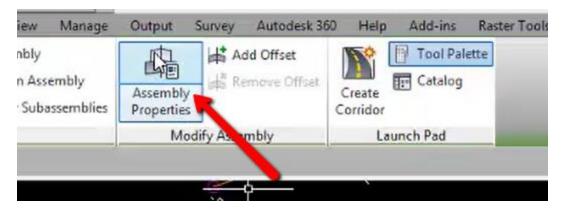
5. OK

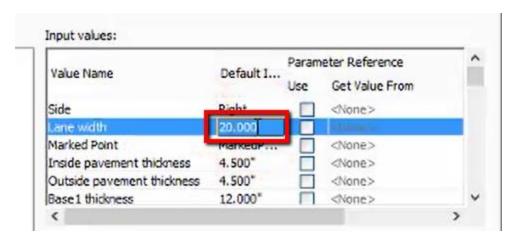*Referencing subassembly parameters*
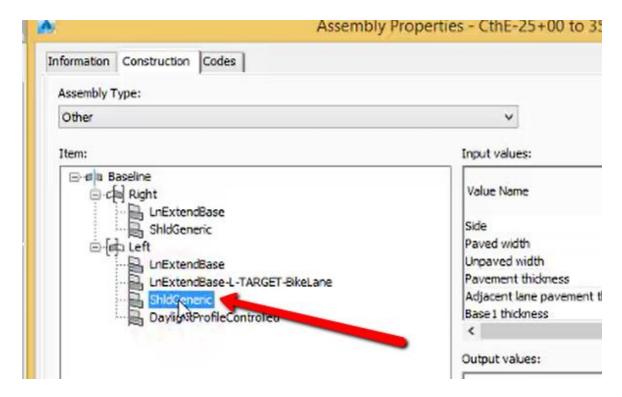
sa-asmbly-basc-05.mp4 02:24

1. Left Click on Assembly Marker
2. **Contextual ribbon > Modify assembly > Assembly Properties**
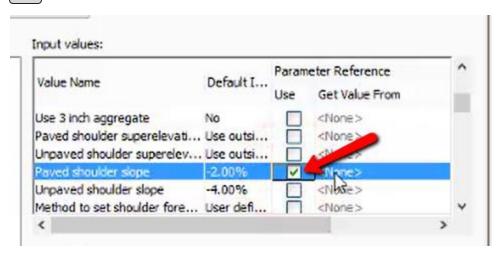
3. **Assembly Properties dialog box > Construction tab > Item Window**
4. Left click to Select **Left > ShldGeneric**
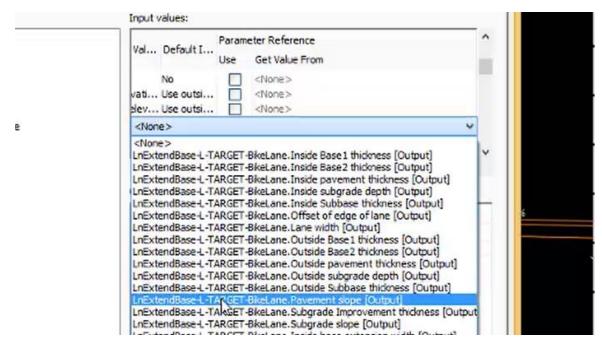
5. In the Input values window, scroll down to **Paved shoulder slope**
6. Click the **Use** checkbox

7. In the **Get value from field**, select **LnExtendBase-L-TARGET-BikeLane.Pavement slope [Output]**

8. OK

Commands to change structure of subassemblies in assemblies

Last updated: 2018-02-14

Total video time: 04:53

Commands to change structure of subassemblies in assemblies

> Exercise files: sub-asmbly-data-c3d16.zip
>
> Start with CthE.dwg
>
> sa-asmbly-sub-cmnd-01.mp4 04:53
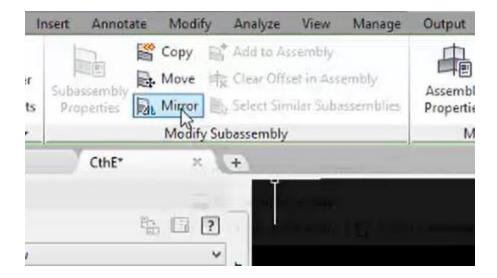
Important to NOT use the base AutoCAD copy, mirror, or move commands with subassemblies.
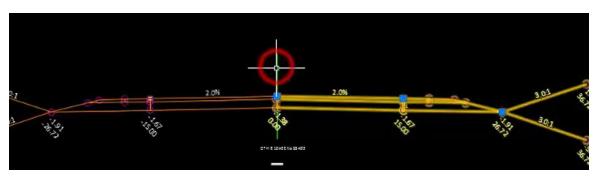
Mirror

1. Select subassemblies to mirror
2. **Contextual ribbon > Modify Subassemblies panel > Mirror**
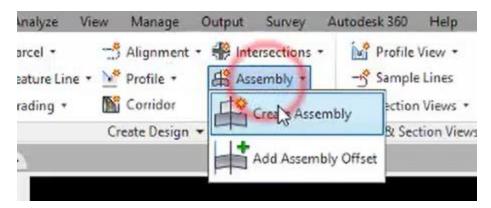
3. Select Assembly marker

4. Esc
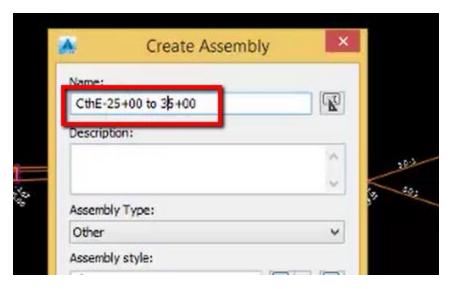
Create new assembly

1. **Ribbon > Home tab > Create Design panel > Assembly > Create Assembly**

2. **Create assembly dialog > Name field**
3. Type CthE-25+00 to 35+00
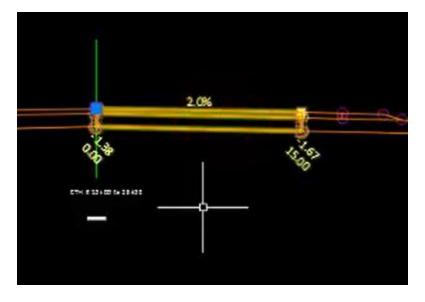
4. OK
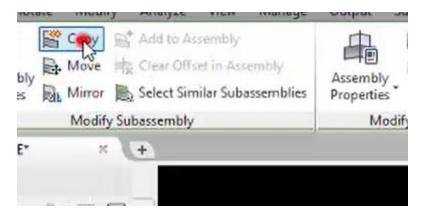
Copy

1. Select **lane** subassembly on right side

2. **Contextual Ribbon > Modify Subassemblies panel > Copy**
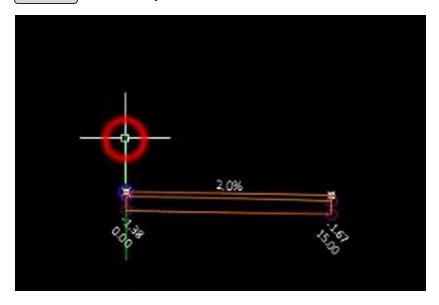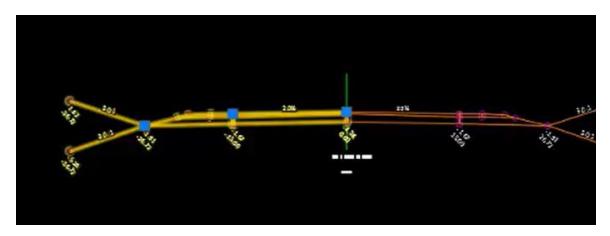
3. Left click on **Assembly Marker**
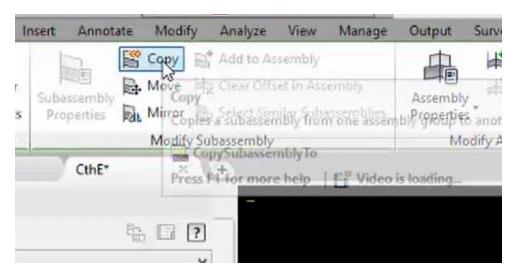
4. Window select all **left side** subassemblies
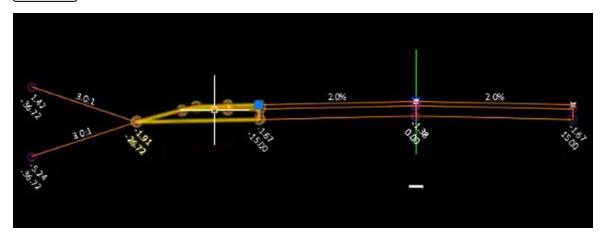
5. **Contextual Ribbon > Modify Subassemblies panel > Copy**
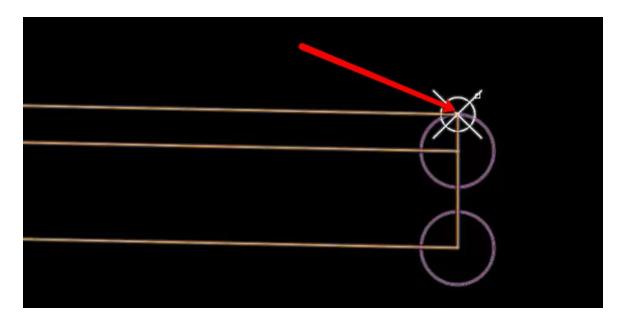
6. [Left Click] on **Assembly marker**
7. [Left Click] on left side **shoulder** subassembly
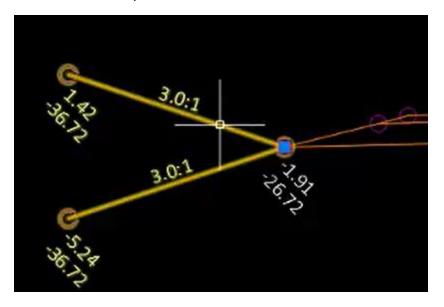
8. **Contextual Ribbon > Modify Subassemblies > Mirror**
9. [Left Click] on white edge of traveled way marker on right side lane

Move
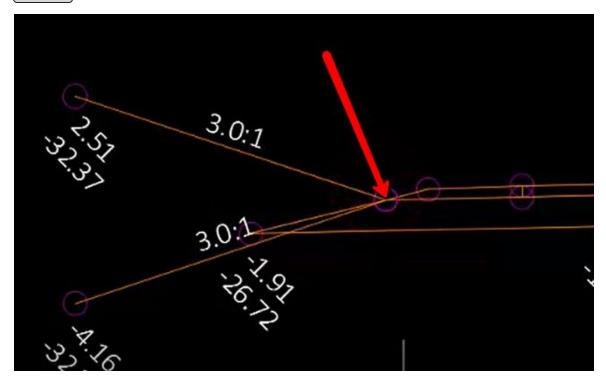
1. Select subassembly to move

2. **Contextual Ribbon > Modify Subassemblies panel > Move**

3. [Left click] on subassembly **point marker** of desired location

Copying entire assemblies

Last updated: 2018-02-14

Total video time: 03:52

Copying entire assemblies

Exercise files: sub-asmbly-data-c3d16.zip
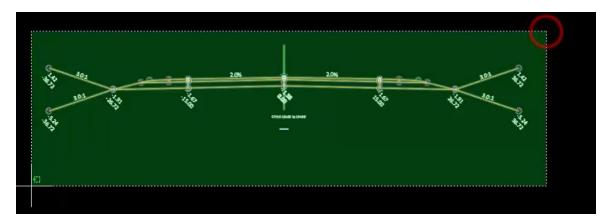
Start with CthE.dwg

sa-asmbly-copy-01.mp4 03:52

Copy Assembly
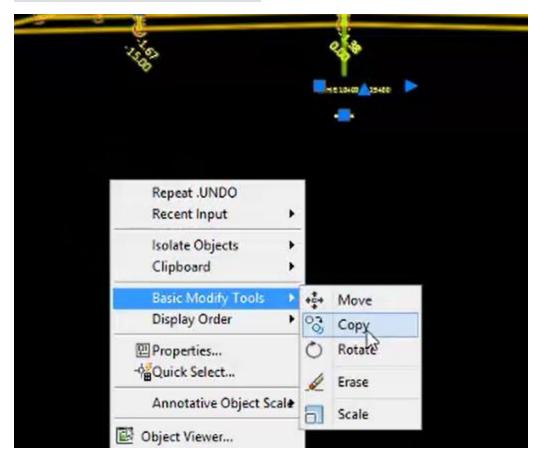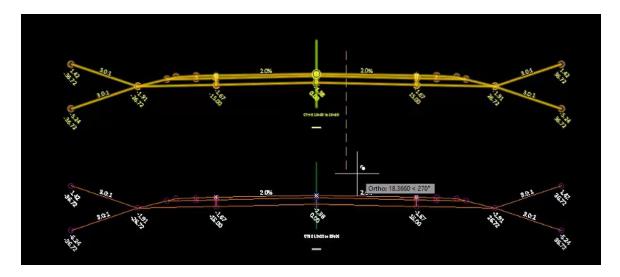
1. Window select entire assembly
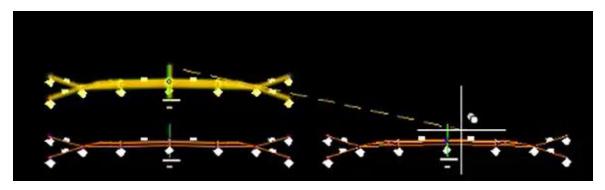
2. **Right click>Basic Modify Tools>Copy**

