CONNECT DOCUMENTATION

Connect Edition Introduction

MicroStation Connect Documentation

OpenRoads Designer Documentation (Survey)

OpenRoads Designer Documentation (Design)

Appendices

OpenRoads Designer

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NHDOT CAD/D Connect Documentation

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Training

SIG - Fundamentals of Horizontal Design https://event.on24.com/wcc/r/2186799/CA4FC23886823D081C512BF456AC8A41

OpenRoads Designer Help Let's Begin with OpenRoads Designer (bentley.com)

Short Version Geometry (bentley.com)

Open the 12345-Geometry.dgn, *Default* model, attach references and modify the View as needed. May need to save settings and reopen the dgn if the terrain's *Default-3D* model is not displaying in the *Default* window.

Set *Feature Definition* from the Feature definition toggle bar and set to use active.

Use the OpenRoads **Modeling** Workflow **Geometry** tab **Horizontal** tools. Place individual lines and arcs for element design and then complex them together or use the *Complex Geometry by PI* to place a linked Alignment.

To display the Alignment curve data, ticks, and stations, use the Annotate element tool from the OpenRoads Modeling > **Plan Production** tab

P-4-2: Vertical Geometry

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Before You Begin

Before working on a Vertical design, a Horizontal Alignment must have been created. The Set Active Terrain Model tool can be found on the Tasks menu in either General Geometry or in the Terrain Model menus. Using the Context Sensitive menu, first select the Terrain with the Element Selection tool, then hover over the Terrain to summon the Context Sensitive menu. Select the Set As Active Terrain Model button and then follow the Heads-Up prompt. Setting the Terrain Model as Active enables the existing ground to automatically appear in the Profile Model.

Process Description

- To begin a Vertical design, select the Open Profile Model button from the Vertical Geometry Tasks menu. The Open Profile Model button can also be found on the Context Sensitive menu. Either way, follow the Heads-Up prompt to Select the Horizontal Geometry and then Click in an Open View.
- When using the Profile Complex By VPI command, the Vertical Curve Length can be changed on the Heads-Up prompt prior to placing the next VPI. If the curve does not display while placing the next VPI, then the current curve is probably overlapping the previous curve.
- Use the tools found on the Vertical Geometry Tasks menu to create a Profile. The Vertical Geometry Tasks operate very similar to the Horizontal Geometry Tasks. It is recommended to issue a Save Settings and a Save prior to starting a profile as well as when you are finished designing. Check out the Vertical Essentials video to learn more.
- set active profile When finished designing, set the desired profile to be the Active Profile. This step is necessary because more than one profile may exist in a single profile model. Therefore it is mandatory to designate which is the intended profile for the Horizontal Geometry. The Set (As) Active Profile tool is found either on the Vertical Geometry Tasks menu or on the Context Sensitive menu. Afterwards, Save the DGN if not set to automatically do so.
- Profiles should look the same as the Horizontal features that they represent. If your profile does not look like it's Horizontal counterpart, then select the profile with the Element Selection tool. Next, open Element Information and expand the General category. Change the Feature definition to match the Feature Definition assigned to the Horizontal component of the alignment. This should change it's attributes to match. Also set the profiles name.

P-4-3: Geometry from SS4 OpenRoads

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Before You Begin

This process is assuming you have OpenRoads SS4 Horizontal and Vertical geometry alignments that need to be brought forward into ORD to use in design.

Copy the SS4 Alignments into the New Drawing

Attach the *Default* model of the SS4 alignment drawing to the *Default* model of the project's *Geometry.dgn* file. Also attach the *Default-3D* model of the SS4 alignment drawing to the *Default-3D* model. If the referenced alignments have elevations, set the

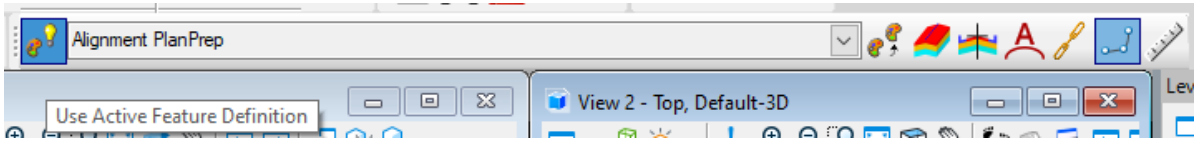
Default-3D model as the active model and select the alignment(s) to be updated. If they do not have elevations, perform these steps with the *Default* model.

Copy the alignment(s) into the new drawing.

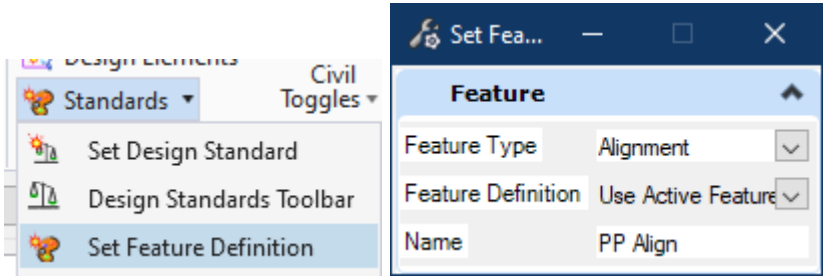
Update the Feature Definition

Turn off display of the reference attachment.

Set the *Feature Definition* to **Alignment Mainline** (or other appropriate feature).



On the Geometry tab of the OpenRoads Modeling workflow



The geometry will update to the correct symbology but the stations will not be shown.

To display the Stations and Curve data you must use the *Element Annotation* tool from the Drawing Production tab. With the element selected click on the tool and *data point* on the screen to *accept*. The stations, ticks, pc/pt's, bearings and curve data will all be added to the drawing.

Set the Existing Terrain as active prior to opening the profile.

The active profile should already exist but its feature definition is not defined. Go to the Geometry tab, and **select Open Profile Model** from the Vertical section or select the Alignment hover and select it from the popup menu. An easy way to bring up a profile if you only have the *Default* model in view 1 is to use the *Right Click* hold menu > *View Control* > *Views plan/profile*. Next select the horizontal alignment and then the view for it to go in.

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Use *Element Selector* to select the profile and change its feature definition to match it's horizontal feature definition. Set it active if not already.

Your alignment is good to go!

Repeat for each alignment.

OpenRoads Designer - Corridors

P-5-1: Creating Corridors

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Before You Begin

OpenRoads Designer works using the Civil Tools to perform all the roadway design steps. A corridor is the main civil object used for modeling a roadway. The corridor civil object acts as a container for all the elements and design constraints that make up your design.

Note that references to "12345" in file names refer to the project's five digit Project Number.

Use the *Create Template* tool to check to see if an active template file is set. If no templates are displayed in the box use the file open command to open one or go to section P-5-2: Templates to see how to copy one to the correct location and rename it so it can be found.

Review the engineering base plan, engineering report, as well as the pavement recommendation prior to creating the corridor. It is a good idea to create the Typical Section before creating a corridor to ensure the design follows intent. Review the intended template before use and edit to match the standard widths, slopes, and depths indicated in these resources. The no component template can be used first to work on the corridor design prior to switching to a template containing all the components when the pavement recommendation comes in.

Corridor training can be found in *How to Deliver - From Survey to Plan Production - Session 3* https://www.bentley.com/en/Global-Events/Accelerator-Series/2019/OpenRoads-Virtual

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Short Version

1. Open the Drawing, reference attach the Terrain and Geometry drawings. Set the Terrain active.
2. Use the OpenRoads Modeling workflow > Corridors tab *Create* > *New Corridor* tool, select the alignment, answer and accept through the prompts. (Ensure you are hitting on the 2D alignment geometry feature.)
3. Select the Template to be applied and set the start and ending stations. Reset to complete.

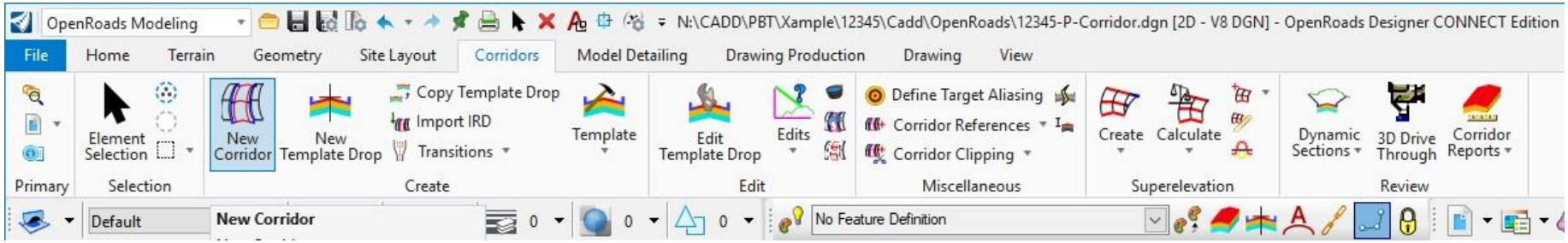
Create the Corridor

Each Corridor should be in its own DGN for larger projects. For smaller projects a single DGN can be used with multiple corridors. If DGN files have not yet been created, see the Create Project Drawings.

Open 12345-P-Corridor.dgn. Open the *Default* model and attach the Combined.dgn's *Default* model with Live Nesting = 1, if not already attached.

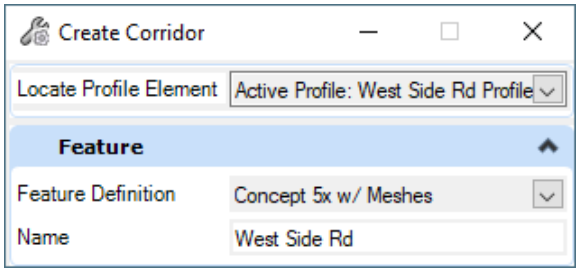
Using Level Display, expand the dgn's *Default-3D* entry. Expand the Combined DGN's *Default-3D*'s attachments. Shut off the display of all referenced *Default-3D* models in any attached reference except the Terrain's.

Select the terrain element and use the context popup menu to set the terrain as active. (may need to make the *Default-3D* model snapable)

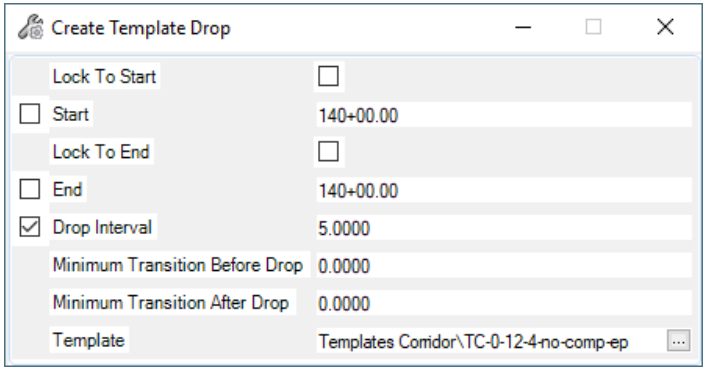


Use Element Selector with the *Individual* and *New* toggles active. Select the Alignment that you want to create a corridor with. Hover on the alignment and the Context Menu popup will appear. (Element Selector needs to be set to Individual and New buttons active).

Select **Create Corridor** or go to the **OpenRoads Modeling** Workflow **Corridors** Tab **Create - New Corridor** tool and hit on the alignment.



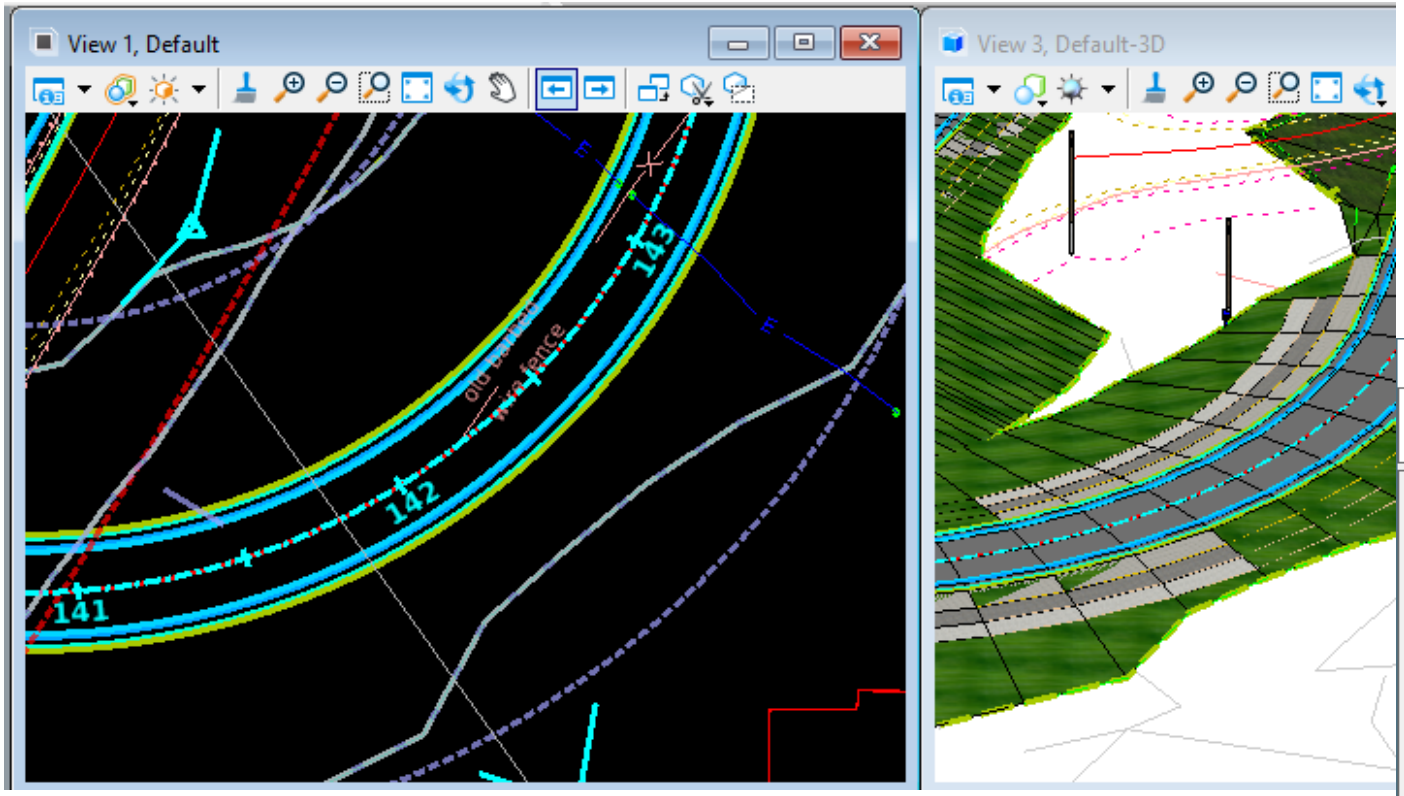
Reset to use the active profile of the alignment chosen or choose another from the drop-down as needed. Set the https://nhgov.sharepoint.com/sites/DOT-ProjectCentral-Home/SitePages/OpenRoads-Corridor-Design-Stages.aspx in the tool box then type a Name for the corridor into the on screen tooltip and left click to accept.