3. Left Click point of displacement
4. Left Click new location below
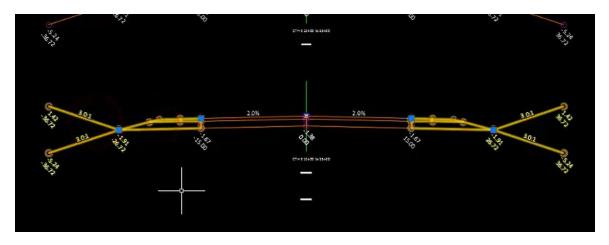
5. [Left Click] new location to the right

6. [Enter] to end command

Modify copied assemblies and rename
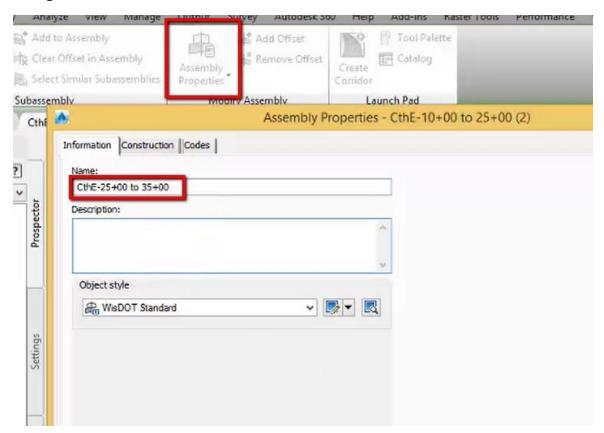
1. Select Shoulder and Daylight assemblies

2. [Delete]

3. Esc
4. Left Click assembly marker
5. **Contextual ribbon>Modify Assembly panel>Assembly Properties>Assembly Properties dialog box>Information tab**
6. Change name to *CthE-25+00 to 35+00*

7. OK
8. **RE** Enter to regenerate labels

Editing subassembly parameters in assemblies

Last updated: 2018-02-14

Total video time: 02:33

Editing subassembly parameters in assemblies

Exercise files: sub-asmbly-data-c3d16.zip
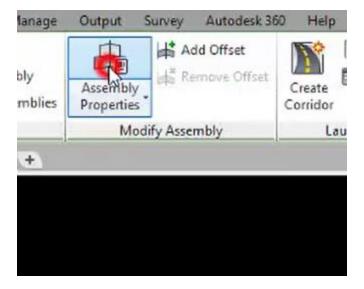
Start with CthE.dwg

sa-asmbly-edit-sub-prmtr-01.mp4 02:33
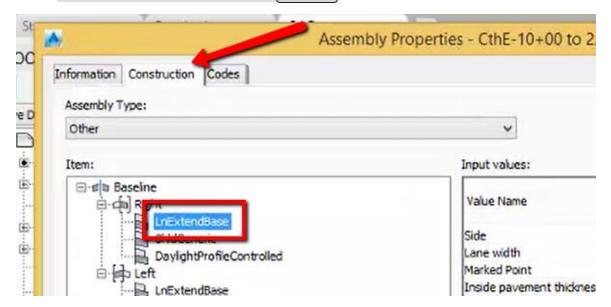
Method 1

1. Left Click on *Assembly Marker*
2. **Contextual ribbon > Modify Assembly panel > Assembly Properties**

3. **Assembly Properties dialog box > Construction tab**
4. In the **Items window > Baseline > Right** Left Click on *LnExtendBase*
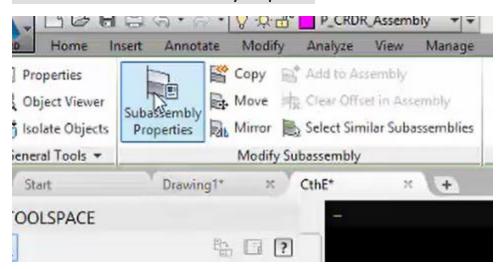
5. In the Input Values window, scroll down to Lane Width
6. Change value to **20**

7. Apply
8. OK
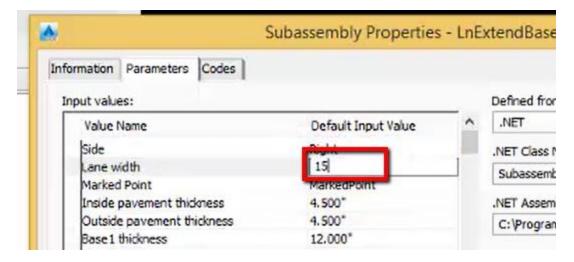
Method 2

1. Left Click on *subassembly*
2. **Contextual ribbon > Subassembly Properties**

3. **Subassembly Properties dialog box > Parameters tab**
4. Input Values window change the Lane width value to 15
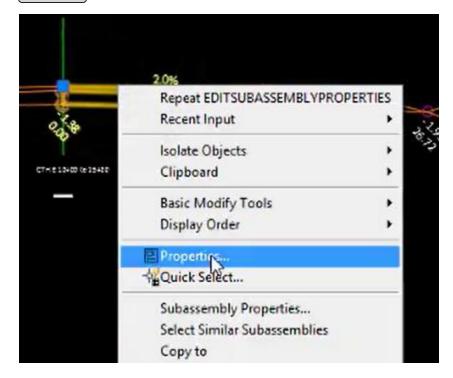
5. OK
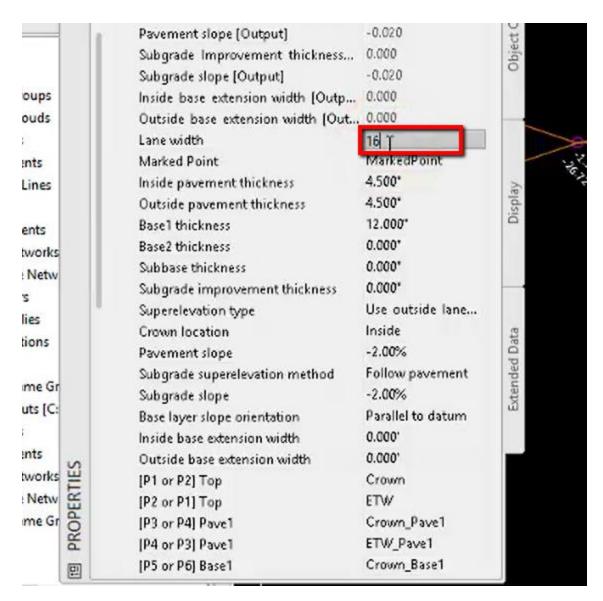
Method 3

1. Left Click on *subassebly*
2. Right Click
3. Properties

4. In the Properties panel, scroll down to the parameters
5. Change lane width value to 16

Pavement slope [Output]	-0.020
Subgrade Improvement thickness...	0.000
Subgrade slope [Output]	-0.020
Inside base extension width [Outp...	0.000
Outside base extension width [Out...	0.000
Lane width	16
Marked Point	MarkedPoint
Inside pavement thickness	4.500"
Outside pavement thickness	4.500"
Base1 thickness	12.000"
Base2 thickness	0.000"
Subbase thickness	0.000"
Subgrade improvement thickness	0.000"
Superelevation type	Use outside lane...
Crown location	Inside
Pavement slope	-2.00%
Subgrade superelevation method	Follow pavement
Subgrade slope	-2.00%
Base layer slope orientation	Parallel to datum
Inside base extension width	0.000'
Outside base extension width	0.000'
[P1 or P2] Top	Crown
[P2 or P1] Top	ETW
[P3 or P4] Pave1	Crown_Pave1
[P4 or P3] Pave1	ETW_Pave1
[P5 or P6] Base1	Crown_Base1

6. Esc

Place WisDOT assembly in modelspace from tool palette

Last updated: 2018-02-14

Total video time: 01:38

Place WisDOT assemby in model space from tool palette

Exercise files: sub-asmbly-data-c3d16.zip
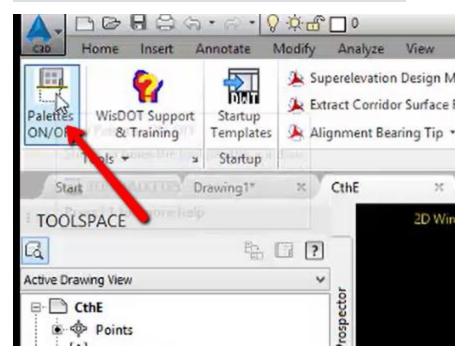
Start with CthE.dwg
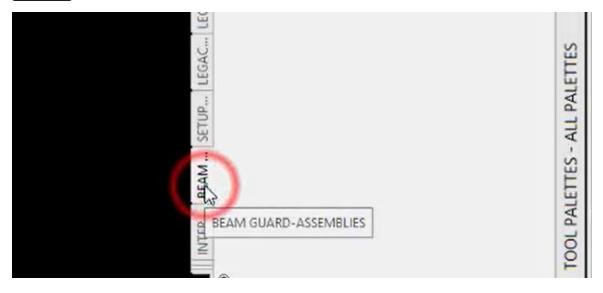
sa-asmbly-plac-wisdot-01.mp4 01:38

1. **Ribbon>WisDOT Design tab>Tools panel>Palettes ON/OFF**

2. Left Click on *BEAM GUARD ASSEMBLIES* tab

3. Left Click on *Beam Guard* assembly

4. ⌈Left Click⌋ desired location in model space
5. ⌈Enter⌋

Create custom assembly

Last updated: 2018-02-14

Total video time: 04:46
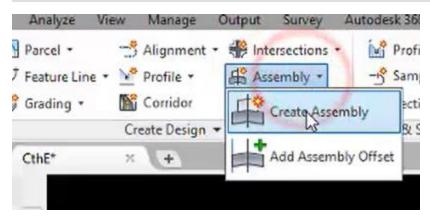
Create custom assembly

Exercise files: sub-asmbly-data-c3d16.zip

Start with CthE.dwg
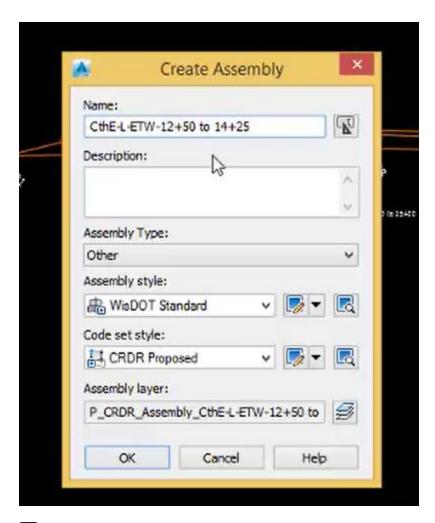
sa-asmbly-creat-cstm-01.mp4 04:46

1. **Home tab of ribbon > Create Design panel > Assembly > Create Assembly**
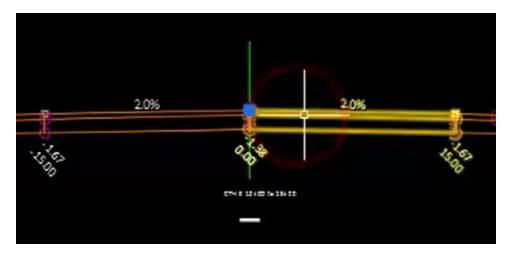
2. Name new assembly *CthE-L-ETW-12+50 to 14+25*

Create custom assembly
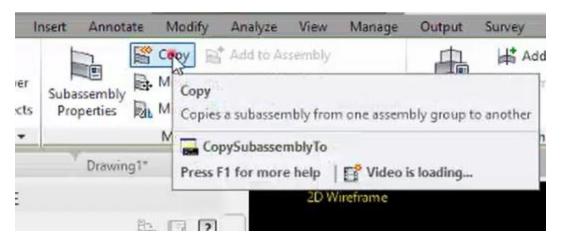
3. OK
4. Left click in model space to place assembly
5. Select the right side **lane subassembly** from the assembly above
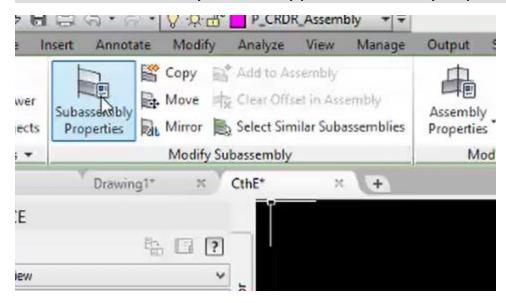
6. **Contextual ribbon > Modify Subassebly panel > Copy**
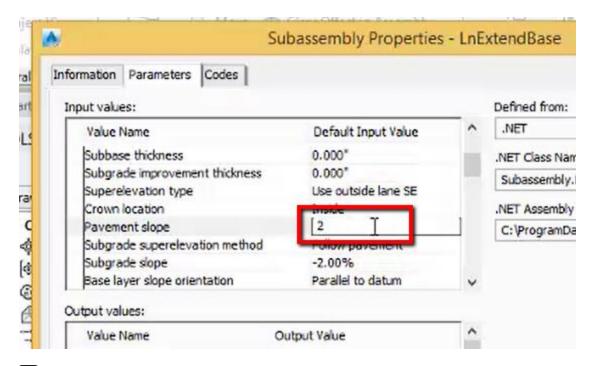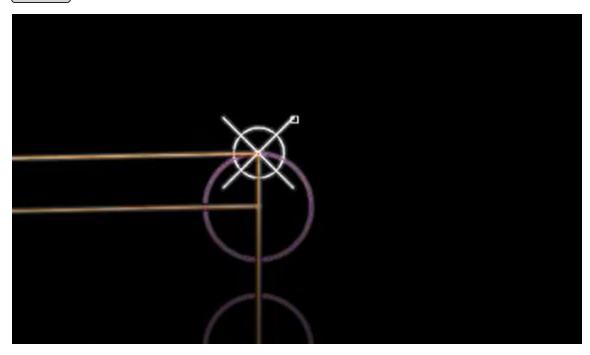
7. Left click on assembly marker ***CthE-L-ETX-12+50 to 14+25***
8. Left click on newly copied **subassembly**
9. **Contextual ribbon > Modify Subassembly panel > Subassemby Properties**