After the corridor is created the *Create Template Drop* toolbox becomes active. The first prompt is for the template (name). Use the Alt key + down arrow to bring up the *Pick Template* box. Select the Template and hit **OK**. Left click on the screen to accept the template, then define the start and end points. You can type in the Start and End stations of the Proposed profile or use the alt key to set the Start and End stations to the beginning and end of the alignment. Set the template *Drop Interval* = **5**, and set the *Transitions* to **0**. Templates are only placed\created where the selected profile exists.

After the template drop is placed you can create additional template drops with different stations by selecting another template and following the prompts again. *Reset* to finish placing templates. After each drop is defined the template is applied to the stations indicated and added to the corridor.

Your corridor has now been created and can be refined using the other corridor creation tools. Many tools work by hitting on the feature's 2D lines that were created. Shut off the display of all the 3D design components by opening the level display, expand the tree under your *Default-3D* model, highlight only the *Default-3D* model, then right click in the levels pane and select **All Off**.



Save Settings and Save. Review your Design by viewing Dynamic Sections.

NOTE:

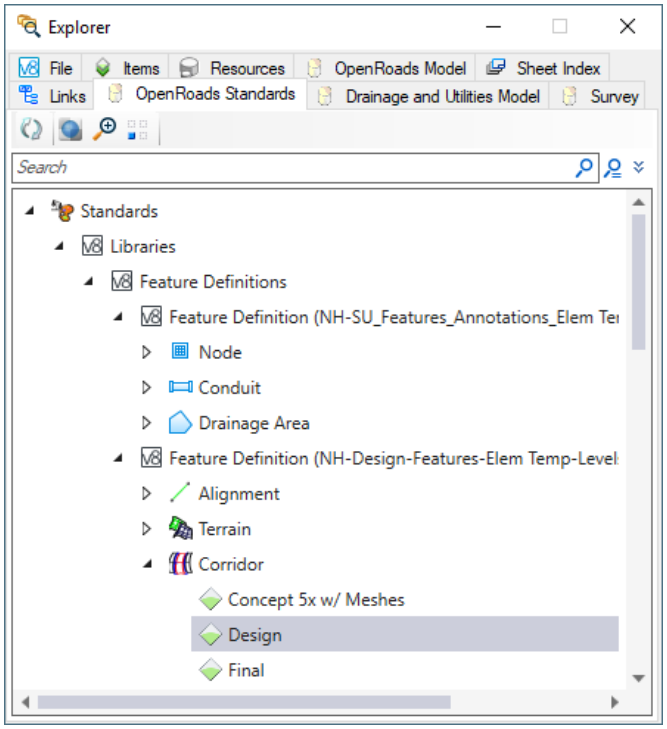
If you cancel out of the command before selecting a template an empty corridor outline could still be created... Delete it before creating a new one.

Use Project Explorer - Civil Model Tab to review all the corridors in a DGN.

For projects with Bridges create separate corridors with overlaps for clipping the approach, the bridge, and the departure. Video

Design Stage

The corridor design stage and the template drop increment determine the frequency of the placed templates. NHDOT has determined that the Final Template drop increment should be 5' therefore the template drop increment should be 5. When working on a conceptual 5, design 2 or final design 1, the design stage uses a template drop multiplier to determine the actual increment of drops translating to 25', 10' and 5' respectively. To see additional information about the design stages properties, use the Home tab's Primary tool **Explorer**. Expand the OpenRoads Standards tab of the Explorer, expand Feature Definitions > Corridor > and select and review the settings of the different design stages in the properties box. Also refer to the Help.



P-5-2: Templates

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Before you Begin

Templates are used to create corridors. Each template is basically a typical section that contains the features and components that are extruded along an ORD alignment.

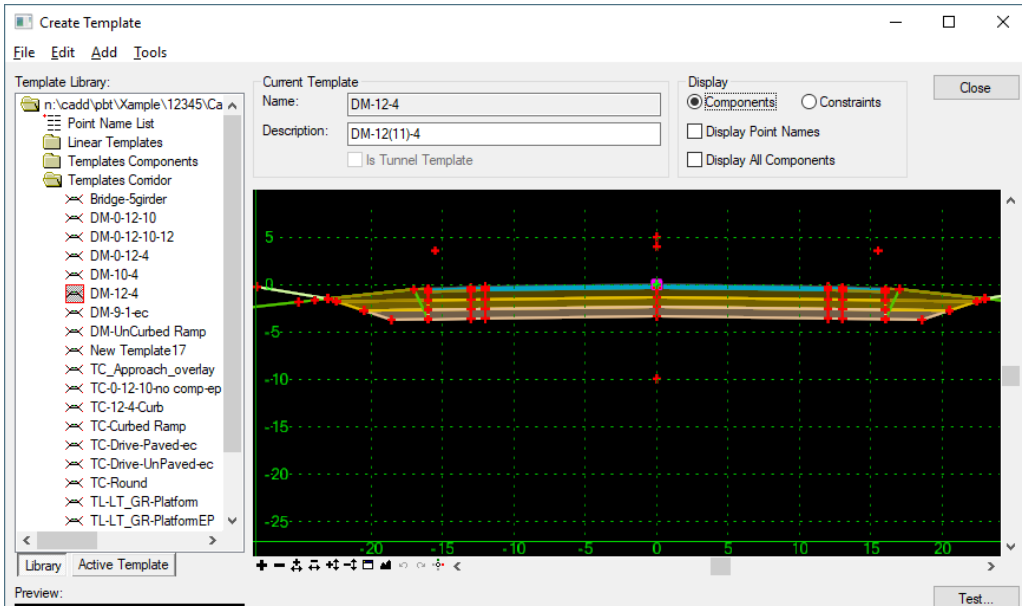
Since each project is unique and will likely need modification to any standard template, a “seed” template file has been created — ApprovedCE-NHDOT-Templates.itl — which contains templates developed by the NHDOT. When working in a new project, this file should be copied into the project’s …*Cadd**Standards**Template Library*\ directory and rename it with your project number (such as ***12345****CE-NHDOT-Templates.itl*) for it to be found by OpenRoads.

If your template file is not found when you open the *Create Template* panel check the project number in the CFG file name and make sure it matches the 12345 in the itl\cfg file name.

Templates are continuously being updated as new ones are created and old ones revised, it will become necessary to update your ITL file or even replace it. Notice will be posted when significant changes take place. For additional information on Templates the ORD Help can be viewed as well a search on Connect Advisor for Templates. They can be accessed from File > Help.

New Design Manual templates have been created and are prefaced with DM_ rather than the previous DM-. these templates should be used as they have updated components allowing for widened and steeper ditches to be developed without the components looping.

Create Template - Tool

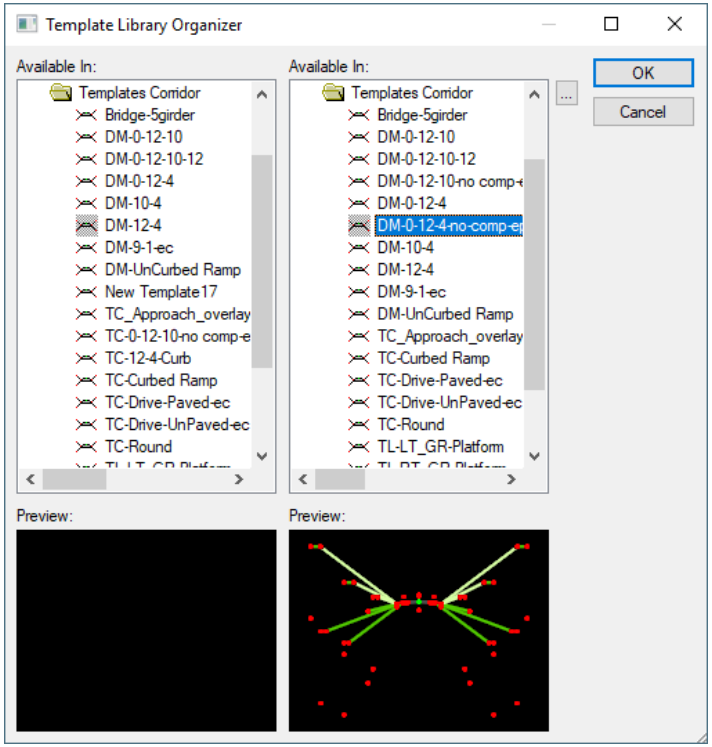


The Create Template tool is used to create and modify templates. It can be accessed from the *OpenRoads Modeling* workflow > *Corridors* tab > *Create* tools - **Template**. The main templates are designated with ***DM*** (Design Manual) prefix and match what is shown in the Design Manual typical sections. A curbed template *TC-12-4-Curb* also exists. The naming convention helps to indicate the intent of the template. Prefixes - TC = Corridor Templates, TL = Linear Templates, TS = Surface Templates.

Components to create templates are in the Template Components folder. Creation of Templates is covered in the Help files as well as on the Bentley learn server and may be documented here in the future.

Common practice should be to create a new 12345 folder in your template file and copy\rename any templates you want to use in your project into the new folder. You can then edit the templates without corrupting the original.

Copy Templates from other ITL files



The template library organizer is used to copy templates from one ITL file to another. Delete any similarly named folder prior to opening the Organizer. It is not an especially user friendly interface.

1. Select *OpenRoads Modeling* workflow > *Corridors* tab > *Create* tools - **Template** to open the Create Template panel.
2. *Tools* > *Template Library Organizer..* opens the current ITL file into the organizer panel.
3. Click on the folder to expand the ITL's contents. To the right of the second pane select the ... to pick the ITL to copy from.
4. If copying a folder of templates, drag it from the right pane up to the top ITL name of the left pane to copy it.
5. Individual templates can be copied by dragging and dropping also but must be dropped onto a folder.
6. Close the Organizer to save the changes.

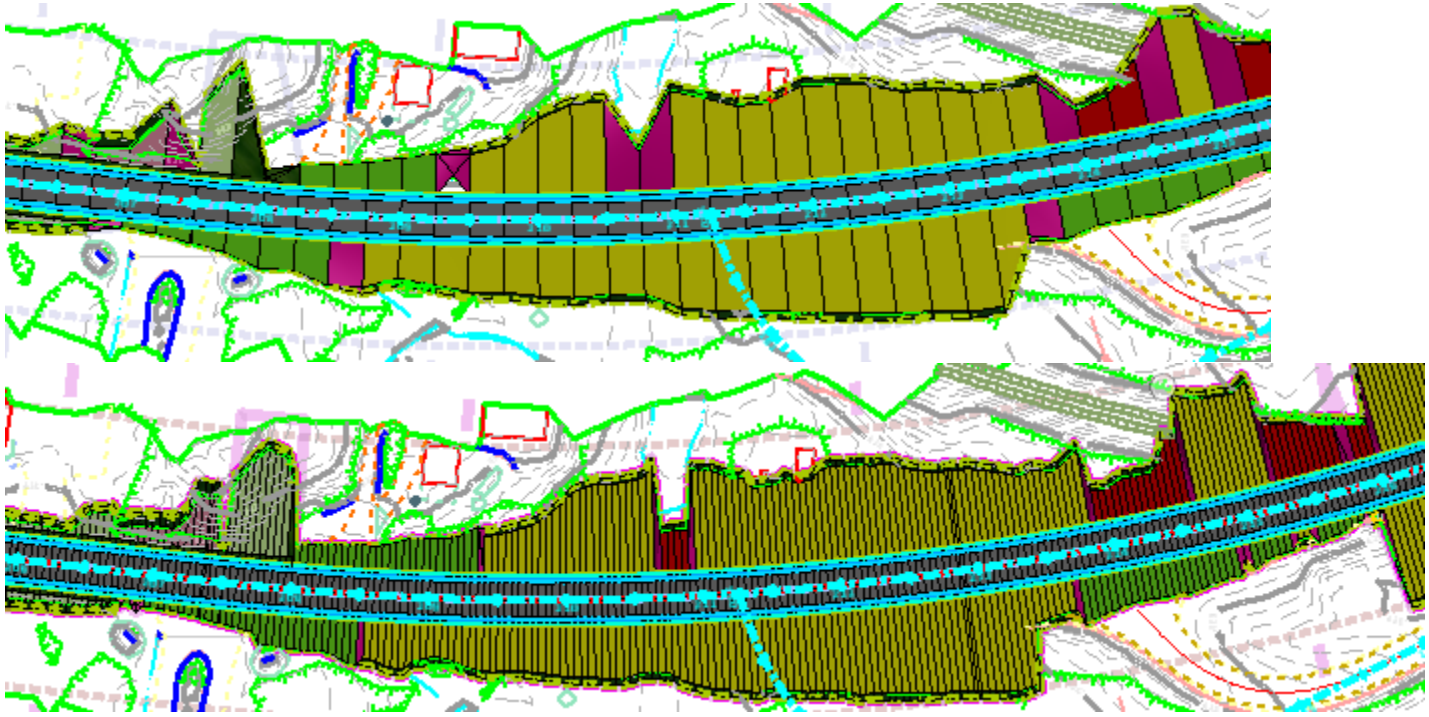
Preliminary Design "No Components" Templates

Latest design practice would be to use the *DM-12-4-no-components* to start your design. The Horizontal and vertical alignments, lane and shoulder widening's, superelevations, slope break modifications for guardrail would all take place using this stripped down template file. This greatly improves processing speeds as well as just the speed of opening a dgn. Once the majority of the top line design is complete, a set of cross sections would then be cut and used to review the side slopes and write parametric constraints that set the side slopes, slope transitions and rounding's throughout the whole project. The template would then be changed to the *DM-12-4 template* that has material components. All parametric constraints are the same for the two templates so the top line design would reflect what was designed using the no-components template. The select materials issues/conflicts would then be looked at and resolved.

The reasons for this approach are because the DM templates do not contain fill height criteria with multiple end conditions, this reduces the complexity of dealing with multiple components and multiple end condition conflicts.

DM-0-12-4-NC-Color with Color Coded Slopes

A new *DM-0-12-4-NC-Color* template file has colored cut and fill height components that show what the slopes are and help visualize where the Parametric Constraint slope transitions need to be. When ready to work on the slope transitions, the Corridor's template can be changed from the *DM-12-4-no-components* to the *DM-0-12-4-NC-Color* template. To clearly see the slope, change the *Default*'s View attributes to *Illustration*. Fill slope colors are 6:1 Green 55, 4:1 Yellow 84: 2:1 Red 80, cut slope colors are 4:1 light green 102, 3:1 Fuchsia 191, 2:1 Orange 7. Transition slopes are hot pink 252.



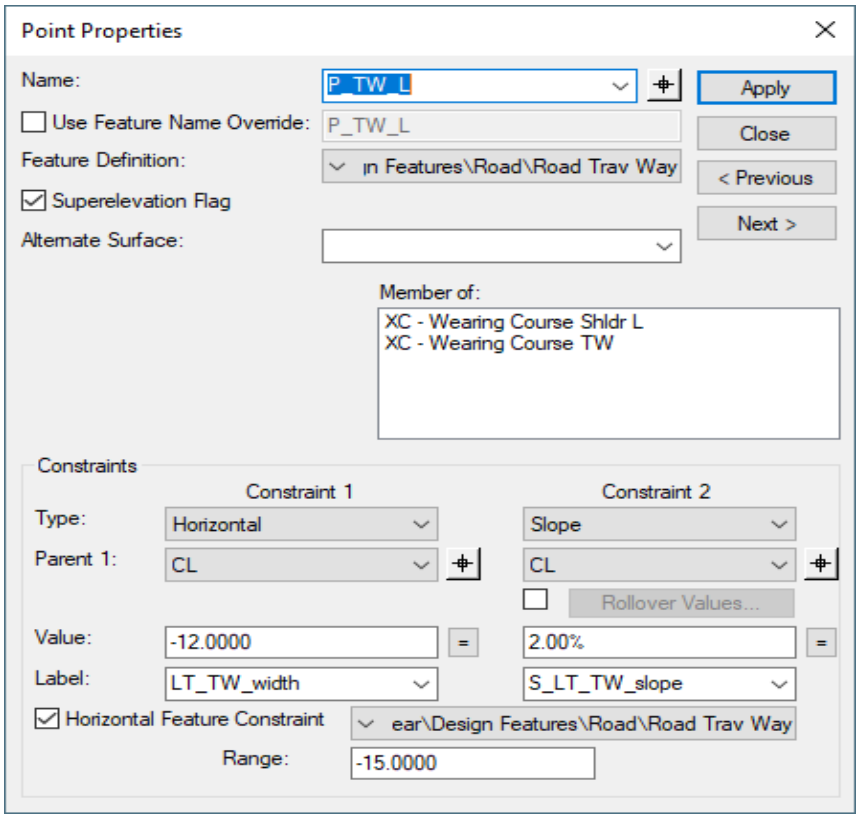
Using this we can clearly see where the slope transitions need to occur. Changing the corridor Feature Definition from *Concept 5x w/ Meshes* to *Final w/ Meshes* which uses a template from modifier of 1 vs the 5 may help, though the pink transition slopes don't seem to display in some instances.

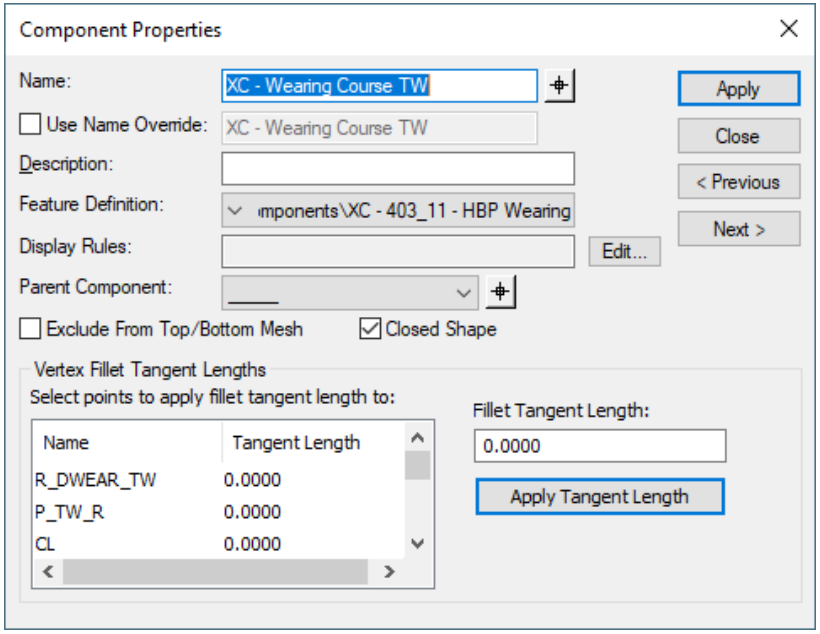
Create *Parametric Constraints* to control the slope transitions over 50-foot intervals. Steeper slopes and some of the yellow slopes may change as the actual end condition is forced to a steeper slope.

Template Parts

Templates are made up of points and components. A point's constraint value can be controlled and modified through Parametric Constraints which are defined as the label. These labels are variables which can be used with the *Create Parametric Constraint* tool in the *Corridor* to modify their values.

Components are made up of the points which define them and have other properties such as *Display Rules* and *Parent Components*. The Component's Display rules allow components to be turned on and off based on criteria controlled by PCs. If a Parent component is turned off, then all of its children will also turn off. Other display rules work automatically to display the appropriate cut or fill select material and can be very tricky to define.





End Conditions

End Conditions are Components that seek an intersection with the active terrain. They have properties similar to display rules in that end conditions are displayed if certain conditions are met within defined parameters. i.e. a 6:1 slope end condition will typically have height of fill criteria defined for it. Meaning it will solve and display if it finds an intersection point within 6 vertical feet of the slope break. Cut slope end conditions are checked before fill slope conditions and are controlled through the end condition's priorities. The *SFill SubEC X* end condition is priority 1 for many templates but its width is set to 0 so it will not solve unless its width is widened through a parametric constraint. Setting the *LT_Fill_Sub_EC_width* allows the end condition to look for an intersection with the existing ground along the subgrade from the EP out. This results in a variable slope from the Slope Break but can be helpful if you are trying not to chase slope work.

P-5-3: Parametric Constraints – Control the Design

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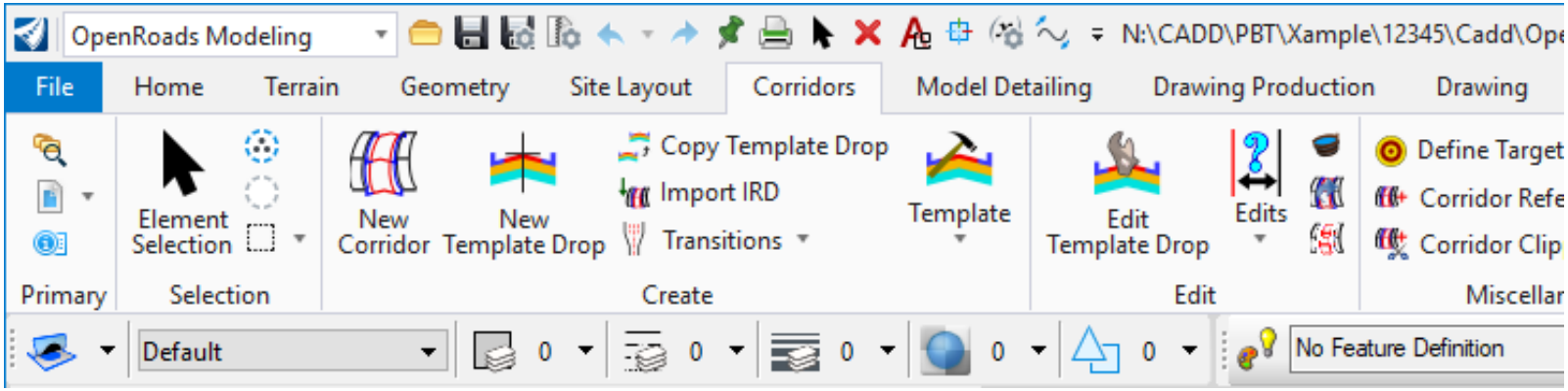
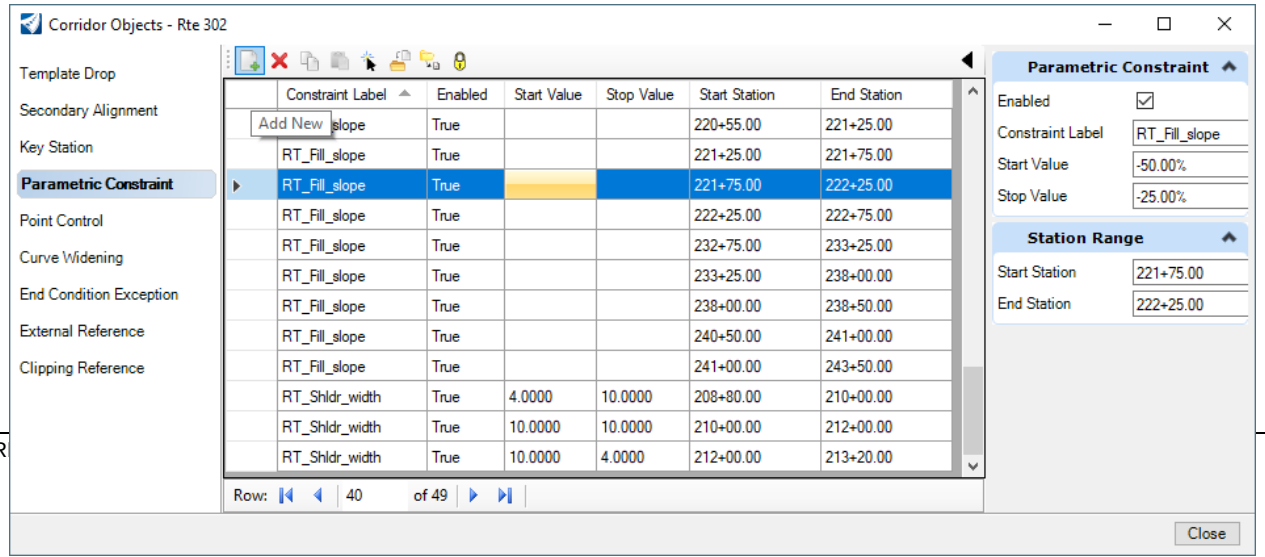
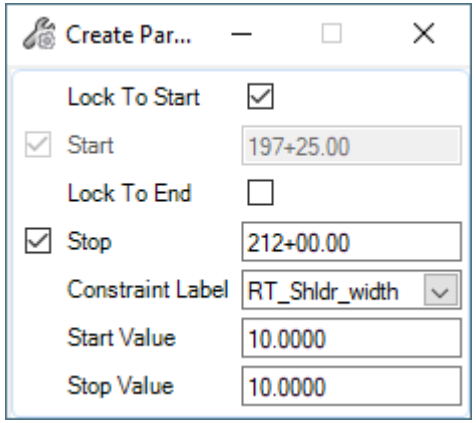
The *Create Parametric Constraint* and the *Corridor Objects* tools are found on the *OpenRoads Modeling* Workflow in the *Corridors* Tab under the *Edit* tools. Use either tool to create a Constraint.