10. Select the **Parameters tab** of Subassembly properties dialog box
11. Change the Pavement slope value to 2

12. OK
13. Select the right side **lane assembly** from the assembly above
14. **Contextual ribbon > Modify Subassembly > Copy**
15. Left click on **white marker** of lane assembly

16. Select the right side **shoulder** and **daylight subassemblies** from the assembly above
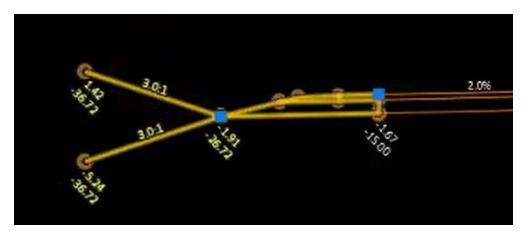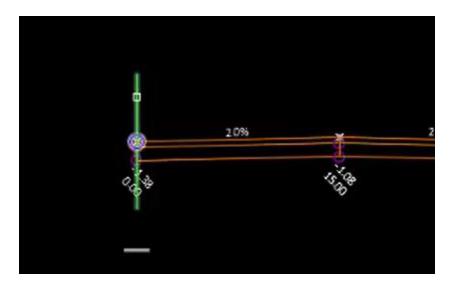
17. **Contextual ribbon > Modify Subassembly panel > Copy**
18. [Left click] on **white marker** of newest lane subassembly

19. Select the left side **shoulder** and **daylight subassmblies** from the assembly above
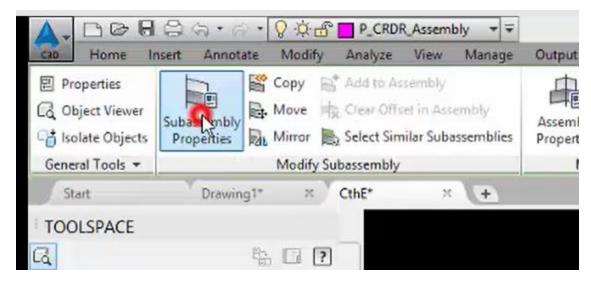
20. **Contextual ribbon > Modify Subassembly panel > Copy**
21. [Left Click] on assembly marker *CthE-L-ETW-12+50 to 14+25*
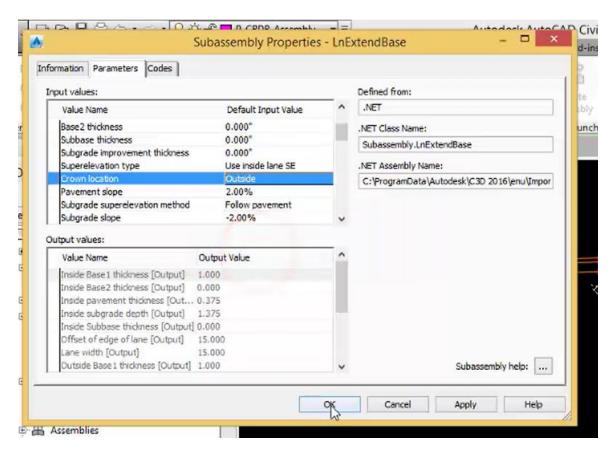
Review subassembly parameters

1. Left click on subassembly
2. **Contextual ribbon > Modify Subassembly panel > Subassembly Properties**

3. **Parameters tab** of Subassembly Propeties dialog box

4. Verify parameters are correct for assembly conditions
5. OK

WisDOT subassemblies and superelevation (Civil 3D 2012 and beyond)

Last updated: 2015-04-21

WisDOT subassemblies and superelevation (Civil 3D 2012 and beyond)

Civil 3D 2012 provides new superelevation controls. This content explains what the new functionality means for users of the WisDOT subassembly library.

The new superelevation functionality is described in the What's New help file content, accessed in the top right corner of Civil 3D interface. You can also view the version upgrade videos at ftp://ftp.dot.wi.gov/dtsd/bpd/methods/c3d-trn/wisdot-c3d-train-manual.pdf#190_050_Superelevation_changes.

New features

New Features

AutoCAD Civil 3D 2012 contains many new features and enhancements.
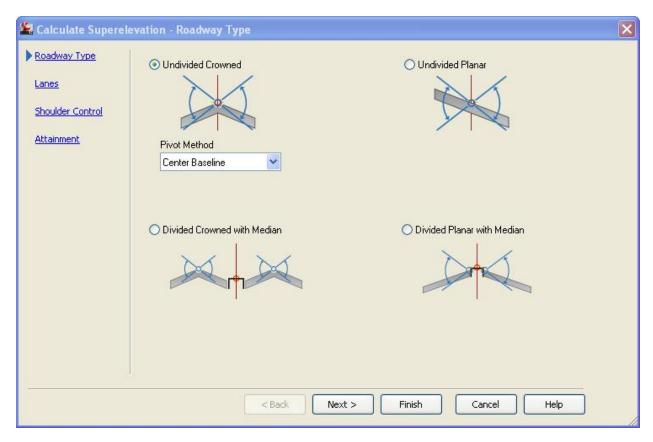
Design
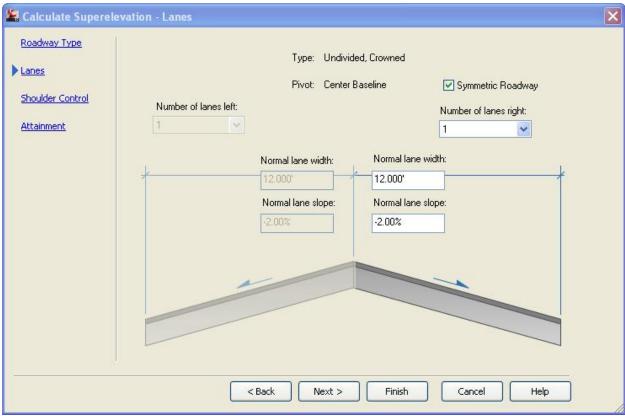
- Editing Alignment Constraints
- Alignment Points of Intersection
- Superelevation Axis of Rotation Pivot Methods ←
- Superelevation Shoulder Rollover Control (Calculate Superelevation - Shoulder Control page) ←
- Setting Corridor Targets from Section Editor
- Adding a Corridor Region in the Section Editor
- Changing an Assembly in a Corridor Region
- Specifying a Section Editor Station in Plan and Profile
- Viewing Civil 3D Objects in Section Editor
- Sampling Multiple Baselines
  - Watch Video With Audio [00:03:19]
- Creating a Pipe Network from Imported GIS Data
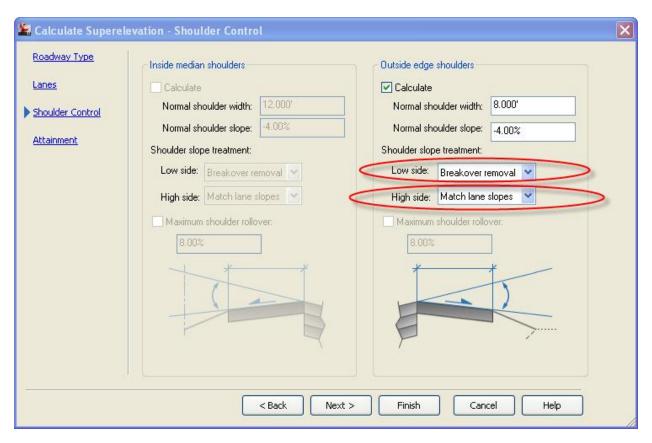
The C3D2012 stock subassembly library is built to work in tandem with new superelevation controls in the superelevation wizard to add flexibility in defining how corridors handle superelevation. If you want to explore the new superelevation controls, build an assembly using Autodesk's LaneSuperelevationAOR subassembly, run through different combinations of superelevation configurations, and monitor the changes to the assemblies' behavior in a corridor. Controls like the inputs for Potential Pivot, Slope Direction, and specifying SE side different from insertion direction all work to allow flexibility in defining the Axis of Rotation through superelevation transitions.
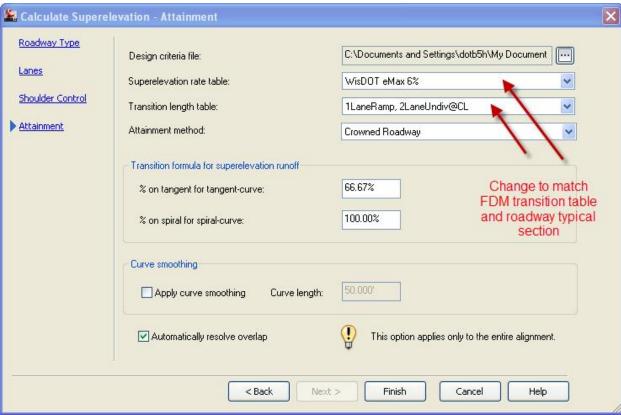
The WisDOT subassembly library is not built to use this functionality. In fact, with some combinations of Superelevation wizard inputs, WisDOT subassembly corridors will produce a slew of error messages and may not read the intended lane slopes. The WisDOT subassembly library already has the superelevation controls needed for WisDOT design standards built into lane and shoulder subassembly logic. If you choose to use the WisDOT library for your roadway lanes and shoulders, the alignment superelevation should be developed in the superelevation wizard as follows:

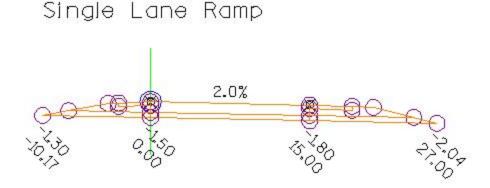WisDOT subassemblies and superelevation (Civil 3D 2012 and beyond)

Remember to run the Superelevation Update macro and you now have the baseline super-elevation properties needed to use WisDOT subassemblies in your corridors. This same Undi-vided – Crowned superelevation setup will work for all cases of general roadway design with WisDOT subassemblies.

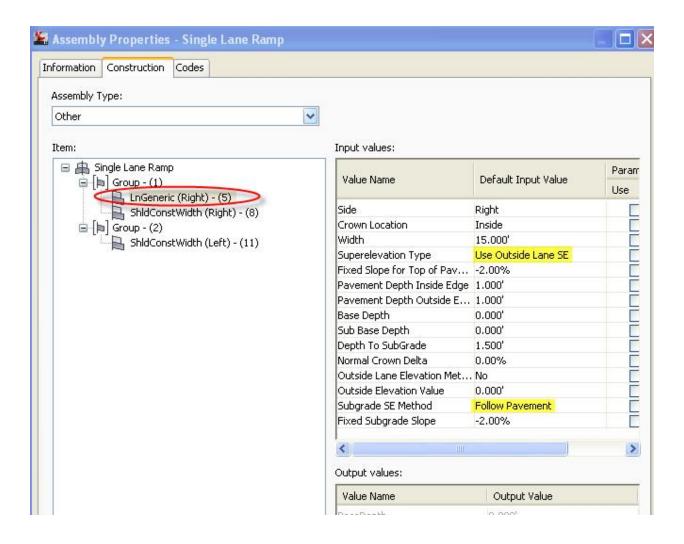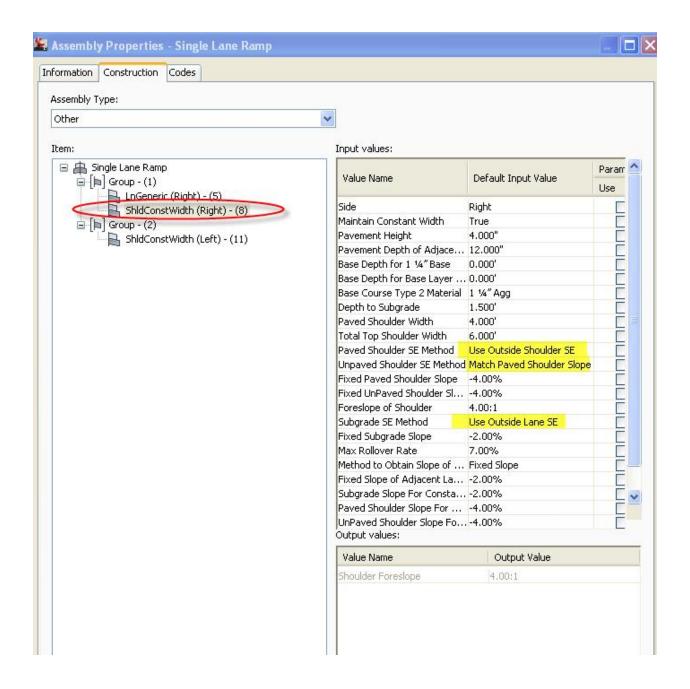For more information on WisDOT's superelevation macro and why it is needed, see Civil 3D New User Training, alignments module.