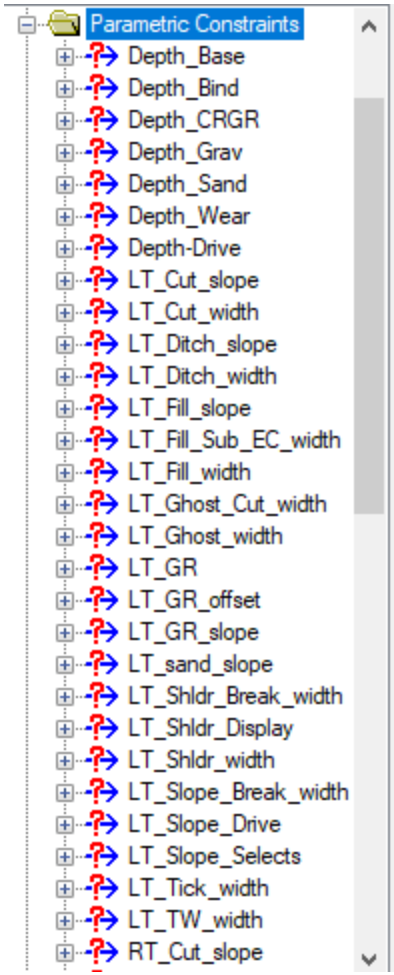
Parametric Constraints or PC's have been defined to control almost every aspect of the NHDOT Templates. Material depths, travel way, shoulder, cut and fill, widths and slopes as well as guardrail display and offset. These constraints are used to refine/define your design. You will use the constraints to transition your slopes from 6:1 - 4:1 - 2:1 as well as transition the rounding's from 5 feet to 0 feet when going from a 4:1 fill to a 6:1 fill. Slope transitions should generally occur over 50 feet.





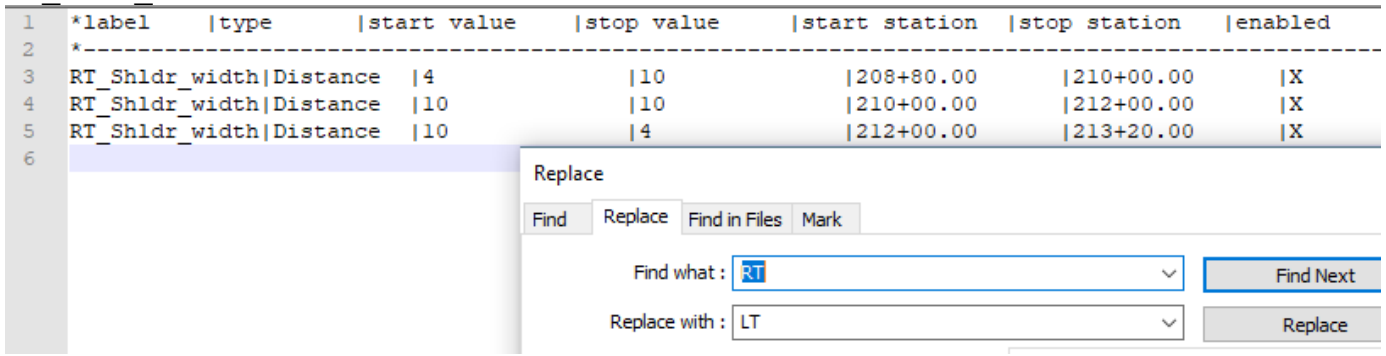
Some constraints like the *LT & RT_EL_width* can be set to 0, others which are used to extend and break slopes in superelevated areas like the LT and *RT_Shldr_Break_width* points should be set to a minimum offset of 0.005 so that the points slope property is still usable to create subsequent points.

When editing or creating multiple constraints using the Corridor Objects tool it is sometimes beneficial to use the *Unlock - Activate Rule* button  . This allows you to create and edit constraints without each change or addition being processed. Reactivate the lock when done adding constraints, Close the tool then reprocess the corridor to have all the changes processed.



Import\Export Parametric Constraints

Constraints can be exported to a text file which can be edited and re-imported to create the constraints as shown here by copying the RT_Shldr_width constraints and editing them for the LT_Shldr_width.



Display Switches

Some constraints control the display of template components like a switch through display rules. The default value for *RT_GR* is -0.5, which has the Guardrail hidden. When the parametric constraint for *RT_GR* is set to positive (+) it turns on the display of the guardrail. *LT_GR* needs to be set to negative to turn it's display on.

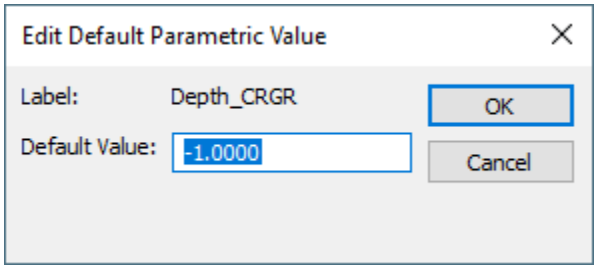
When rounding's, represented by a tick mark offset from the toe (LT & RT_Tick_width) are set to a negative number their display is shut off.

The display of the shoulders and slopes for many templates can be controlled with the LT and RT_Shoulder_Display PC, when XT_Shldr_Display is set to an offset other than 0 they are hidden.

If the Depth_Base is set to 0 it shuts off its display so it will not be shown in the corridors quantities.

Modify all values of a Parametric Constraint in a Template

Mass editing of the material depths (or any constraint) can be achieved by opening the *Active Template* tab, expand the *Parametric Constraints* entry and double click on the desired depth. This will bring up a box showing the default value which can be changed. i.e. if the *Depth_CRGR* is set to -0.66666 or 8" it can be set to -1, (tab to fill the value in the box) then OK to change all points in the template to the new value.



P-5-4: Superelevation

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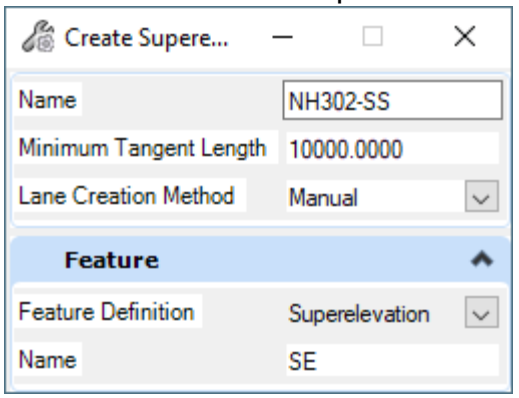
Before you Begin

Create or open a 13245-SuperElevation.dgn and reference in the Geometry drawings. It is sometimes helpful to also reference the Corridor.dgn files as well to see the limits of the design.

Superelevations can be created using the Superelevation tools on the Corridors tab of the OpenRoads Modeling workflow. Supers can be imported as parametric constraints generated from the Excel worksheet that was used in SS4 or as point control lines from the same Excel sheet.

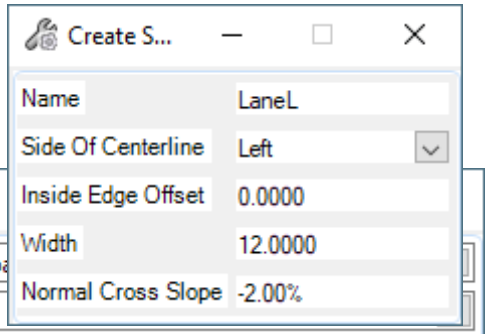


ORD Superelevation

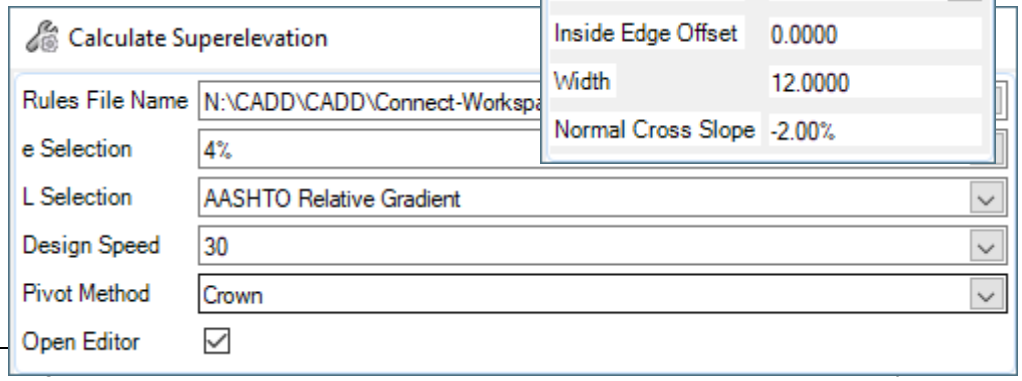
Open the *Default* model and adjust the display as necessary to be able to select the 2D geometry feature of the roadway.

Open the *OpenRoads Modeling* workflow > *Corridors* Tab > Superelevation tool **Create Superelevation Sections**. Supply a name and set the Minimum Tangent Length to a large number. Set the Feature Definition and accept through the prompts to create the Super Section.

After creating the Super Section the next tool should automatically start…. Define the superelevation lanes by defining the name (use the templates TW's point name P_TW_L or R), side, width, and normal crown slope for both the left and right lanes accepting through after verifying each entry.



After Create Superelevation Lanes the next tool should automatically start… the Calculate Superelevation tool allows you to define the AASHTO Rules file, the e max rate, the Length calculation type, design speed and the pivot method. When this tool is completed with the Open Editor box checked the Superelevation Editor will be displayed.

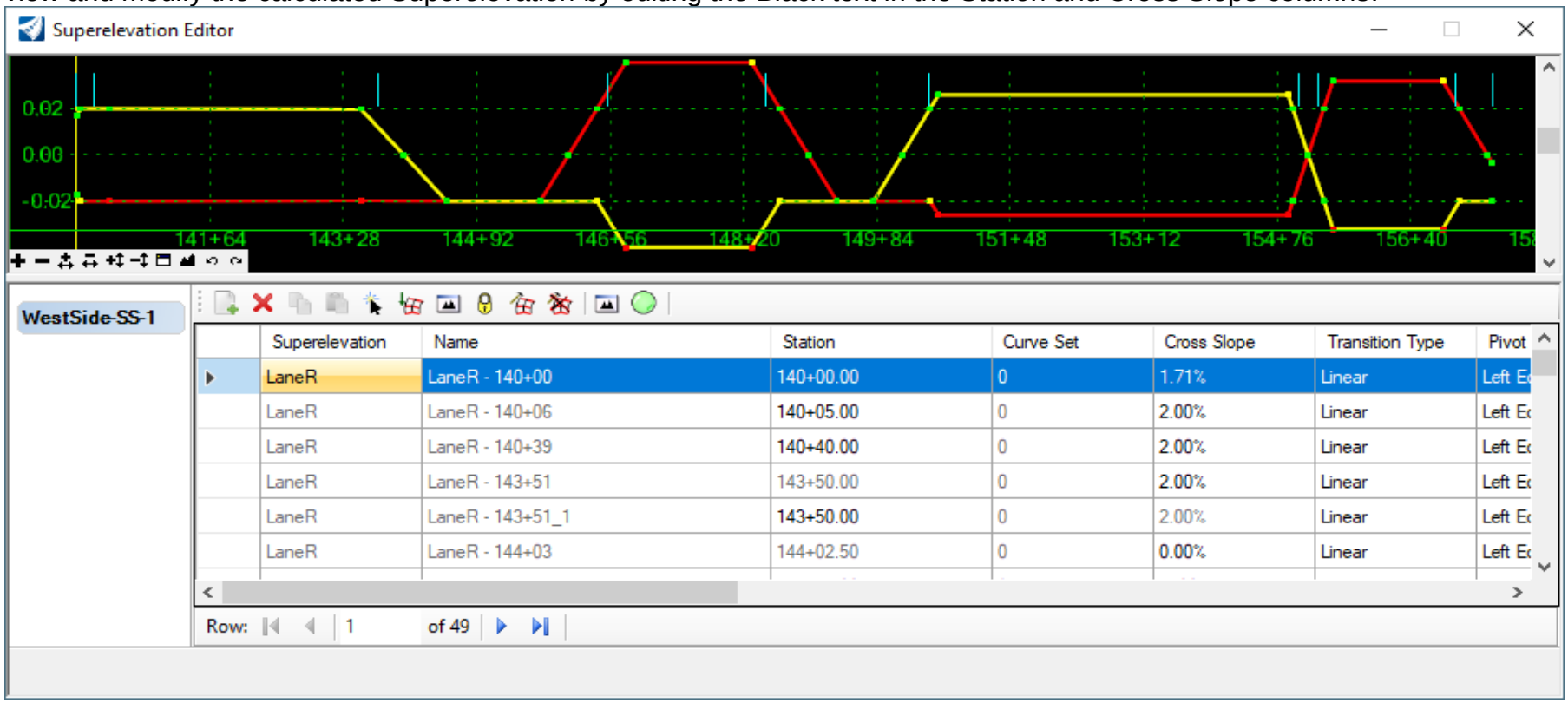


NHDOT CAD/D Connect Documentation

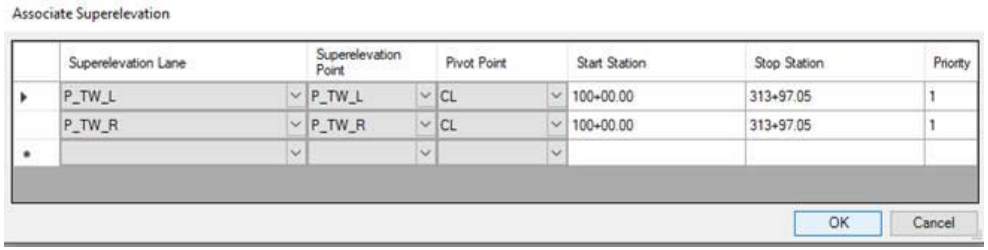
Use the ***AASHTO_2018_NH.xml*** when working on NHDOT projects. The delivered xml files have not been corrected for AASHTO's Errata which corrected some entries in the tables. The Relative Gradient's calculations have also been changed to match how NH calculates it in the Highway Design Spread Sheet previously used.

Superelevation Editor

For information on how to use the Superelevation editor see the Help, Learn server or connect advisor. The Editor allows you to view and modify the calculated Superelevation by editing the Black text in the Station and Cross Slope columns.



When you have finished modifying the Superelevation you can create and save the reports. The next step is to assign the superelevation to a corridor. Save dgn and open the corridor dgn. With the *Default* model active, reference attach the Superelevation dgn's *Default* model. Use the *Assign to Corridor* tool to apply the Superelevation to the corridor by first selecting the super section and then the corridor to apply it to.



Corridor Modeling – By Constraints – non-preferred method in ORD

Using Template Constraints for Superelevation - Video

Found under Corridor Modeling Tasks the Corridor Objects - Parametric Constraints tools allow for importing of txt files containing constraints.

An Excel spread sheet has been created for Super Elevation design and is located in *ss4_superelevations_2_4.xlsm*. It should be copied into each project prior to use. The sheet will create parametric constraints to import into the corridor for superelevation transitions. Fill in all appropriate boxes for each curve, then open the Parametric Constraints worksheet tab.

Click the "Add Output All" or "Add Output Shoulders Only" to define which entries are to be exported. Click the "Export to TXT" button to create the file in the project directory.

***** This information should be checked carefully for errors such as overlapping curve transitions *****

***** YOU ARE RESPONSIBLE FOR YOUR DESIGN *****

The latest sheet is good for 18 curves - if you need more use a second sheet and increment the files by adding - Part 1 Part 2... to the ROAD NAME

Open the *Corridor Objects* panel by selecting the tool on the *Corridor Modeling* task menu. Then select *Parametric Constraints* on the left side of that panel.

The *Import Parametric Constraint* tool from the *Corridor Objects - Parametric Constraint* view is used to import the text file of the correct format. Constraints can also be exported from a corridor, edited with a text editor and re-imported.

Super elevation control lines can be created using the appropriate tabs, but it is recommended to take advantage of using the *Parametric Constraint* tab of the spread sheet in that it also creates the constraints for the shoulder roll over and is more easily reviewed together.

When editing or creating multiple constraints using the *Corridor Objects* tool, it is sometimes beneficial to use the *Unlock - Activate Rule* button. This allows you to create and edit constraints without each change or addition being processed. Reactivate the lock when done adding constraints. Close the tool then reprocess the corridor to have all the changes processed.

P-5-5: Parametric Constraints – Control the Slope Transitions

Return to Index

The *Create Parametric Constraint*  and the  *Corridor Objects* tool are found on the *Corridor Modeling* task menu. Use either tool to create a Slope Constraint. Constraints for slopes include L(R)_Fill_slope and L(R)_Cut_slope. These constraints will override the default slopes from the fill height criteria used in the no-comp(onents) templates as well as those in the 2 slope templates such as the DM-12-4 and DM-12-10.

Create Slope Parametric Constraints

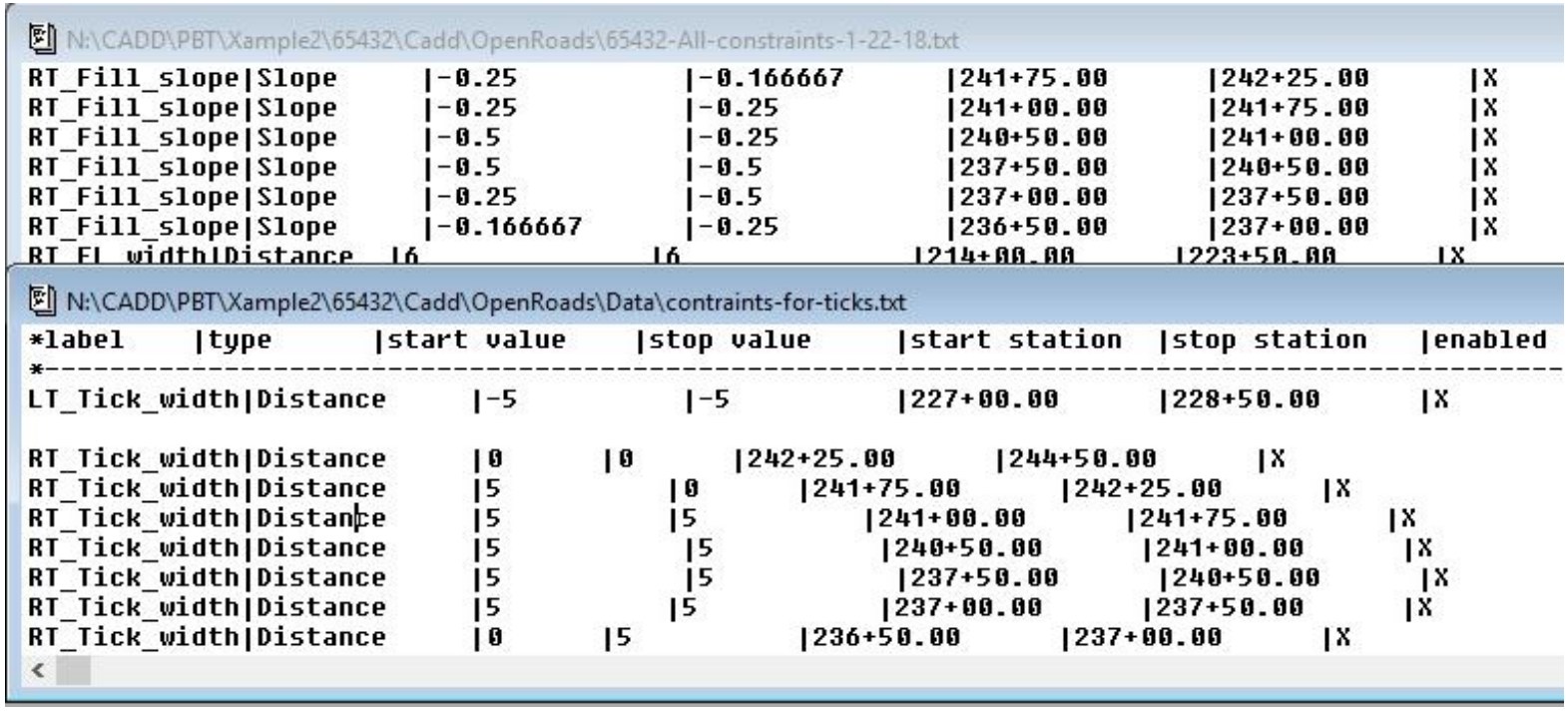
The design should be worked through in order... basically the same order that the Corridor Design documentation is in. Constraints to transition your slopes from 2:1 - 4:1 - 6:1 as well as transitioning the roundings from 5 feet to 0 feet when going from a 4:1 fill to a 6:1 fill should be next after the Guardrail Design. The Video shows the process of using the results of a no component template that uses the Typical section's fill height criteria to determine the base slope solutions. These slopes are shown and annotated on a set of cross sections and then hand recorded into an https://nhgov.sharepoint.com/:x:/r/sites/DOT-ProjectCentral-Home/CADD%20Document%20Library/report-slopes-ticks.xlsx?d=wba11871a8661417b944804d91080c8e9&csf=1&web=1&e=ELAhVs. The spread sheet helps to determine where the parametric slope constraints are needed to set the slopes and transitions between different slopes. Slope transitions should generally occur over 50 feet. The section of the spread sheet to the right can be used to help write the parametric constraints (copy into text file) but it may be easier to just have the recorded slopes displayed while you add the constraints by hand into the *Corridor Objects* > *Parametric Constraints* section. - Video

When editing or creating multiple constraints using the **Corridor Objects** tool it is sometimes beneficial to use the *Unlock - Activate Rule* button  . This allows you to create and edit constraints without each change or addition being processed. Reactivate the lock when done adding constraints, Close the tool then reprocess the corridor to have all the changes processed. - Video

Create Slope Rounding (Tick Width) Parametric Constraints

Slope roundings are not shown on the cross sections as there is no real way to transition their lengths or reliably match them into the existing slopes. Slope roundings are represented by a tick mark on the cross section at the appropriate distance from the slope intersection point. Parametric constraints need to be created to set the tick marks at the correct distance from the toe of slope. Each Template has default slopes and a default Tick width. These can be reviewed and modified by hand (adding

individual constraints) using the Excel spread sheet created in the previous section. An alternate method is to create and edit a report of the cut and fill slope parametric constraints. The report is edited to have the Tick width replace the slope for all variations of the cut and fill slopes parametric constraints then the constraint name is updated to reflect the Tick width constraint.
- Video



N:\CADD\PBT\Xample2\65432\Cadd\OpenRoads\65432-All-constraints-1-22-18.txt

```
RT_Fill_slope|Slope     |-0.25          |-0.166667      |241+75.00      |242+25.00      |X
RT_Fill_slope|Slope     |-0.25          |-0.25          |241+00.00      |241+75.00      |X
RT_Fill_slope|Slope     |-0.5           |-0.25          |240+50.00      |241+00.00      |X
RT_Fill_slope|Slope     |-0.5           |-0.5           |237+50.00      |240+50.00      |X
RT_Fill_slope|Slope     |-0.25          |-0.5           |237+00.00      |237+50.00      |X
RT_Fill_slope|Slope     |-0.166667      |-0.25          |236+50.00      |237+00.00      |X
RT_FL_width|Distance  |6              |6              |214+00.00      |223+50.00      |X
```

N:\CADD\PBT\Xample2\65432\Cadd\OpenRoads\Data\contraints-for-ticks.txt

```
*label    |type       |start value    |stop value     |start station  |stop station   |enabled
*-------------------------------------------------------------------------------------------
LT_Tick_width|Distance     |-5           |-5           |227+00.00      |228+50.00      |X

RT_Tick_width|Distance     |0      |0      |242+25.00      |244+50.00      |X
RT_Tick_width|Distance     |5          |0      |241+75.00      |242+25.00      |X
RT_Tick_width|Distance     |5          |5          |241+00.00      |241+75.00      |X
RT_Tick_width|Distance     |5          |5          |240+50.00      |241+00.00      |X
RT_Tick_width|Distance     |5          |5          |237+50.00      |240+50.00      |X
RT_Tick_width|Distance     |5          |5          |237+00.00      |237+50.00      |X
RT_Tick_width|Distance     |0      |5          |236+50.00      |237+00.00      |X
```

When roundings (LT & RT_Tick_width) are set to a negative number they are shut off in newer templates. This allows you to have slopes shown without the cut or fill linestyle being placed such as at intersections were proposed side road slopes match into the mainline slopes.

Review Displaying Dynamic Cross Sections

P-5-6: GuardRail Platforms

Return to Index

Before you Begin

Create or open a **12345-P-GuardRail-Platforms.dgn** and reference in the **Combined**, and the corridor dgns that require guardrail.

Guardrail platforms can be created within the corridor or created separately by creating a corridor for each in their own dgn. By creating a separate corridor for each platform, the quantities for the platform can be excluded from the corridor as the specifications indicate. The GuardRail Platform's offsets and slopes are created from imported parametric constraints generated from an Excel worksheet. Constraints to turn on the GR display and widen the slope break to 2.5' between the platforms are also generated in the Excel file and need to be imported into the corridor dgn.

GuardRail Note and Calc Sheet

The guardrail_field_notes-calc_sheets-openroads_constraints.xlsx is used to design guardrail and to create the parametric constraints for the platform widening, grading and turning on the display of the guardrail. There are 3 tabs in the file, *GR Field Review* Sheet, the *GR Worksheet* and the *OpenRoads Constraints* sheet. Design information from the *GR Worksheet* is used in the OpenRoads Constraints sheet by populating the drop down selections in green and entering the stationing in fuchsia.

GR Note:	GR-1	Side of Roadway:	RT	Face of GR offset from EP:	0.00 ft
Stationing Information					
Lower Station Guardrail Limit:	106+50.00				
Upper Station Guardrail Limit:	113+00.00				
Lower Station Platform Type:	TL-3				
Is Platform Preferred or Alternate?	Preferred				
Distance of Guardrail from EP:	< 2.50' from EP				
Upper Station Platform Type:	TL-3				
Is Platform Preferred or Alternate?	Preferred				
Distance of Guardrail from EP:	< 2.50' from EP				

```
RT_Slope_Break_width |Distance |1 |9 |106+18.00 |106+50.00 |X
RT_Slope_Break_width |Distance |9 |9 |106+50.00 |106+50.00 |X
RT_Slope_Break_width |Distance |9 |5 |106+50.00 |106+75.00 |X
RT_Slope_Break_width |Distance |5 |4 |106+75.00 |107+00.00 |X
RT_Slope_Break_width |Distance |4 |2.5 |107+00.00 |107+12.50 |X
S_RT_Slope_Break_slope |Slope |-0.05 |-0.1 |106+18.00 |106+23.00 |
S_RT_Slope_Break_slope |Slope |-0.1 |-0.1 |106+23.00 |107+00.00 |X
S_RT_Slope_Break_slope |Slope |-0.1 |-0.05 |107+00.00 |107+12.50 |
RT_GR_offset |Distance |2.5 |0 |106+50.00 |107+12.50 |X
RT_GR |Distance |0.5 |0.5 |106+50.00 |107+12.50 |X
```

There are 3 sections of constraints generated for each GR run. Each section should be highlighted, copied and pasted into notepad, PFE or Notepad++ and saved as text files. The middle 2 lines are for the actual roadway corridor and the Approach and Departure sections for

the GR Platform corridor(s). Name the test files appropriately with GR-# followed by the approximate station values found above each section and then LT or RT. i.e. **GR-1-App-10618-10712-RT.txt**, and **GR-1-Cor-10712-11237-RT.txt**, and **GR-1-Dep-11237-11332-RT.txt**. Alternately, have both the approach and departure sections in the same .txt file.