WisDOT subassembly inputs

So how do you set up your WisDOT subassemblies' superelevation controls in this system? For detailed information on subassembly behavior, review the subassembly help files. To help you get started, here's a look at several different roadway typical section types:

Case 1: Single lane ramp, crown at lane edge, planar subgrade (shoulder slopes down at crown but subgrade continues upward)
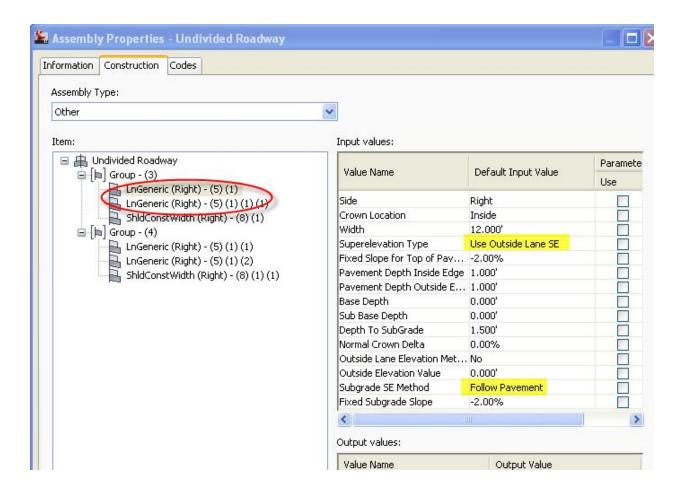
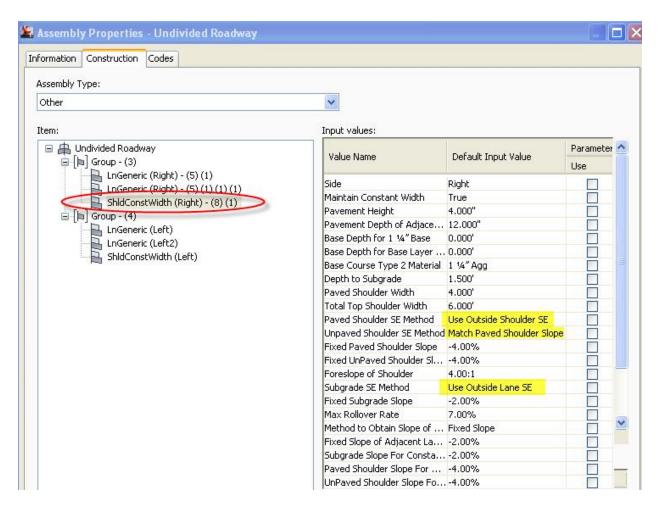## Assembly Properties - Single Lane Ramp

Information | Construction | Codes

Assembly Type:

Other

Item:

- Single Lane Ramp
  - Group - (1)
    - LnGeneric (Right) - (5)
    - ShldConstWidth (Right) - (8)
  - Group - (2)
    - ShldConstWidth (Left) - (11)

Input values:

Value Name	Default Input Value	Param Use
Side	Right	
Maintain Constant Width	True	
Pavement Height	4.000"	
Pavement Depth of Adjace...	12.000"	
Base Depth for 1 ¼" Base	0.000'	
Base Depth for Base Layer ...	0.000'	
Base Course Type 2 Material	1 ¼" Agg	
Depth to Subgrade	1.500'	
Paved Shoulder Width	4.000'	
Total Top Shoulder Width	6.000'	
Paved Shoulder SE Method	Use Outside Shoulder SE	
Unpaved Shoulder SE Method	Match Paved Shoulder Slope	
Fixed Paved Shoulder Slope	-4.00%	
Fixed UnPaved Shoulder Sl...	-4.00%	
Foreslope of Shoulder	4.00:1	
Subgrade SE Method	Use Outside Lane SE	
Fixed Subgrade Slope	-2.00%	
Max Rollover Rate	7.00%	
Method to Obtain Slope of ...	Fixed Slope	
Fixed Slope of Adjacent La...	-2.00%	
Subgrade Slope For Consta...	-2.00%	
Paved Shoulder Slope For ...	-4.00%	
UnPaved Shoulder Slope Fo...	-4.00%	

Output values:

Value Name	Output Value
Shoulder Foreslope	4.00:1

Case 2: Undivided Roadway with crown (Left side same settings as right)

Undivided Roadway

Assembly Properties - Undivided Roadway

Information | Construction | Codes

Assembly Type:

Other

Item:

- Undivided Roadway
  - Group - (3)
    - LnGeneric (Right) - (5) (1)
    - LnGeneric (Right) - (5) (1) (1) (1)
    - ShldConstWidth (Right) - (8) (1)
  - Group - (4)
    - LnGeneric (Right) - (5) (1) (1)
    - LnGeneric (Right) - (5) (1) (2)
    - ShldConstWidth (Right) - (8) (1) (1)

Input values:

Value Name	Default Input Value	Paramete Use
Side	Right	☐
Crown Location	Inside	☐
Width	12.000'	☐
Superelevation Type	Use Outside Lane SE	☐
Fixed Slope for Top of Pav...	-2.00%	☐
Pavement Depth Inside Edge	1.000'	☐
Pavement Depth Outside E...	1.000'	☐
Base Depth	0.000'	☐
Sub Base Depth	0.000'	☐
Depth To SubGrade	1.500'	☐
Normal Crown Delta	0.00%	☐
Outside Lane Elevation Met...	No	☐
Outside Elevation Value	0.000'	☐
Subgrade SE Method	Follow Pavement	☐
Fixed Subgrade Slope	-2.00%	☐

Output values:

Value Name	Output Value

Case 3: Divided Roadway with median, baseline at median edge or center of median, crown between lanes (only showing one of the divided roadways, the other is a mirror image)

Divided Roadway

WisDOT subassemblies and superelevation (Civil 3D 2012 and beyond)

Frequently asked questions

What do you prefer that we do? Use WisDOT lane/shoulder subassemblies, or stock? Should I change my assemblies to use the stock subassemblies?

Some possible scenarios:

I'm starting a new corridor

My corridor is built, but there's time to change it

I have a PS&E in 4 months

The choice is yours. We developed the WisDOT subassemblies to use point, link, and shape codes that are compatible with the stock subassemblies' codes, allowing use of WisDOT and Autodesk subassemblies side-by-side resulting in consistent surface and corridor output. And, with the new superelevation functionality in C3D2012 the Autodesk lanes and shoulders sub-assembly offerings have the needed controls to develop superelevation as per our design stand-ards. So you have some flexibility to choose which subassemblies work best for your design intentions.
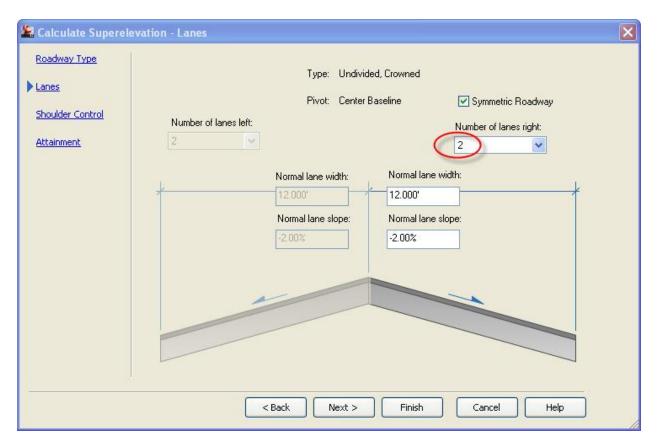
There are limitations to this flexibility however. Each alignment has a single set of super-elevation properties, and these superelevation properties may need to be different for WisDOT subassemblies vs. Autodesk subassemblies because of the differences in subassembly logic. The WisDOT subassemblies can't correctly read the Axis of Rotation information created by some input combinations in the Superelevation Wizard, so you shouldn't use both Autodesk and WisDOT lanes/shoulders on the same corridor baseline alignment. For each baseline alignment, use all WisDOT subassemblies on superelevated parts of your assemblies, or use all Autodesk subassemblies on superelevated parts of your assemblies. Don't mix up lanes and shoulders sub-assemblies, or other superelevated subassemblies, on the same baseline alignment. You can use non-superelevated WisDOT subassemblies in combination with Autodesk lanes and shoulders.
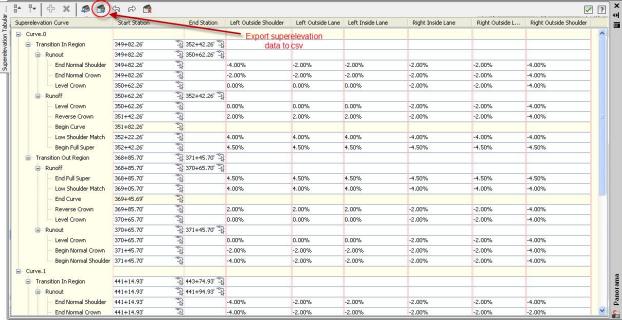
Keep in mind there is other functionality in some of the WisDOT lanes and shoulders that isn't currently in the stock subassemblies. So you have to choose what's right for your situation.

Are you telling us to never use "Use Inside Lane SE"? What about an urban roadway with park-ing lanes where the parking lane slope varies to match adjacent properties? Wouldn't we need to use inside and outside lane superelevation there?

You can still use Inside Lane superelevation definition for situations that need it. WisDOT sub-assemblies will correctly read the Inside Lane SE data. To include the Inside Lane Super-elevation containers in an alignment's superelevation properties, use a number value of 2 in the Number of lanes field in the Lanes dialog box of the Superelevation Wizard, other settings are as shown above.

You probably will not get design-ready results from the Superelevation Wizard in this scenario; you may have to do some manual editing of the lane slope values and transition locations in the tabular editor.

Another way to do mass changes is to the tabular editor superelevation data is to export to a csv file, edit the csv file in Microsoft Excel, and import the edited csv back into the alignment's tabular editor superelevation data. A csv file is a comma-separated value file that can be opened in Excel and edited with common spreadsheet copy-paste functions.

Corridor modeling fundamentals

Corridor basics

Last updated: 2018-02-12

Total video time: 03:14

> crdr-basc-01.mp4 03:14
>
> crdr-basc-data-c3d16.zip

Corridor Object - A 3 dimensional object built from horizontal, vertical and cross sectional geometry.

Alignment - Controls the horizontal geometry of a corridor object

Profile - Controls the vertical geometry of a corridor object

Assembly - Controls the cross sectional geometry of a corridor object

Corridor properties

Last updated: 2018-02-14

Total video time: 08:03

Regions
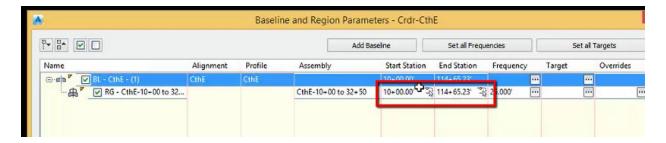
> Exercise files: crdr-data-c3d16.zip
>
> Start with CthE.dwg
>
> crdr-prprtis-01.mp4 02:31
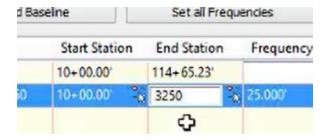
Regions of a corridor are defined by a station range and an assembly

To set the station range

1. Left click in the Start Station column
2. Type 1000
3. Left click in the End Station Column
4. Type 3250

5. Enter

Frequency
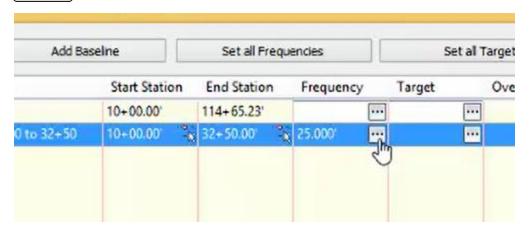
crdr-prprtis-02.mp4 05:32

Frequency defines how often the assembly is applied along the baseline

To adjust frequency
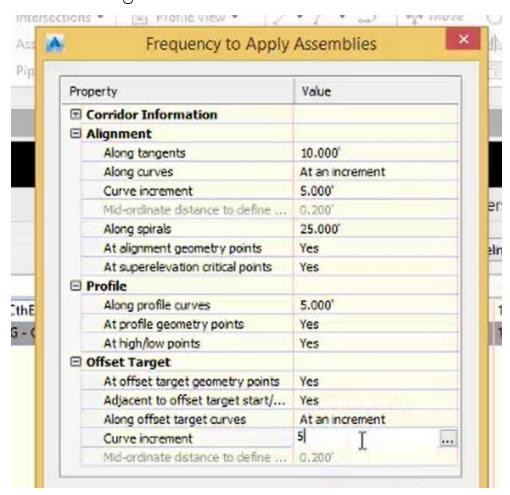
1. [Left click] the ellipses in the frequency column

2. Adjust frequency settings
   1. Along tangents [10]
   2. Along curves **At an incriment**
   3. Curve increment [5]
   4. Along spirals [25]
   5. At alignment geometry points **Yes**
   6. At superelevation critical points **Yes**
   7. Along profile curves [5]
   8. At profile geometry points **Yes**
   9. At high/low points **Yes**
   10. At offset target geometry points **Yes**
   11. Adjacent to offset target start/stop **Yes**
   12. Along offset target curves **At an increment**

13. Curve increment 5

3. Add Additional stationing
4. Left click Plus sign

5. Type 1717.14
6. Enter
7. OK

Create corridor

Last updated: 2018-02-14

Total video time: 01:51
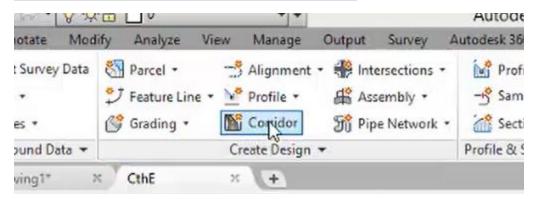
Create corridor

> Exercise files: crdr-data-c3d16.zip
>
> Start with CthE.dwg
>
> crdr-creat-01.mp4 01:51
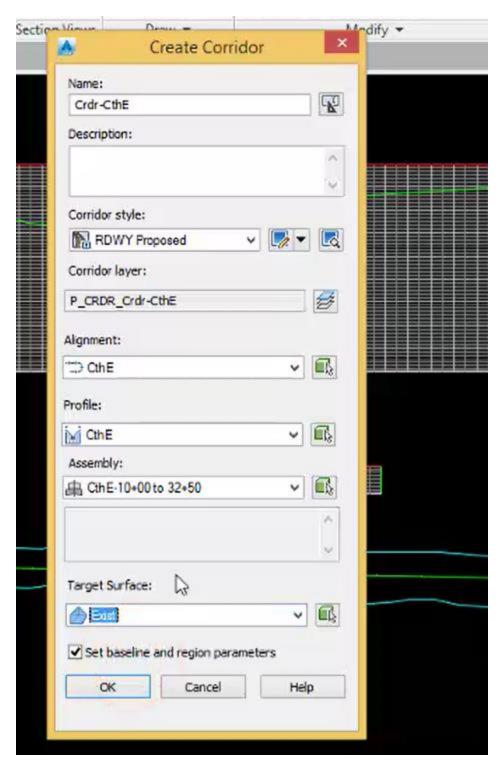
1. **Home tab of ribbon>Create Design panel>Corridor**
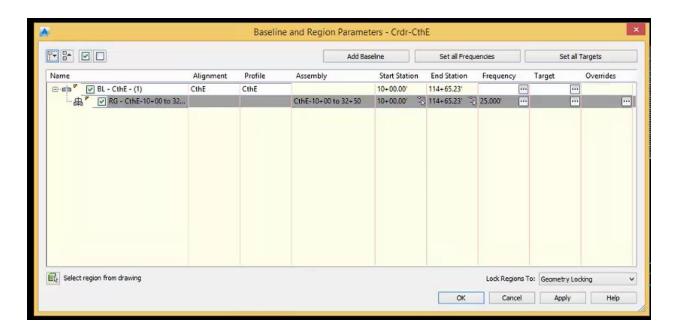
2. Name the corridor Crd-CthE
3. Select Alignment *CthE*
4. Select Profile *CthE*
5. Select assembly *CthE-10+00 to 32+50*
6. Select Target Surface *Exist*

7. OK

The Corridor Properties dialog box opens

Corridor targets

Last updated: 2018-02-14

Total video time: 05:44

Corridor targets

Exercise files: crdr-data-c3d16.zip

Start with CthE.dwg
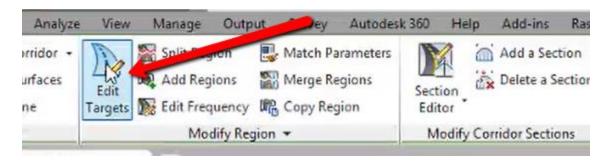
crdr-trgt-01.mp4 05:44

Targeting allows you to create a more complex design geometry by widening or changing slopes based on targeted objects such as alignments, profiles, feature lines polylines, etc.
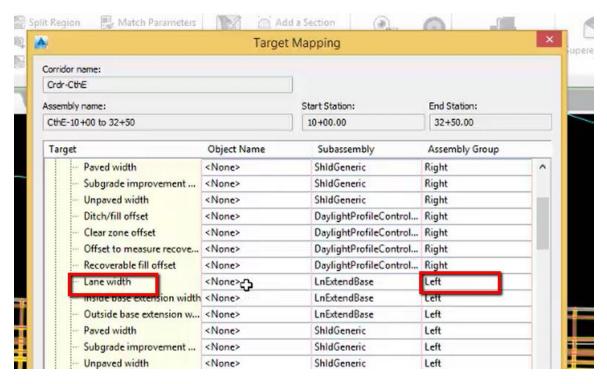
It is not recommended to target any xreffed objects.

1. Left click on corridor
2. **Contextual ribbon>Modify Region>Edit Targets**
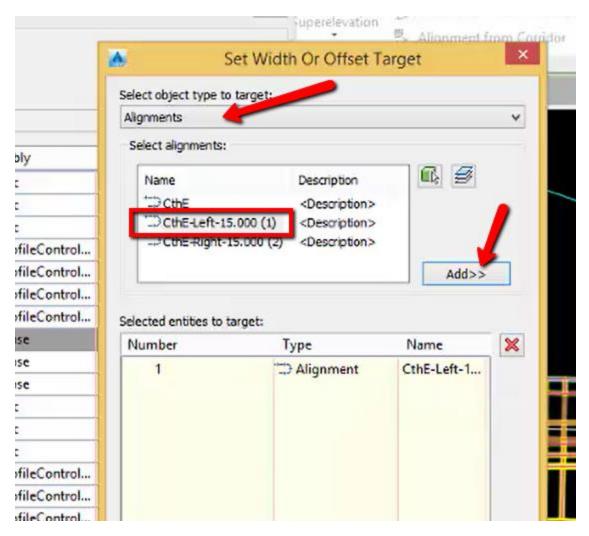
3. ⟦Left click⟧ inside of region
4. In the **Target Mapping** dialog box, scroll down to the **Lane width** left
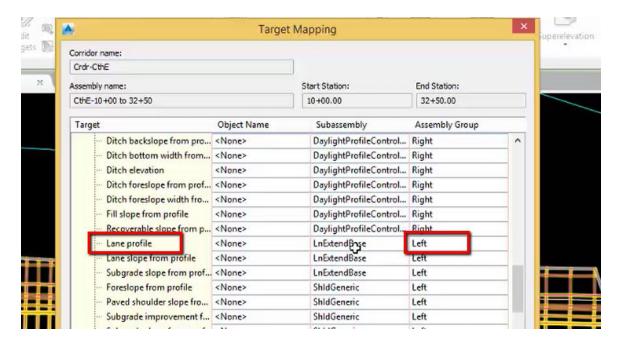
5. ⟦Left click⟧ in the **Object name** column
6. In the **Set Width Or Offset Target** dialog box, select alignments
7. Left click on ***CthE-Left-15.000 (1)***
8. Click ⟦Add⟧
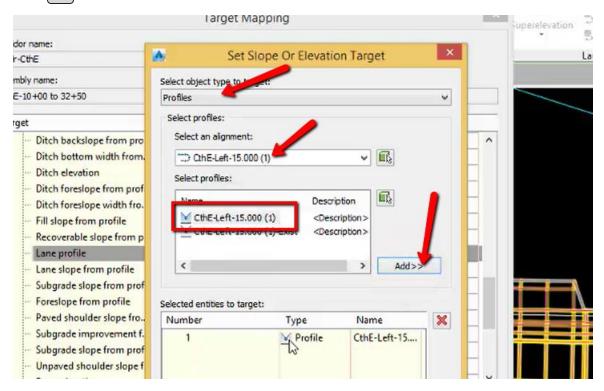
9. OK
10. Scroll down to **Lane profile** left

11. Left click in the **Object name** column
12. In the **Set Slope Or Elevation Target**, select Profiles
13. Select the *CthE-Left-15.000 (1)* alignment
14. Select the *CthE* profile
15. Click Add

16. OK
17. OK

Create corridor regions

Last updated: 2018-02-14

Total video time: 04:24

Split regions

Exercise files: crdr-data-c3d16.zip

Start with CthE.dwg

crdr-creat-rgn-01.mp4 01:51
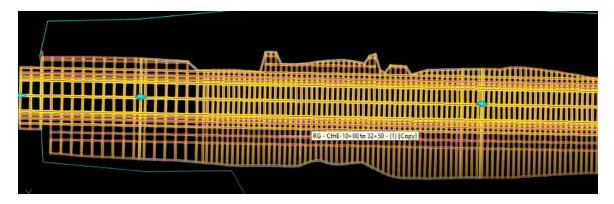
Split Region

1. Left click on corridor
2. **Contextual Ribbon>Modify Region>Split Region**

3. Left click inside corridor
4. Left click the area to split region
5. Left click to the right of the region break
6. Left click a second region break

RG - CthE-10+00 to 32+50 - (1) [Copy]
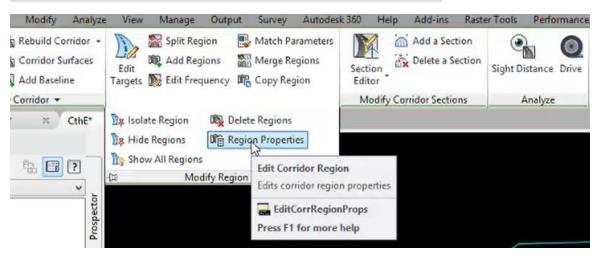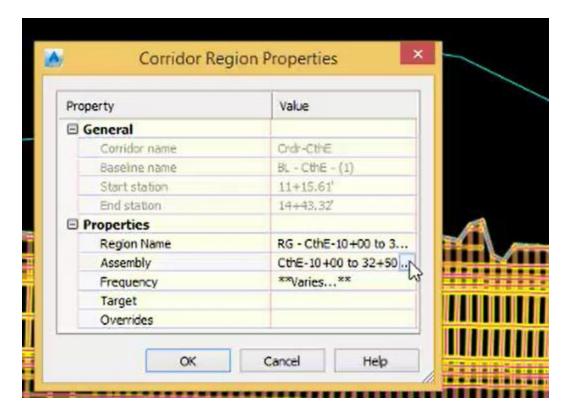
7. Esc

Region Properties
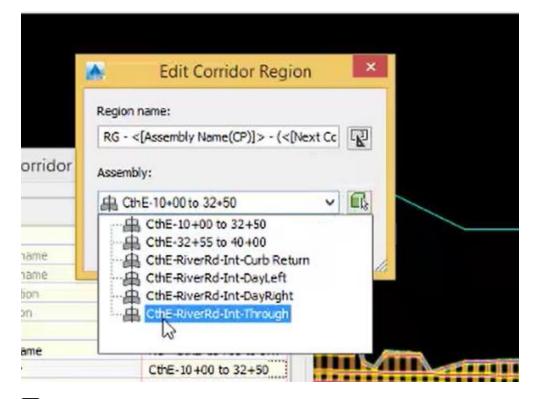
1. Left click on corridor
2. **Contextual ribbon>Modify Region dropdown>Region Propeties**

3. Left click inside region to change
4. In the **Corridor Region Properties** dialog, left click the ellipses in the Assembly field
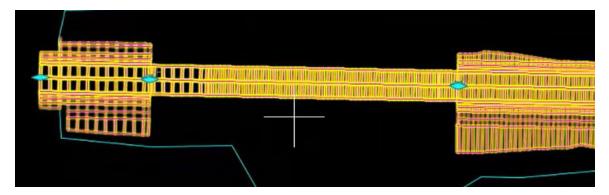
5. In the **Edit Corridor Region** dialog, change the Assembly to *CthE-RiverRd-Int-Through*
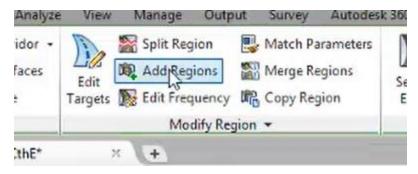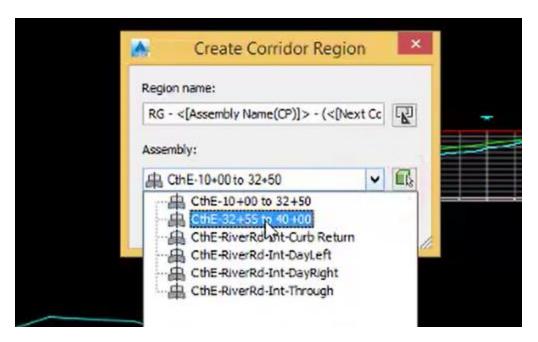

6. OK

7. OK

8. Esc

Add Region
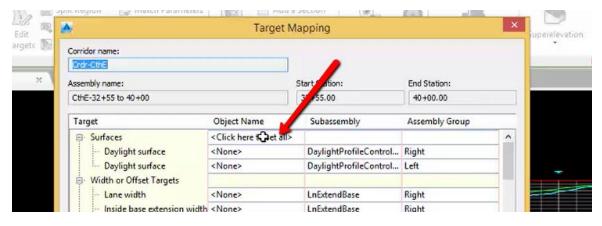
1. **Contextual ribbon>Modify Region panel>Add Regions**

2. Type 3255
3. Enter
4. Type 4000
5. Enter
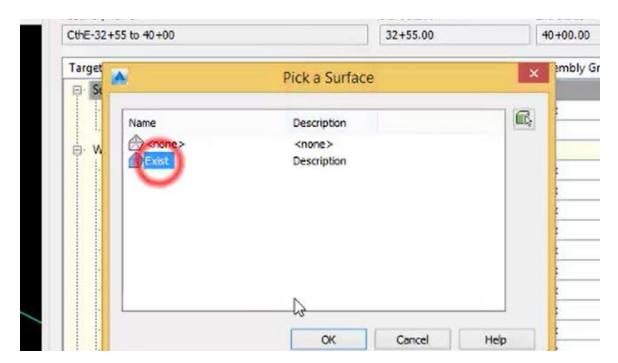6. In the **Create Corridor Region** dialog, select the *CthE-32+55 to 40+00* assembly