Create Guardrail Corridors

With the **12345-P-Guardrail-Platforms.dgn** open, and referenced corridor attached, select the Mainline Geometry, hover and select *Create Corridor* from the Pop-up list. Make sure you are selecting the 2D geometry reference. If needed, shut off the display of the 3D corridor and geometry reference models. Right click to use active profile and name the corridor with the corresponding GR-# that you are working on. Use the *Alt+Down arrow* to select the template, ***Templates Corridor\TC-RT_GR-Platform***, *Left click* to accept. Next, key in the start and end stations of the platform shown in the Excel file above the constraint section. Use a 5-foot template drop. When finished placing the template drop you can place another one for the departure platform using the start and end stations above that section. *Right Click* to end.

Create Point Controls and import Constraints

The Template that was used has points corresponding to the points on the roadway corridor. Select the corridor, hover and select *Corridor Creation Tools > Corridor Objects* from the Pop-up Menu. Select *Point Controls* from the *Corridor Objects* tool box, and select *Create Point Control*. Three point controls need to be created. They should be created from the Start of the Geometry to the End so they will already be defined when/if you add additional template drops.

Description

1 Description-EP/ Both /Linear Geometry/**Corridor EP_R** /Plan Element/ hit on the Roadway corridor's *P_EP_R* feature.

2 Description-SB/ Both /Linear Geometry/**Corridor Slope Break_R** /Plan Element/ hit on the Roadway Corridor's *P_SLP_B_R*.

3 Description-Toe/ Both /Linear Geometry/**Corridor Toe** /Plan Element/ hit on the Roadway Corridor's toe *P_TOE_R.*

This should align the platform corridor on to the roadway corridor. In the Dynamic section view the platform should appear as a thin fill over the roadway slopes.

Widen the platform and turn on the 2D and 3D guardrail by importing the txt files created earlier. In the *Corridor Objects Box* switch to the *Parametric Constraints* section. Click on the *Import Parametric Constraints* tool and import the App and Dep files created earlier.

If the 2D guardrail line is not showing up, use *OpenRoads Modeling* workflow > *Model Detailing* tab > *3D tools* pane > *Plan By 3D Element* from the dropdown menu and click on the 3D guardrail.

Open the Roadway Corridor and Import the Parametric Constraints

The corridor .txt file can be imported directly into the roadway corridor's constraint section. Open the **P-Corridor.dgn** and Select the corridor, hover and select *Corridor Creation Tools* > *Corridor Objects* from the Pop-up Menu. In the *Corridor Objects Box* switch to the *Parametric Constraints* section. Click on the *Import Parametric Constraints* tool and import the Cor file created earlier.

If the 2D guardrail line is not showing up, use *OpenRoads Modeling* workflow > *Model Detailing* tab > *3D tools* pane > Plan By 3D Element from the dropdown menu and click on the 3D guardrail.

P-5-7: Drives and Side Roads

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Introduction

Drives and Side Road civil cells have been developed for the designer's use. Standard driveways should always match into the edge of pavement of the main corridor. Side roads can also match into the edge of pavement or into the travel way so the shoulder is continuous from the main road into the side road. Alignments for either should generally be designed perpendicular from the mainline out to at least the EP before skewing or curving.

Side Roads and driveways are designed after the Mainline corridor has been completed. The horizontal and vertical geometries will match into the Mainline. All alignments that are intended to be stationed and shown on the plans should be created in the project's Geometry.dgn. All other Drive alignments, Civil cells and corridors can be created in the **P-Drive.dgn** and side roads can either be in the mainline corridor or in their own corridor.dgn file if the work is extensive.

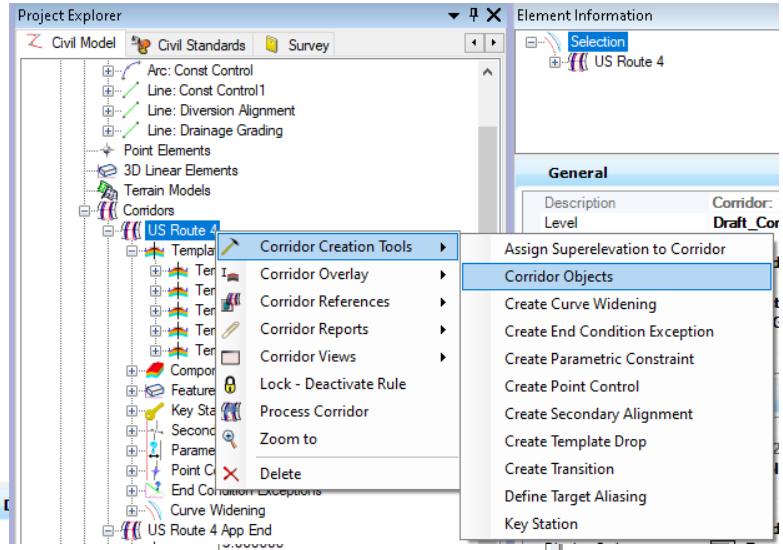
Create the Drive Alignment

Open or create the **xxxxx-P-Drives.dgn** file, *Default* model and attach the existing reference files, geometry and the corridors the drives will match into.

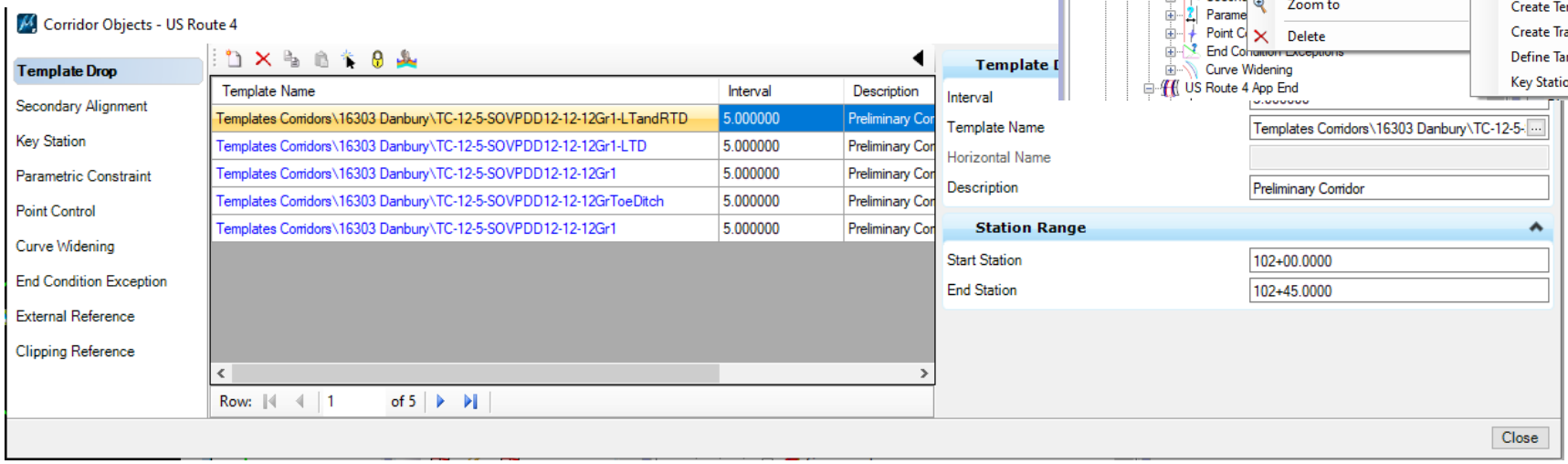
P-5-8: Importing Corridors from SS4 InRoads

Create Corridor Object Reports

Using InRoads, open each SS4 corridor dgn in the old *–ss4* project. Now that the project has been renamed you may need to update the Project Defaults to point to the correct file locations. Open Project Explorer to the Civil Model Tab. Expand the dgn dropdown > Expand the *Corridors* entry. Each corridor listed should be examined and determined whether it needs to be exported. Right click on the corridor and use *Zoom To* to find it (may or may not work).

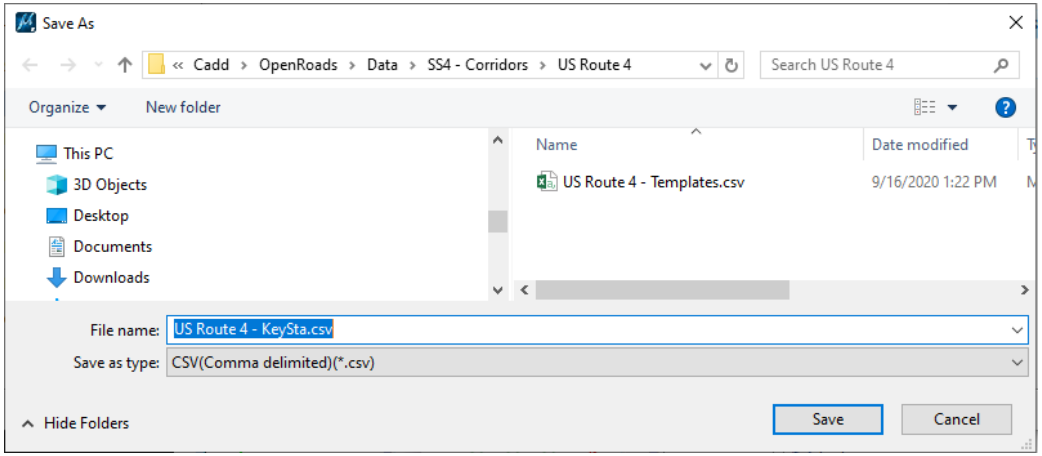


Select the corridor and make note of the Horizontal Name and Profile Name that the corridor was created from as they need to be recreated using Section P-4-2: Geometry from SS4.. Next, *right click* on the corridor expanding the Corridor Creation Tools and select *Corridor Objects*. The box will appear containing the parts of the corridor.



Click on each category in the left pane and if information is present, *Right Click* in the gray area and select *Export*.

Create a Folder(s) in the Connect project OpenRoads\Data\SS4-Corridors\RoadName\ and save each export there with corresponding name and description for each corridor. The Parametric Constraints are really the only part of the corridor that can be imported into the ORD corridor but the rest of the Exported files provide information on what was and needs to be done.



Template Reports

With both InRoads and ORD open, review each template and, if necessary, make modifications to standard ORD templates mimicking any changes that were done to the SS4 templates used in the corridor. SS4 templates can be imported into ORD but there are more changes that would need to be done than its worth. When editing ORD templates, check for any new functionality (like shoulder shutoff display rules) that work to make things easier before just making modifications (like deleting the shoulder and creating additional template drops).

Parametric Constraint Reports

Edit the exported *ParametricConstraint.csv* file and remove any super elevation slope constraints as supers are done with the Superelevation tools in Connect and the shoulder Rollovers are controlled in the template. Dimension Height constraints can also be deleted as they are not used in ORD.

Most PC's are named the same as those defined in SS4 but some have been upgraded. Review the constraints and use Find/Replace to update any constraint names to those used in the ORD template selected. Import this edited file into your ORD corridor.

Point Control Reports

These cannot be imported. Use the report to see what other control lines may need to be recreated in ORD, whether other alignments or other corridors possibly in different corridor dgn files. The list will help you determine those dependencies but cannot be created until those pieces are created. *Superelevation Point Controls* will be created when the SuperElevation tool *Assign to Corridor* is used.

External Reference and Clipping Reference Reports

Neither of these categories can be imported as they will need to point to things newly created in ORD. They will help you to understand what may need to be created and referenced in order to recreate the SS4 corridor design in ORD.

Continue creating the reports until all corridors are completed or determined to be unnecessary.

Follow the steps in OpenRoads Designer - Corridors for importing the Parametric Constraints file after creating the template drops.

The SS4 Corridor dgn file's *Default-3D* model can be attached to an ORD Corridor's *Default-3D* model in order to compare the 3D Models by viewing the Dynamic Sections. The regular way of attaching the *Default* to the *Default* model and the 3D being automatically attached will not work as connect does not recognize the SS4 files as being civil files.

OpenRoads Designer - Creating Cut Sheets

P-6-1 Cross Section Cut Sheets MOVED TO -

nhdot-cadd-doc-cross-section-cut-sheets-2023.pdf

nhdot-ce-cadd-doc-ord-cross-section-cut-sheets-21r2.pdf

P-6-2: Plan Cut Sheets

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Introduction – Creating ORD Plan Cut Sheets Video

Working with ORD to create the cut sheets is a bit different than only using MicroStation as in the past. In ORD, reference files are attached both as 2D and 3D drawings. Knowing the content of each drawing will help to ensure that the correct information is being shown on the plans produced. For many drawings 2D information will be shown on the plan sheet. Cells representing the symbology of Utility and Drainage features need to be referenced from their 2D models. Corridor and Drive dgns should have their 3D models displayed as the 3D model is the only model information that gets clipped out of the design when placing civil cells along the corridor or at Bridge locations.

The Cut Sheet Seed dgn will be set up and copied to create subsequent cut sheet sets. The *Default* model of a cut sheet dgn is used to turn levels and reference files on and off in each sheet set, very similar to the Master dgn's view definition in SS4.

**** Note that for plan and profile cut sheets, the Sheet model has the Drawing model attached with *Display Overrides* set to ***Never*** and the Drawing model has the *Default* model attached with *Display Overrides* set to ***Never!*** This means that if you want to turn a level or reference file on or off you need to open the *Default* model, modify the view and save setting and save the dgn to save the Reference and Level state. You may have to reopen the dgn to see the changes propagated through to the sheet models!