7. OK
8. In the **Target Mapping Dialog** under Surfaces, select <Click here to set all>

9. In the **Pick a Surface** dialog box, left click on Exist

10. OK
11. OK
12. Esc, Esc

Corridor issues: waterfalls

Last updated: 2018-02-14

Total video time: 05:04

Corridor issues: waterfalls
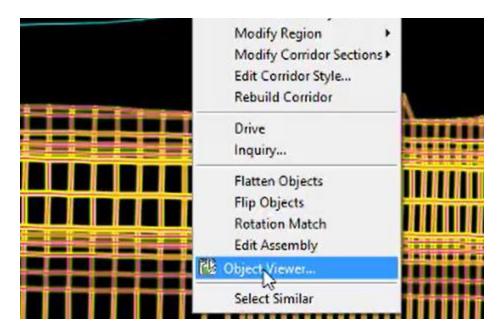
> Exercise files: crdr-data-c3d16.zip
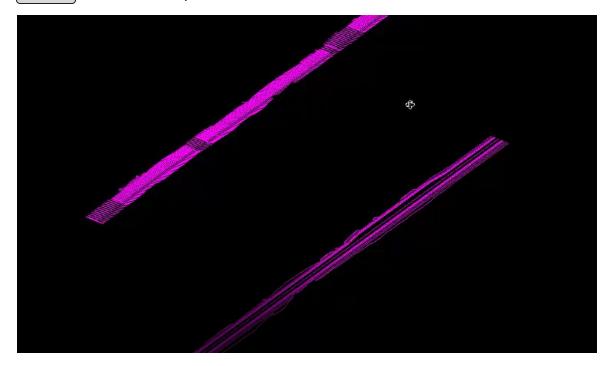>
> Start with CthE.dwg
>
> crdr-isu-wtrfl-01.mp4 05:04

To check for corridor waterfalls

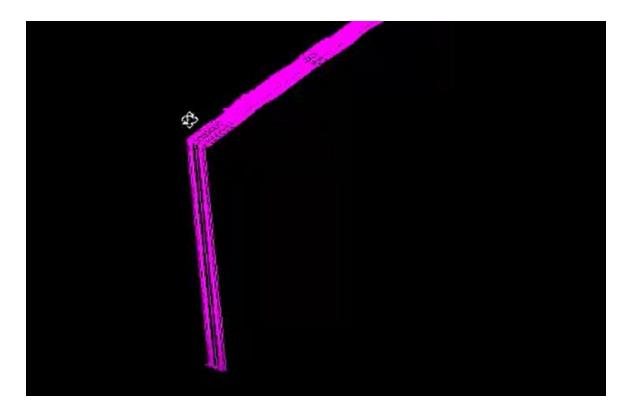1. Left click on corridor
2. Right click
3. Select **Object viewer**

4. Left click, hold and move your mouse to orbit
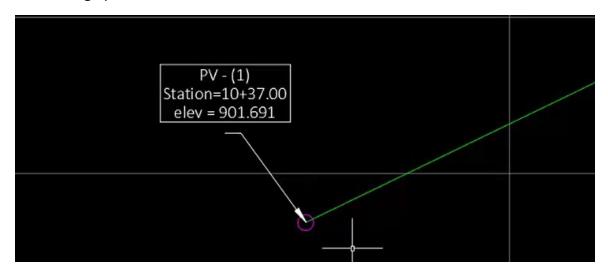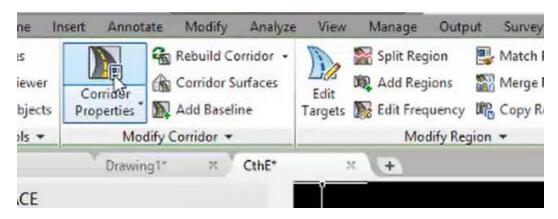

5. Inspect where waterfall happens

6. Close object viewer
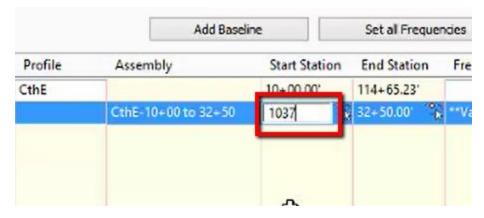
To fix waterfall

1. Check design profile start station
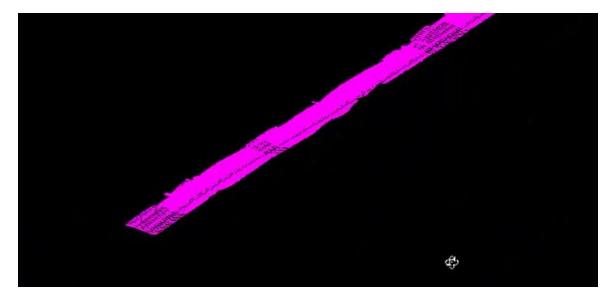
2. Left click on corridor
3. **Contextual ribbon>Modify Corridor panel>Corridor Properties**

4. Change corridor start region station value to 1037

5. OK
6. Rebuild Corridor
7. Inspect in object viewer

Corridor issues: bowties

Last updated: 2018-02-14

Total video time: 03:29
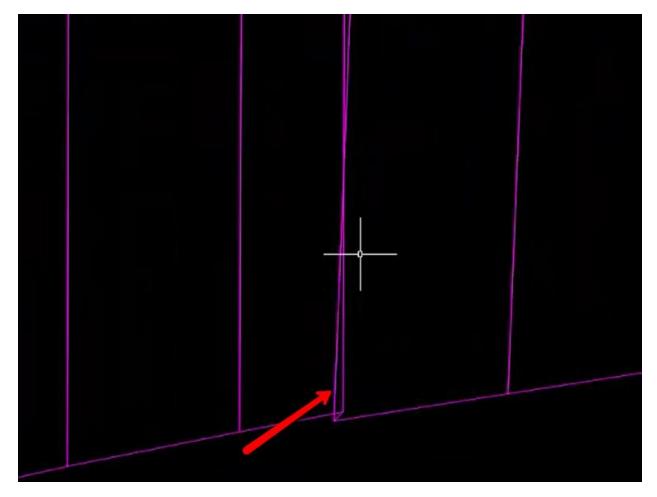
Corridor issues: bowties

> Exercise files: crdr-data-c3d16.zip
>
> Start with CthE.dwg
>
> crdr-isu-bowtie-01.mp4 03:29

Bowties happen when the corridor links cross over themselves.

Causes

- Jog in alignment
- Wide daylighting on the inside of a curve

How to recognize Bowties

- Corridor surface contours look odd
- Corridor surface boundary won't create
- Corridor doesn't look right when orbiting in object viewer

Possible solutions

- Adjust alignment
- Adjust assembly
- Adjust targets
- Create a gap in the corridor

Corridor issues: missing daylights

Last updated: 2018-02-14

Total video time: 03:07

Corridor issues: missing daylights

Exercise files: crdr-data-c3d16.zip
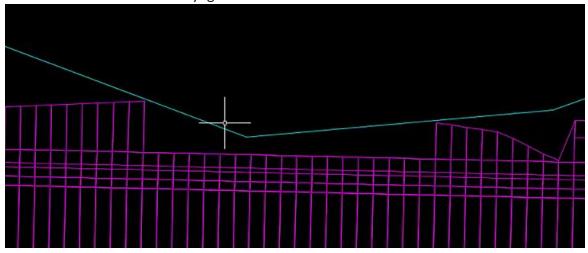
Start with CthE.dwg

crdr-isu-miss-dalit-01.mp4 03:29

Missing daylight
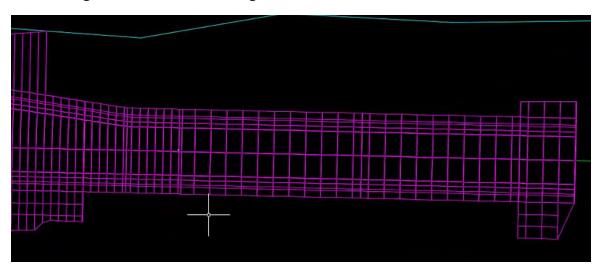
Causes

- No surface information in daylight ares

- Surface targets not set in corridor region
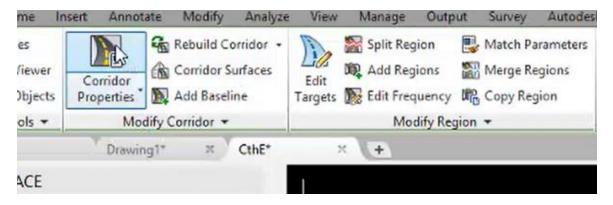
Fixes

- Adjust daylight slopes
- Request expanded surface data
- Define surface targets
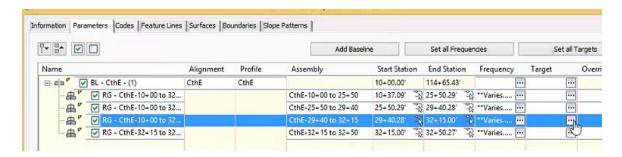
To define surface targets

1. Left click on corridor
2. **Contextual ribbon>Modify Corridor panel>Corridor Properties**
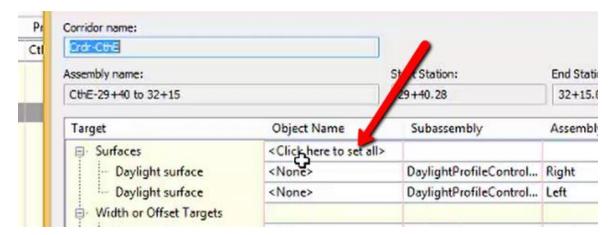
3. **Corridor Properties dialog box>Parameters tab**
4. Select the region
5. Left click in Set all targets column

6. Select **<Click here to set all>**
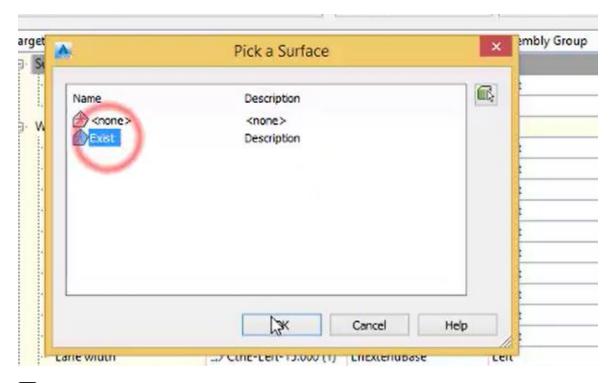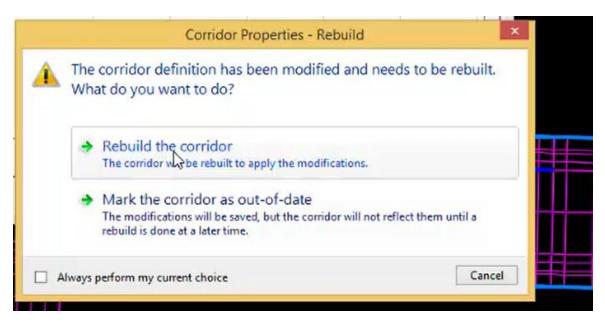
7. Select the surface *Exist*

8. OK

9. OK
10. Select to **Rebuild Corridor**

Reports and macros

Reports

Civil 3D stock reports

Last updated: 2012-08-24

Total video time: 62:33

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rpt-sum-stock.xls

Exercise files: rpt-c3d-stok-data-C3D10.zip

Civil 3D reports introduction

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rpt-c3d-stok-01.mp4 11:55

- WisDOT C3D Reports worksheet explained 0:00
- StockReportSummary worksheet explained 1:46
- Alignment_Curve Report Explained 2:32
- Setup Project data for Reporting 4:00
- Pick the Correct drawing file 6:44
- Run the Report from Toolbox 7:55
- Export to XML Report dialog 8:15
- HTML Report Review 9:00
- Save the CivilReport.HTML file 9:48
- Summary, things to remember 11:34

Stock alignment reports

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rpt-c3d-stok-02.mp4 14:30

Alignment Design Criteria verfication Report 0:20

- Open Drawing File 0:39
- Prespector Toolbox - Run Report 1:32
- Fill Dialog 1:50
- Save File 2:38
- Review Report 3:30

General Legal Description for Alignment 4:16

- Skip this Incremental Stationing Report 4:30
- Select Alignment

- Start/End Sta 5:10
- Save to 5:20
- Review Report 5:40

PI Station Report 6:12

- Select Alignment 6:30
- Start End 6:54
- Save to 7:05
- Review Report 7:20

Stakeout Alignment 7:34

- Points 7:40
- Store the Points 7:56
- Insert Points Manually 8:30
- Review Points Collection 8:56
- Run Report 9:04
- Select Alignment 9:20
- Select Points 9:40
- Stationing start/end 10:00
- Save to 10:30
- Review Report 10:48

Alignment Station and Curve 11:25

- Alignment Station and Curve Report requirements 11:35
- Run Report 12:00
- Select Alignment 12:10
- Review Report 12:50 Compare running without all check boxes on 14:00

Stock corridor reports

rpt-c3d-stok-03.mp4 10:46

Corridor Reports Summary 0:20

Feature Line Report 0:40

- Switch Project 1:00
- Run Report 1:20
- Select Alignment 1:45
- Corridor Points 2:18
- Report Name and Location 2:50
- Create Report 3:38
- Review Report 3:50

Reports

Feature Line Report - Corridor Links

- Corridor Links 4:24
- Link Code 4:42
- Report Name and Location 5:00
- Review Report 5:06

Feature Line Report - Surface Report 5:25

- Sample Line Group 5:36
- Select Surface 5:46
- Report Name and Location 6:18
- Review Report 5:06

Slopestake Report 6:36

- Requirements 7:05
- Create some Sample Lines 7:14
- Sampling Surfaces 7:45
- Station Range 8:12
- Run Slopestake Report 9:00
- Report Name and Location 9:45
- Create Report 10:06 image
- Review Report 10:28