Create Cut Sheet Seed dgn - Attach Reference Files

Create new drawing *12345-Cut-Sheet-Seed.dgn* either in the CutSheet folder of the prj directory or create a new \CutSheet folder in the OpenRoads folder. Use the ORD seed file - …*\NHDOT\Standards\Seed\NH_SeedORD_Design.dgn*

With the new drawing open and its *Default* model active, attach the project's reference files. Use *Reference File Attach* and attach the Combined.dgn with live nesting set to 1. If using a Proposed Container file, also attach that with live nesting set to 1. All other proposed files such as the Corridor, Drainage, Drive, and Utility files should be attached with live nesting set to 0. MicroStation's files can be attach using the *Drawing* workflow > *Utilities* tab select the ***NHREF*** Macro > **PLAY.** The nhref macro may attach some of the civil drawings like the Geometry drawings so review the attachments carefully.

The *Open Ref Lev* macro can be used to turn levels and reference file display off / on for a particular plan set. It will only work if the Reference file's logical names were defined during the attachment process. The *Default-3D* model attachment's logical name will not be defined and must be assigned by hand. See the Drawing name list for Logical names of Civil drawings.

Use Level Display to turn levels on and off for the plan set. Remember to look at both the *Default* 2D model's levels as well as the *Default-3D* attached model levels. Can turn some levels *Off* that you know will be off in any cut sheet such as the Corridor outlines, Template Drop outlines. The Right click menu can be accessed and Off by element used to shut off displayed levels.

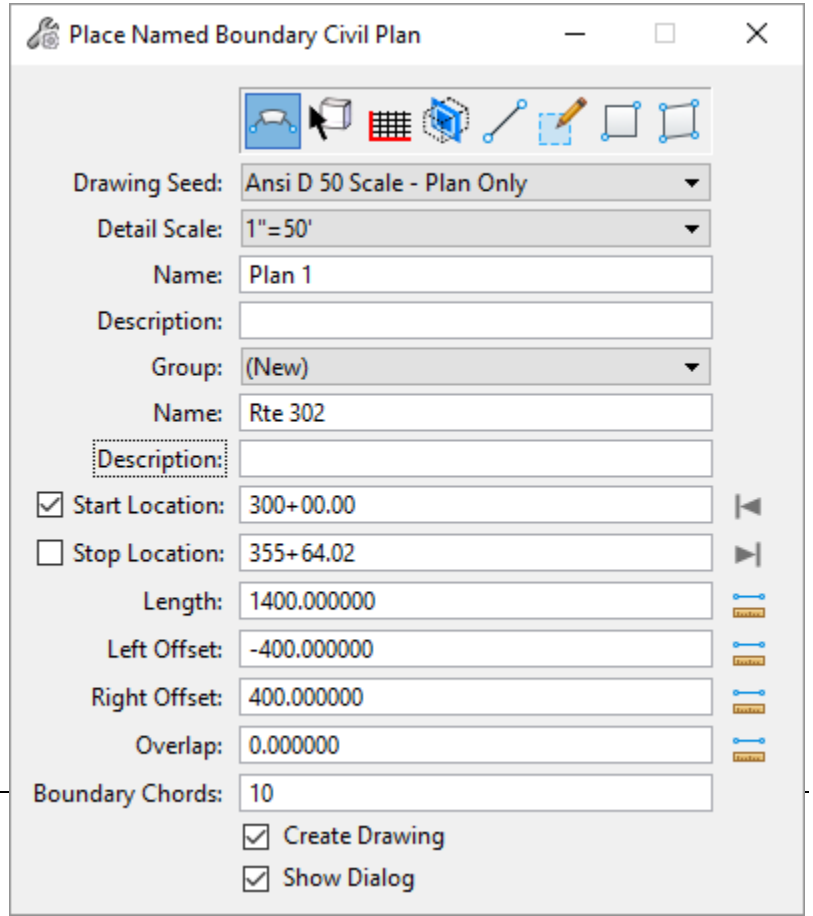
Save Settings and save the dgn.

Create Named Boundaries

Named Boundaries are the clipping elements for the cutsheets. The *Place Named Boundary* tool is used to create the named boundaries of the various types of plans, from plan, profiles to cross sections and details.

Set the workflow to *OpenRoads Modeling* > *Drawing Production* > *Named Boundary* tool

Select the Drawing seed in the top and then select the Alignment in the *Default* model *View 1*. Ensure the correct geometry and name is selected by viewing the popup information on your cursor. Set the start station of the first cut sheet and then move to the location of the end of project and select the stop location.

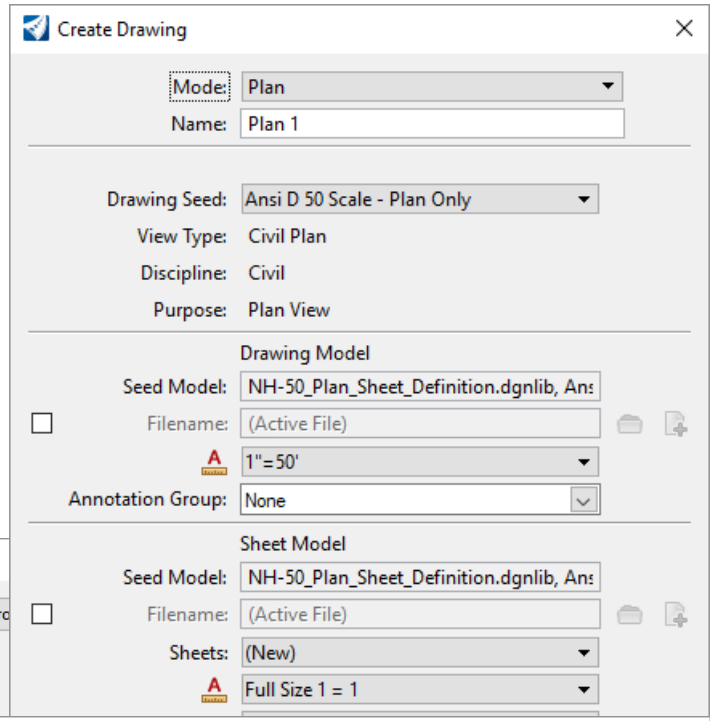


Create the Drawings (from checking the Box)

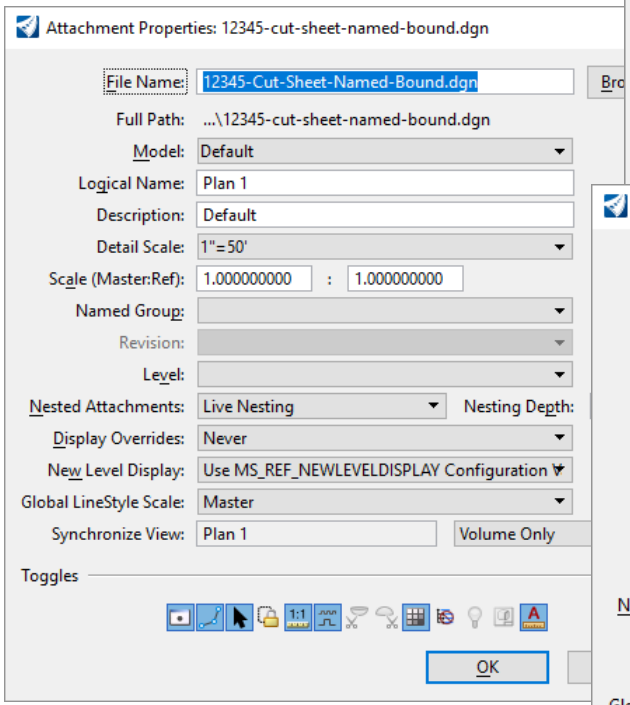
Sheets of equal length will be created. Sheets can be placed one at a time of varying lengths. Select any sheet Boundary and you can move vertices to change the shape of the clipped area. With the *Create Drawing* box checked, the cut sheet Drawing models and the Sheet models will be created. It is suggested that you actually uncheck the *Create Drawing* box and verify that the sheets are where you want them. Modify the *Named Boundaries* then use the *Named Boundaries* Tool Box to create the drawings.

Accept through the prompts.

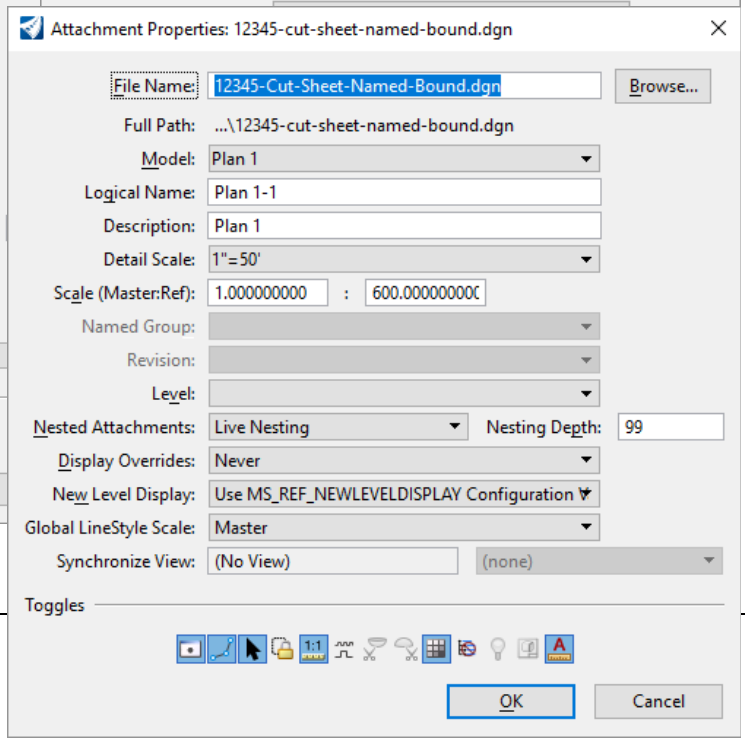
The *Create Drawing* box is as shown. Use the default *Annotation Group* (Plan Annotation). Change the Logical name to the plan type you are creating. i.e. DRN PLAN 1, or GEN PLAN 1. Click OK



This image shows the Drawing Model's properties. Note the *Display Overrides* are set to *Never*, and the model is synchronized to Plan 1 Saved view.



This is the Sheet Model's Reference Attachment settings of the Drawing Model. Note that the Display Overrides are set to Never.



After reviewing the Drawing and Sheet models return to the

NHDOT CAD/D Connect Documentation

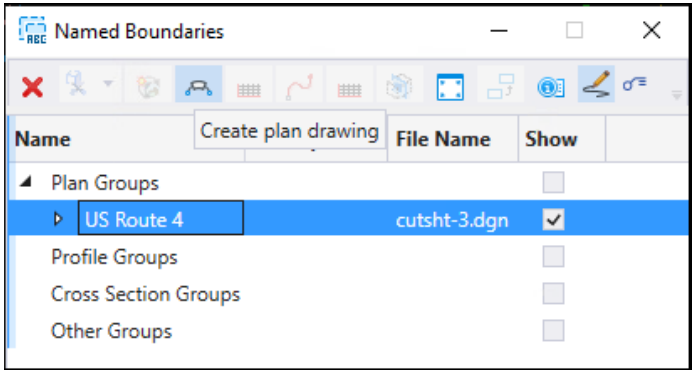
Default model in View 1, Save Settings and Save the DGN.

To create the first set of cut sheets use the *File* > *Save As* command and choose the folder and drawing name. 12345-Gen-Plans.

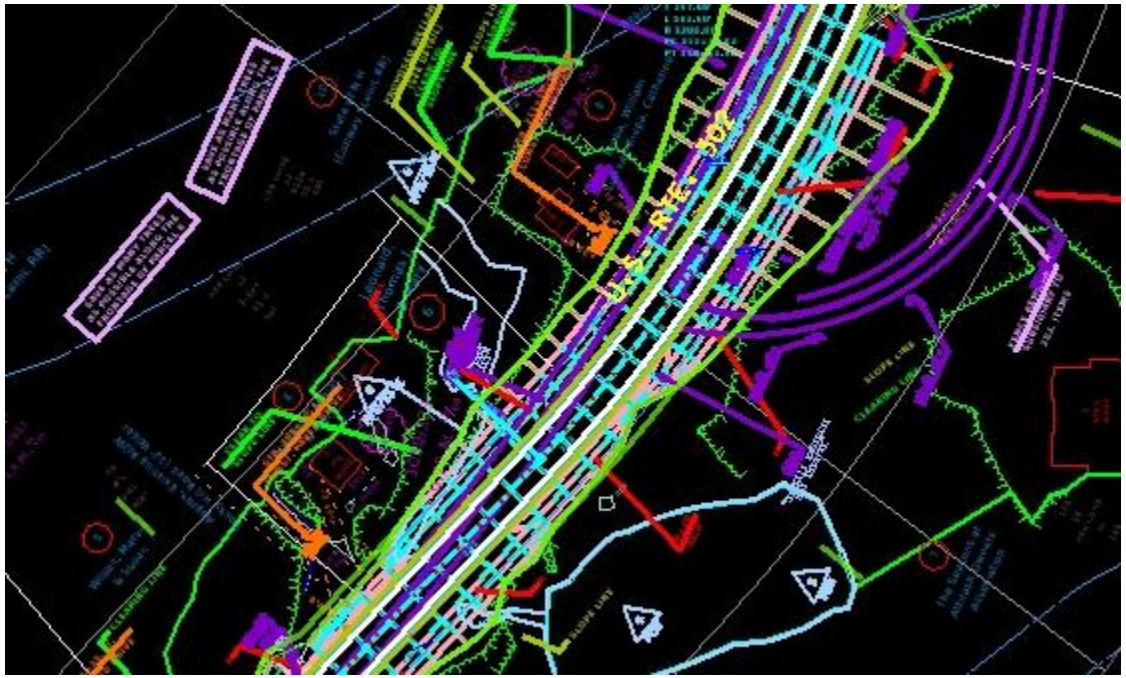
The Drawing will open. Note that if you view the *Default* model you will see that the view's level state is the same as the sheet model's.