Summary 10:36

Stock parcel reports

rpt-c3d-stok-04.mp4 9:20

Parcel Report Summary 0:10

- Parcel Area Report 0:40
- Generic Legal Description 1:06
- Inverse Report 1:28
- Report Review 2:20
- Save as 3:04
- Metes and Bounds 3:38
- Report Review 3:56
- Save as 4:08
- Pacel Area in CSV 4:12
- Report Review 4:44
- Save As 4:56
- Parcel Map Check 5:20

- Description 5:32
    - POB 6:00
- Save As 6:32
- Report Review 7:00
- Parcel Volume Report 7:34
- Surveyors Certificate 7:56
- Run Report 8:04
- Report Review 8:32
- Save As 9:04

Stock point reports

rpt-c3d-stok-05.mp4 7:21

Point Report Summary worksheet 0:10

- Points in CSV 0:35
- Switch to Corridor-STH25-4thAve. DWG file 0:40
- Report Review 1:54
- Save as 3:10
- Points List 3:21
- Report Review 3:38
- Save as 3:54
- Radial Stakeout 4:00
- Allow Blocked content 4:36
- Report Review 5:30
- Save as 5:45
- Station Offset Report 6:12
- Report Review 6:54
- Save as 7:18

Stock profile reports

rpt-c3d-stok-06.mp4 4:52

- Profile Report Summary worksheet 0:10
- Incremental Station Elevation Difference 0:25
- Report Review 0:48
- Incremental Stationing Report 1:12
- DWG File Data Referencing a Profile 1:28
- Report Review 2:20
- Profile Design Criteria Check does not work
- Profiles in CSV 2:40

- Report Review 3:20
- Save as 4:00
- PVI Station 4:08
- Report Review
    - PVI Station and Curve
        - Report does not work
    - Vertical Curve Report
        - Report does not work

Stock surface reports

rpt-c3d-stok-07.mp4 3:49

- Surface Report Summary worksheet 0:20
- Select Earthwork-STH25BestFit.DWG for surface reporting 1:45
- Surface Points to CSV 2:21
- Report Review 2:48
- Surface Report 3:12
- Report Review 3:43

WisDOT custom reports

Last updated: 2012-08-24

Total video time: 49:48

rpt-sum-wisdot.xls

WisDOT alignment and point reports

rpt-wisdot-01.mp4 21:56

Right-click rpt-sum-wisdot.xls review 0:20

1. Alignments - SuperElevation Transition Report
    - Select DWG (Earthwork-STH25-BestFit.DWG) 1:10
    - Running Reports if Toolbox does not work 2:00
    - Command: Netload 2:20
    - Select Reports.DLL 2:40
    - Command: SETransitions 3:20
    - Report Super Transitions at even stations
    - Save as 4:05
    - Report Review 5:00

2. Run SETransitions Again 5:35
   - Report Slope Change
   - Save as 5:50
   - Review Report 6:25
3. Parcel -Legal Descriptions Report
4. Switch to Corridor-STH25-4thAve.DWG 7:00
5. Run LegalDescriptions command 7:20
   - Custom Header 7:50
   - Save AS 8:30
   - Review Review 8:50
6. Points Reports Summary rpt-sum-wisdot.xls 9:00
7. Points - Describe Points Report 11:16
8. Run DescribePoints command 11:36
   - Create Points 11:50
9. Run DescribePoints command 13:05
   - Individual Points selection
10. Review Report 13:45
11. Run DescribePoints command 14:10 (use spacebar to repeat last)
    - Offset Alignment selection
    - Save as 14:40
12. Rerun Report because Offset limits were too limited 15:00
13. Rerun Report because Offset limits were too limited 15:20
14. Review Report 15:40
15. Points - Stakeout - From Remote Point
    - Run Stakeout command 16:00
    - From Remote Point 16:20
    - Review Report 17:00
16. Points - Stakeout - Even Stations
    - Run Stakeout command 17:18
    - Review Report 17:30
17. Points - Stakeout - Offset Alignment
    - Run Stakeout command 17:46
    - Review Report 18:06
18. Points - SOE
    - Run SOE command 18:40
    - Do Not Select Boundary Limits 19:25
    - Review Report 19:54
19. Points - Course Table
    - Run CourseTable command 20:40
    - Review Report 21:20

WisDOT profile and corridor reports

[rpt-wisdot-02.mp4](#) 11:51

ReportSummaryWisDOT.xls review 0:20

1. Reported from Corridor-STH25-4thAve.dwg
2. Profile - Profile Grades
3. Run ProfileGrades command 1:21
4. Station Limits 1:50
5. Offsets 2:20
6. Save as 3:40
7. Open Report from Windows Explorer 5:00
8. Review Report 5:20
9. Change File to Earthwork-STH25BestFit.DWG

Corridor - Topsoil Computations

1. Summary 6:40
2. Explain Differences betwwen Sample Line Group and Station Spacing 7:16
3. Run Topsoil command 7:40
4. Please PARDON HILL FARMS announcements! Select Boundary Limits 8:30
5. Real Offset inputs 9:30
6. Save as 9:40
7. Review Report 10:10

WisDOT feature line reports and Import Station Offset Depth

[rpt-wisdot-03.mp4](#) 16:01

1. Reported from Earthwork-STH25BestFit.DWG
2. Feature Line Report - Offset from Alignment Summary 0:20
   - Open Surface-STH25-Refinement.DWG 2:30
   - Netload Reports.dll
   - 3:17
   - Featureline command 3:30
   - No Alignments Data Reference 4thAve 4:00
   - Run FeatureLine command 4:10
   - Report Offset from Alignment - 4:40
   - Report 4:45
3. Feature Line Report - Feature Line Run FeatureLine command 5:05
   - Report feature line 5:14
   - Review Report 5:30
   - Summary 6:00

4. Import Station Offset Depth file 6:30
    - Create a New DWG file 7:00
    - Save As Exist-Sub.DWG 7:20
    - Create Reference to **4th Ave** alignment 7:40
    - Create SOD file (4thAveSub.txt) 9:30
    - Save File as 4thAveSub.SOD Netload Importsoe.dll 11:20
    - Run ImportSOE Command 11:30
    - Create Reference to **EXIST** surface 11:58
    - Rerun ImportSOE command 12:30
    - Import 13:30
    - Create **Marsh** Surface 13:56
    - Add Point Group 14:12
    - Add Point Group to Surface 14:56
    - Change Marsh Surface style 15:10
    - Review Surface 15:30

Superelevation reports

Last updated: 2013-01-13

Total video time: 10:28

Exercise data: rpt-super-data-C3D12.zip

Export superelevation transition data to Excel

rpt-super-01.mp4 5:51

This segment will demonstrate how to create a Data Shortcut reference of the baseline alignment and then create a superelevation transition data report by using the export to CSV tool in the Superelevation tabular Editor.

1. Create drawing from template
    - Create a new drawing using the wisdot12.dwt template.
    - Save the drawing in the project's Construction folder.
    - Create the Alignment Data Shortcut Reference
    - Navigate in the Toolspace, on the Prospector tab and expanding the Data Shortcuts collection. Select the alignment under the Alignment/Centerline Alignments collection, then right-click and select Create Reference.
    - The default alignment style and Alignment label set will work fine for visual reference.
2. Click OK
3. Save the drawing.

Export Superelevation Transition Data in the Superelevation Tabular Editor to an Excel file

4. Select the alignment from the drawing
5. Select Superelevation in the contextual ribbon
6. Select "View Tabular Editor" button

The Superelevation Tabular panorama displays all the superelevation transition data for each curve.

7. In the panorama click Export superelevation data and save the data as a CSV file in the Construction subfolder of the project.

Review the CSV file data and format in Excel.

WisDOT toolbox, superelevation transition macro

rpt-super-02.mp4 4:37

This segment will demonstrate how to use the WisDOT Superelevation Transition Macro to create an Excel file using the Even Station Increment report setting and then the Slope Change report setting.

1. Create drawing from template
   - Create a new drawing using the wisdot12.dwt template.
   - Save the drawing in the project's Construction folder.
2. Create the Alignment Data Shortcut Reference
   - Navigate in the Toolspace, on the Prospector tab and expanding the Data Shortcuts collection. Select the alignment under the Alignment/Centerline Alignments collection, then right-click and select Create Reference.
   - The default alignment style and Alignment label set will work fine for visual reference.
   - Click OK
   - Save the drawing.
3. Create an Excel file using the Even Station Increment Report Setting
   - **Toolspace -> Toolbox tab -> WisDOT Toolbox -> Reports-> Alignment Reports-> right-click SuperElevation Transition -> Execute**.
   - Select the alignment(s) in the tabular area, or use the 'Select" button to pick from the drawing. There are two report options. One is to report by even station increments and the other is to report by increments of cross slope change.
   - To create an even station increment report, select the "Use Even Stationing" under Report Settings, and supply the desired Station Increment.
   - To create a cross slope change report, select the "Use Slope Change" under Report Settings, and supply the desired Slope Change frequency.

- Choose which Lane and Shoulder section locations you wish to include in the report.
- Supply a name for the Output file and save it in the project construction subfolder.
- There is an option to "Auto open report upon completion".
- Click Create Report.

Review the CSV file data and format in Excel.

Inquries used in construction

Last updated: 2013-01-13

Total video time: 24:40

Cutting quick cross sections

rpt-cnst-inqry-01.mp4 15:39

This segment will demonstrate how to use the Quick Cross Section tool, and the Quick Profile command to create quick cross sections. These tools can cut cross sections across multiple surfaces, so at least one tin surface must exist in the drawing.

The Quick Cross Section tool creates a temporary cross sections view for instant viewing, with no select, or data extraction capabilities the view will disappear once any key is pressed.

> **Info:** The Transportation Extension must be installed. This is an add-on available from the Autodesk Subscription site.

1. Open or create the drawing that has the project alignment and surface you wish to query the data from, along with any location reference objects.
2. **Toolspace > Toolbox > Transportation Extension > Utilities > Surfaces > Quick Cross Sections > Enter**
   - Select the surface (multiple surfaces may be selected) and press the space bar
   - This tool has two cross section options;
   - 3p, which creates a single cross section by selecting 2 points as the cutting plan, and the last point to define the direction the cross section is viewed from.
   - Multiple, option allows the user to create a path for multiple sections by selecting points, then prompts for frequency, and left and right widths, to create multiple section along the defined path.

> **Info:** The section(s) may be viewed using zoom and pan only.

Notice once the mouse is clicked or a key pressed, the cross section view no longer exists.

3. The Quick Profile command, under Home, Create Design, Profile, can use the following objects as the cutting plane to build a cross section; 2D or 3D lines or polylines, Lot lines, feature lines, Survey figures, and a series of points. This command creates a temporary Profile View and samples selected surfaces.
     - Select an object listed above as the cutting plane, or select a series of points in the model space.
     - Select the surfaces to sample, along with a visual style in the dialog.
     - Select the Profile view Style.
     - OK and pick a point in the drawing area to place the Quick Profile.

> ℹ **Info:** The Quick Profile view and surface profiles created do not disappear once the mouse is clicked or a key pressed. The Quick profile remains as an object until the save drawing command is used.

The elevation data can be extracted from the Quick Profile using the same tools as a profile. Use the 'Profile Station and Elevation at Point" option in the Inquiry Tool under Profile.

When using an object as the cutting plane, the relationship between the object and the quick profile is dynamic. This means the object can be moved, stretched, vertices added or subtracted and the quick profile updates the profiles and view automatically and instantaneously.

Extracting grades from the roadway model

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rpt-cnst-inqry-02.mp4 2:44

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1. Open or create the drawing that has the project surfaces you wish to query the data from.
2. Navigate to and select the Inquiry Tool found on the Analyze ribbon tab and expand the Surface list.
     - Select "Surface Elevation and Grade at Point"
     - Select the surface in the pull down list next to Surface Name
     - Select point by coordinate
3. Click the Object Select icon next to Point Coordinate to pick the location in the drawing area, or type the coordinates into the textbox.

Notice a temporary slope area symbol shows the direction of the grade at the picked location.

4. Use the Copy to Clipboard to extract the current data within the Inquiry Tool dialog, to a file.

Each data box can also be extracted independently. Hover over a data box with the cursor then use the mouse-right-click, Copy to Clipboard option.

Extracting elevations from cross-sections

rpt-cnst-inqry-03.mp4 4:04

This segment will demonstrate how to use the Inquiry Tool to extract Elevation data from Sections and Section Views.

1. Open the drawing that has the project sections you wish to query the data from.
2. To extract elevation information in a section view that is not on a surface use the "Section View Offset and Elevation at Point" option by selecting a section view in the drawing area, then select Inquiry on the contextual ribbon.
   - Select the "Section View Offset and Elevation at Point" as the inquiry type.
   - When prompt to select section view, chose the section from the list or use the Object Select icon to pick the section view from the drawing area.

   > **ⓘ Info:** Pick the grid or the labels of the section view and not the sections.

   - Select point by coordinate
3. Press the Object Select icon next to Point Coordinate to pick the location in the section view, or type the coordinates into the textbox.
4. Use the Copy to Clipboard to extract the current data within the Inquiry Tool dialog, to a file. Each data box can also be extracted independently. Hover over a data box with the cursor then use the mouse-right-click, Copy to Clipboard option.
5. To extract elevation from a point on a surface section use the "Section Offset and Elevation at Point" option by selecting a surface section in a section view, then select Inquiry on the contextual ribbon.
   - Select the "Section Offset and Elevation at Point" as the inquiry type.
   - When prompt to select the section, chose the section from the list or use the Object Select icon to select the section from one of the section views.

> **ⓘ Info:** Pick the surface section, not the section view.

6. Select the offset point in a section view by using the Object Select icon next to Offset and selecting the offset location in a section view. Once a location in the section view has been picked, typing the offsets into the textbox will produce elevation data along the selected surface section in that section view.

> **ⓘ Info:** Select inside a different section view to inquiry elevation information about the same surface section in a different section view.

A different surface section can be selected at any time, or picked from the list.

7. Use the Copy to Clipboard to extract the current data within the Inquiry Tool dialog, to a file. Each data box can also be extracted independently. Hover over a data box with the cursor then use the mouse-right-click, Copy to Clipboard option.

rpt-cnst-inqry-04.mp4 2:13

1. Open or create the drawing that has the project alignment and surface you wish to query the data from. Navigate to and select the Inquiry Tool found on the Analyze ribbon tab and expand the Alignment list.
   - Select "Offset and Surface Elevation at Point"
   - Select the alignment in the pull down list next to Alignment Name
   - Select the surface in the pull down list next to Surface Name
   - There are two option for initially picking the location
   - Select point by coordinate
2. Press the Object Select icon next to Point Coordinate to select the location in the drawing area, or type the coordinates into the textbox
   - Select point by station
3. Press the Object Select icon next to Station and select the station location in the drawing area, or type in the station in the textbox. Then select the offset location in the drawing area, or type the offset in the textbox.

Notice the pick for the station point, and the pick for the offset point are independent of each other.

4. Use the Copy to Clipboard to extract the current data within the Inquiry Tool dialog, to a file. Each data box can also be extracted independently. Hover over a data box with the cursor then use the mouse-right-click, Copy to Clipboard option.

Course table report
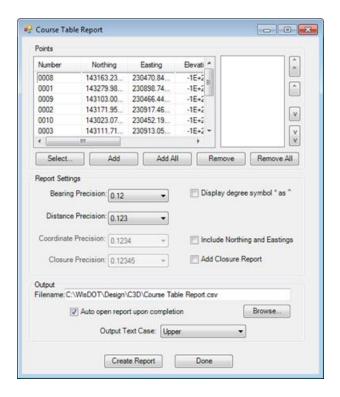
Last updated: 2016-07-26

Description

The CourseTable report macro reports on distances and bearings between selected points. An optional Closure Report may be appended to the end of the report to calculate closure error of a closed traverse.
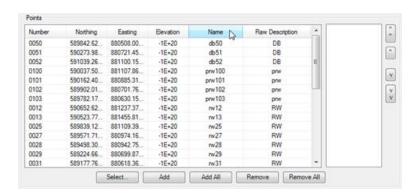
General Operation

When launching the macro the user must be in a drawing that contains Civil 3D COGO points. If no points are found the macro will display a message to the user and exit.

Points

All of the COGO Point objects found in the drawing are displayed in the Points table. To expand the Points table, select a corner of the main dialog and drag to expand. The controls on the dialog will automatically adjust. To sort the point display, click in the desired column heading to sort on that column. Only points selected or added to the processing list to the right of the points table will be processed.

Select

Clicking the Select… button allows the user to graphically choose a COGO Point from the drawing and add it to the processing list.

Add

The Add button will copy the selected points in the Points table listing and add them to processing list.

Add All

The Add All button will copy the all of the points in the Points table listing and add them to processing list.

Remove

The Remove button will delete the selected point from the processing list.

Remove All

The Remove All button will delete all points from the processing list.

Arrow Keys

The points will be processed in the order in which they are shown in the processing list. To change the order, select the desired point(s) and click the appropriate directional arrow. The double arrow icons will move the selected point(s) to the top or bottom of the list.

Report Settings

The **Report Settings** selections allow the user to format their report output.

Bearing Precision

This drop down allows the user to control the precision of the Bearing values displayed in the report.

Distance Precision

This drop down allows the user to control the precision of the Distance values displayed in the report.

Coordinate Precision

This drop down allows the user to control the precision of the Coordinate values displayed in the report. This drop down is enabled only when the Include Northings and Eastings checkbox is toggled on.

Closure Precision

This drop down allows the user to control the precision of the values displayed *Closure Report* section of the output in the report file. This drop down is enabled only when the Add Closure Report checkbox is toggled on

Display degree symbol ° as ^

In some cases using the standard degree symbol will corrupt the text output. To correct the problem the user may toggle on this checkbox to replace the degree symbol with the alternate carat symbol.

Include Northings and Eastings

When toggled off the individual point Northing and Easting values are not displayed in the output report. To see the Northing and Easting values toggle this checkbox on. When this checkbox is toggled on the Coordinate Precision drop down is enabled.

Add Closure Report

To add a closure error calculation to the end of the report toggle on this checkbox. When this checkbox is toggled on the *Closure Precision* drop down is enabled.

Output

Filename

Specify the full output path and name of the report file.

Auto open report upon completion

When toggled on the report file is automatically opened in its default application when completed.

Output Text Case

This drop-down list allows the user to set the text case formatting in the output report file. The default setting is Upper.

- Upper – Forces all text in the output report file to be upper case.
- Lower – Forces all text in the output report file to be lower case.
- Proper/Title – Forces all text in the output report file to be Title case. (The first letter of each word is capitalized)
- As Is – The text in the output report file has no case conversion applied.

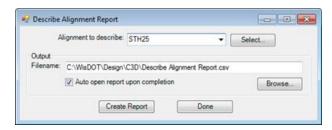## Describe alignment report

Last updated: 2016-10-13

Description

Toolspace > Toolbox tab > WisDOT Toolbox > WisDOT Reports > Alignment Reports > Describe Alignments

The Describe Alignment Report provides detailed geometry information for each entity within the selected alignment.

General Operation

When launching the macro the user must be in a drawing with at least one alignment.

Alignment to describe

Users may select the alignment to report on either by choosing the alignment name from the drop-down list in the dialog, or by clicking the Select button to choose it graphically.

Output

In this section the user will specify the location for the output report file. If the Auto open check box is checked on the file will automatically open when completed.

Create Report

Clicking the Create Report button starts the report processing. A status dialog will display showing the progress as the data is being collected and exported. The status dialog will close when processing is completed.

Notes

1. The report only provides data on Tangent and Arc alignment entities. The Spiral alignment entity types are not supported.
2. Multiple station equations are supported on an alignment. The only restriction is that the change in stationing must occur at a break point between alignment entities.
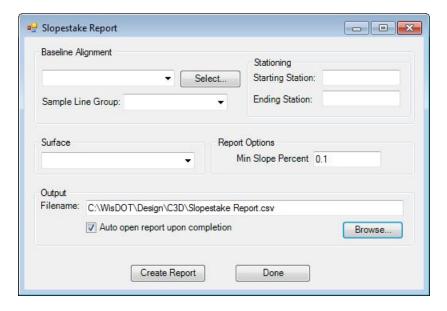
Slope stake report

Last updated: 2016-07-26

Description

The SlopeStake tool is used to create a slope stake report from a surface containing an alignment with sample lines. This tool allows the user to report the slope features along a given surface and station defined by sample lines. It reports the offset, elevation, and slope of these break points into a separate comma separated value (csv) text file.
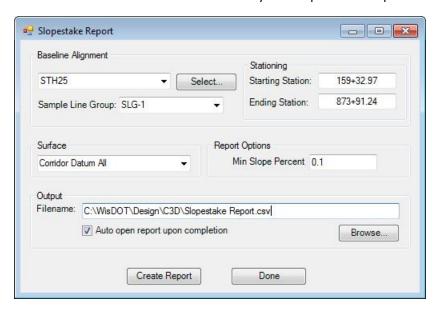
General Operation

1. Open the drawing that you will use to create a Slope Stake report. The drawing must contain a surface, alignment and sample lines.
2. Open the Toolbox tab, in Toolspace.
3. **WisDOT Toolbox > WisDOT Reports > Other Reports**
4. Double-click Slope Stake report. The Slopestake Report dialog will appear.

5. Select the Baseline Alignment that will be used in the Slope Stake report, either from the drop-down, or by selecting it in the drawing.
6. Select a Sample Line Group from the Sample Line Group drop-down menu.
7. Select the desired Starting and Ending station. The default is the full length of the selected alignment.
8. Select the Surface that will be used in the Slope Stake report.

9. Enter the **Min Slope Percent**. Surface slope changes along the sample lines greater than the entered percentage will be included in the output report.
10. Enter a desired destination for your Slope Stake report in the **Output-Filename** location

11. Click Create Report button. The CSV file will be created.

SOE report

Last updated: 2016-10-13

Description

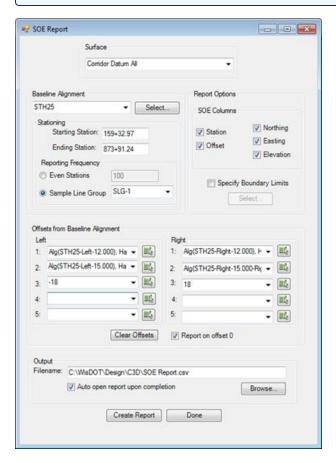The SOE Report generates a report on Station, Offset, and Elevation points from a baseline

alignment.

General Operation

Toolspace > Toolbox tab > WisDOT Toolbox > WisDOT Reports > Surface Reports > Station-Offset-Elevation

> **Info:** When launching the macro the user must be in a drawing with at least one surface and one alignment.

Surface

All of the surfaces in the drawing are in the drop-down list. Select the surface to be used for computing the elevations.

> **Info:** Surfaces that have been upgraded from a prior version of Civil 3D may not be able to be queried for elevation values.

Stationing

Specify the start and end station range on the baseline alignment to use for creating the report. The values default to the start and end station of the selected alignment.

Reporting Frequency

The Reporting Frequency can be either a user defined station interval or a use an existing Sample Line Group interval.
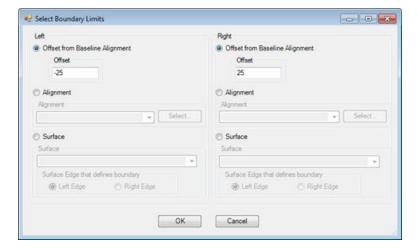
Report Options

SOE Columns

The user has the option to toggle on/off the display of various columns in the output report file. By default the display of all columns is turned on.

Specify Boundary Limits

The user may wish to restrict sampling within a surface. Toggling on the ***Specify Boundary Limits*** checkbox enables the Select button. Choosing this button will display the ***Select Boundary Limits*** dialog which allows the user to specify alternate right and left limits for surface sampling.

> **ⓘ Info:** Negative offset values denote the left side of the alignment while positive values denote the right side of the alignment. Both left and right values on same side of the alignment are allowed.

Offsets from Baseline Alignment

Left/Right

The user my select up to five values to process for both left and right offsets. There are multiple options for selecting offsets:

1. Enter a numeric value in feet.

> **ⓘ Info:** Negative numeric offset values denote the left side of the alignment while positive values denote the right side of the alignment. Both left and right values on same side of the alignment are allowed.

2. Select an alignment from the drop-down list.
3. Click on the Selection button next to the field to interactively select an object from the drawing. The user may select any one of the following object types for the offset definition:
   - Alignment
   - Land Featureline
   - Survey Figure
   - Polyline

When selecting an AutoCAD/Civil 3D object for the offset do not edit the text value placed in the corresponding field. Doing so may cause a parsing error as the report program attempts to locate the objects during processing.

Clear Offsets

Selecting the Clear Offsets button will clear all of the values from the Left and Right offset fields.

Report on offset 0

Toggling this check box on will include the elevation at the baseline alignment location in the report.

Output

In this section the user will specify the location for the output report file. If the Auto open check box is checked on the file will automatically open when completed.

Create Report

Clicking the Create Report button starts the report processing. A status dialog will display showing the progress as the data is being collected and exported. The status dialog will close when processing is completed.
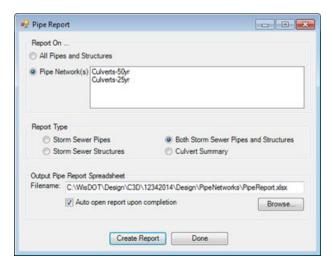
Pipe report

Last updated: 2017-11-08

Description

The PipeReport macro allows the user to create three different types of pipe network related Miscellaneous Quantity reports.

General Operation

Toolspace > Toolbox tab > WisDOT Toolbox > WisDOT Reports > Pipe Reports > Culvert and Storm Drain Report

When launching the macro the user must be in a drawing with at least one pipe network.

Report On

All Pipes and Structures

Selecting the **All Pipes and Structures** option will generate the output report using all Pipe and Structure entities in all Pipe Networks within the drawing.

Pipe Network

Selecting the **Pipe Network** option enables the corresponding list of all pipe networks in the drawing. The user has the option of selecting one or more pipe networks to process in creation of the report. The output report file will be generated using the Pipes and Structures found in the selected Pipe Network(s).

Report Type

Storm Sewer Pipes

Selecting this option will create a STORM SEWER PIPE REINFORCED CONCRETE Miscellaneous Quantities report. In the output spreadsheet file this report will be in the Pipes worksheet.

Manholes, Inlets, Covers

Selecting this option will create a MANHOLES, INLETS, AND COVERS Miscellaneous Quantities report. In the output spreadsheet file this report will be in the Structures worksheet.

Both Storm Pipes and Manholes, Inlets, Covers

This option will create both of the above reports.

Culvert Summary

Selecting this option will create a CULVERT PIPE SUMMARY Miscellaneous Quantities report. In the output spreadsheet file this report will be in the Culverts worksheet.

Output Pipe Report Spreadsheet

In this section the user will specify the location for the output report file. If the Auto open check box is checked the spreadsheet file will automatically open when completed.

Create Report

Clicking the Create Report button starts the report processing. A status dialog will display showing the progress as the data is being collected and exported. The status dialog will close when processing is completed.