Create Drawings from the Named Boundaries Toolbox

Below and to the right of the Named Boundary tool click on the down arrow. This will open the Named Boundaries box. After creating all the boundaries and modifying them the drawings can be created by selecting the plan group name and clicking on Create Plan Drawing. if the Show Create drawing dialog toggle is set the create drawing box will appear. Click Ok to create the drawing and sheet models.



NHDOT CAD/D Connect Documentation

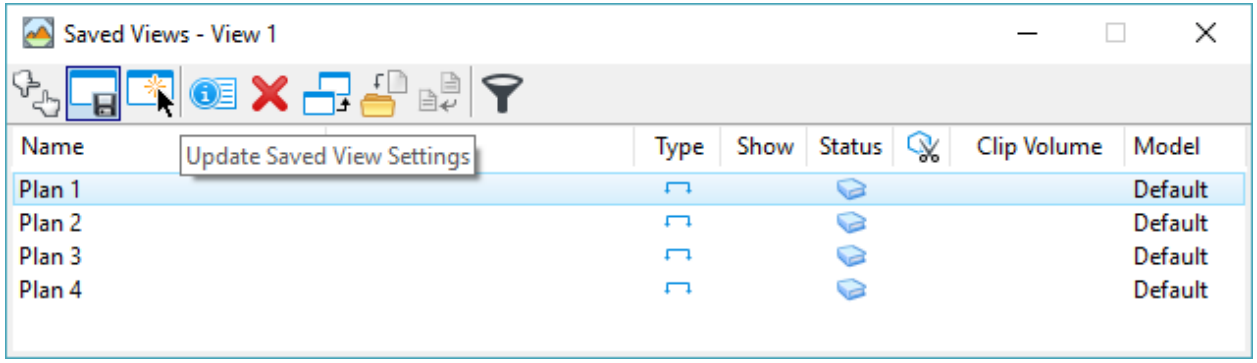


Open the *Default* model view. Use Level Display to shut off any levels not appropriate to the Plan Type. Corridor dgns should display their 3D levels so that any clipped areas will not display, DU dgns should display their 2D model's levels as that is where the 2D annotation cells are. The Guardrail levels are an exception. The corridor's *Default* model should have the Guardrail turned on and have it turned off in the *Default-3D* model.

When the *Default* view setup is finished *Save Settings*, Save the DGN. Reopen the dgn and all sheet models should be synched with the drawing models which is synched to the *Default* model. When changes to the level state or additional reference files need to be attached do it in the *Default* model, Save settings, save the dgn and reopen the file to see the changes propagated through to the sheet models.

If the sheets become out of synch with the *Default* model (should not need to be done!)

Go to the OpenRoads Modeling workflow, then Saved views. With the *Default* model displayed in view 1 select the first *Saved View*, Plan 1 and use the *Update Saved View Settings* tool and click in the view. Repeat for each defined Saved View. *Save Settings, Save* the DGN then ***CLOSE*** it.



Reopen the DGN and open a Sheet model. The Sheet model's level settings should reflect what was saved in the *Default* model.

Saved views also save the views extents. So, when the views are updated from view 1 the drawings model's "clip extents" are lost. The first time this process is done the Sheet model's clip needs to be re-established. Open each Sheet model, used the Reference Files dialog box to highlight the referenced drawing model and then use the Clip Boundary tool and hit on the named Boundary to re-clip the reference file.

Open each drawing and sheet model and make sure the reference files *Display Overrides* are set to ***Never.***

Additional levels can be turned on or off. When finished Save Settings, Save the DGN and then ***CLOSE*** and Reopen it to see the changes.

P-6-3: Profile Cut Sheets

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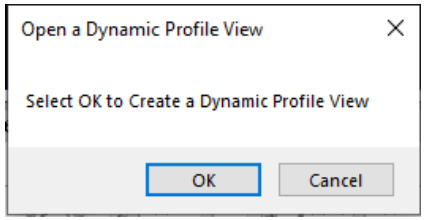
Introduction – Creating ORD Profile Cut Sheets Video

Profile cutsheets are generated similar to plans in that a profile view seeds the create drawing models which in turn are referenced into sheet models. They are generated in ORD using established procedures. The seed profile view can contain a live cut through the attached reference file's 3D models as well as displaying reference profiles of Drainage and Utility profile runs. After creating the profiles the SuperElevation information can be annotated at the bottom of the profile using a special annotation group.

Create the Profile CutSheet Drawing and Attach Reference Files

Open ORD and use the file New command to create *12345-Prof-Seed.dgn* in the \cutsheet directory. Open the *Default* model and Reference file attach only civil drawing to this dgn including all drawings that have information to be drawn and annotated on the profiles. This should include the E-Terrain, E-Drainage, E-Utilities, Geometry, and proposed corridors, as well as the P-Drainage, P-Utilities and the SuperElevation dgns. Set the existing terrain model active. Save settings and Save the dgn. Either copy the dgn and rename it or use a *File > Save As*, to create *12345-Prof-Roadname.dgn*. The seed file can be copied to create drawings for other roads.

Open Profile View

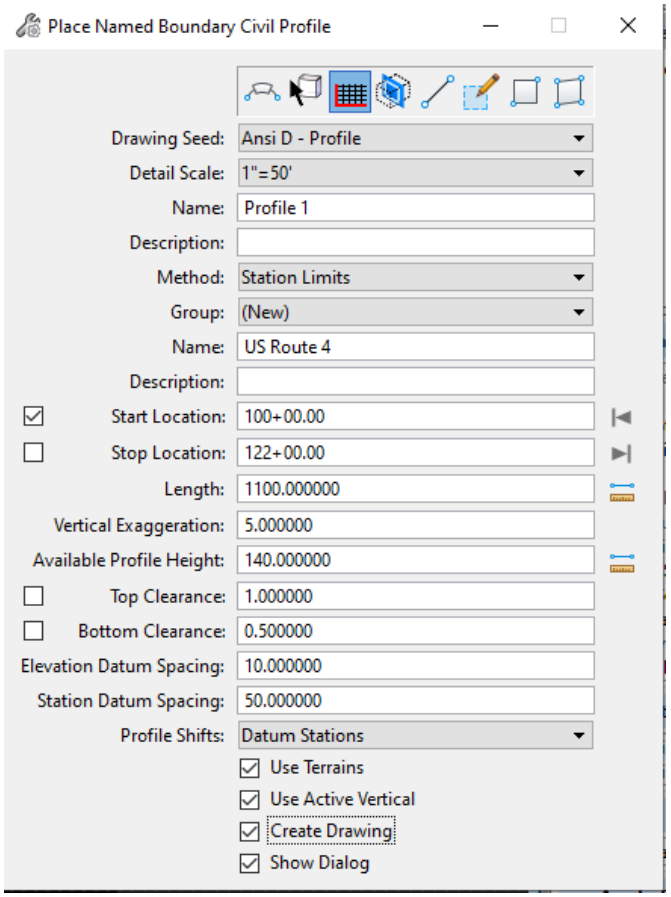


Right click and hold on the screen and select - **3 Views Plan/Profile/3D** from the *View Control* menu. This will open 3 views with the two on top being the *Default* and *Default-3D* models. Click **OK** in the pop-up box to create a Dynamic Profile view. In View 1, as prompted Select the Alignment that you want to create the profile for and then click in the bottom View 4 to create the profile.

If the command ends without placing the profile you may have hit on the alignment's 3D geometry rather than the 2D alignment. Select the alignment in the *Default* model, reset or tentative snap as needed to ensure you hit on the 2D alignment, then hover on it and from the pop-up menu select the **Open Profile Model** and click in the bottom view to create it. If having trouble turn off the display of the referenced *Default-3D* model and anything else under the alignment to be able to select it. **Save Settings** and **Save** the dgn.

Create Profile Named Boundaries

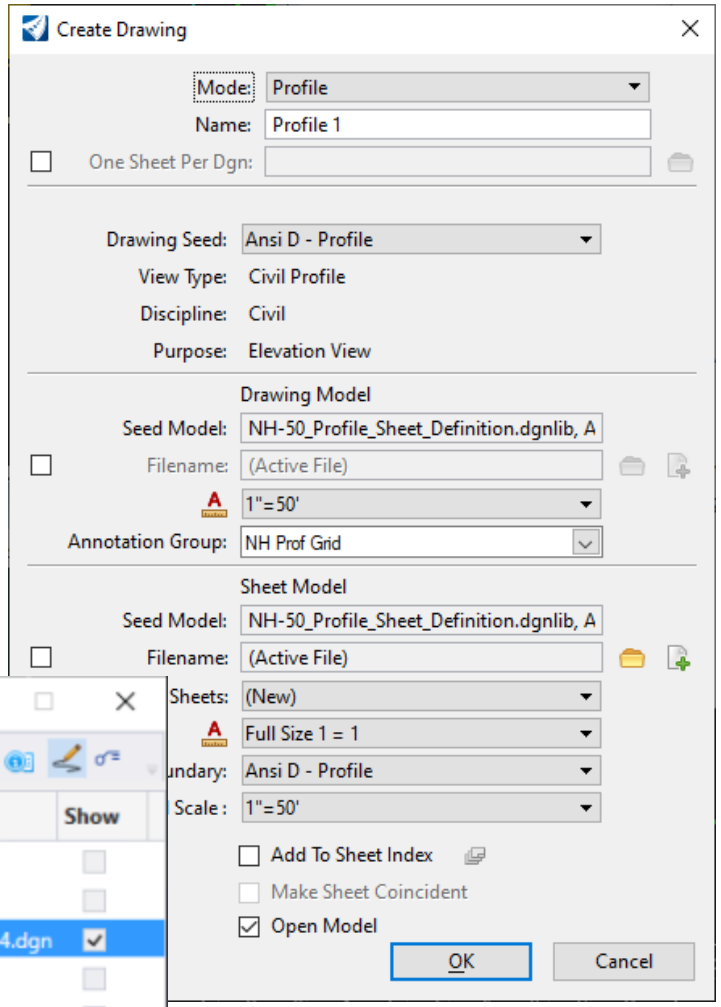
Set the workflow to *OpenRoads Modeling*, *Drawing Production* > *Named Boundary* to open the *Place Named Boundary* tool. Select the *Civil Profile* icon and set the *Drawing Seed*. Next, click inside the profile view to start the command. This sets the *Name* and associates the stationing to the Start and Stop locations so they can be set. Profile sheets should be 50 scale even if the plan scale is 20.



The start location can be set in the view as the station value follows the cursor. It is suggested that you key-in the start. If you use the *Lock to Start* button at the right, it will lock to the start of the active profile not the start of where you may want a couple 100 feet before the proposed. After setting the start station move the cursor to the right along the profile and boundaries will be displayed of the length indicated. Change the length until the last sheet has about the same length as the rest displayed within its boundary. The default height is set to 160'. If you intend to display superelevation information under the profile set it to 140'. The *Create Drawing* box can be checked so the *Create Drawing and Sheet Model* box is displayed automatically. Accept through the prompts to finish creating the Boundaries.

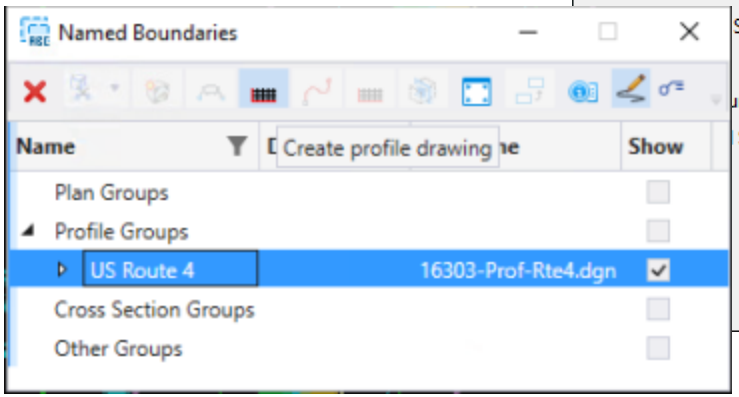
Create Profile Drawings

The *Create Drawing* box should be filled in by default and no changes are needed. If you want the drawing to automatically be added to the *Sheet Index*, check the box and then select the folder icon to the right to select the folder for the sheets to be added to. Hit **OK** and the sheets will be created.



If the *Create Drawing* box was not checked when creating the boundaries, the sheets can be created using the *Named Boundaries* tool box.

Below and to the right of the *Named Boundary* tool, click on the down arrow. This will open the *Named Boundaries* box. The drawings can be created by selecting the profile group name and clicking on *Create Plan Drawing*. if the *Show Create* drawing dialog toggle is set, the create drawing box will appear. Click **Ok** to create the drawing and sheet models.



Add 3D Cut to Profile

Open the profile view again from the View Groups menu selecting MultiModel Views. This should return you to the 3 View setup with the profile at the bottom in view 4. Use the *View Tool* and select *Create 3D Cut*. The modes are *Full Profile* or *Corners*, use *Corners as there seems to be a bug with fulll*. Place from top left to bottom right around the profile. This will cut through all displayed features in the *Default-3D* model and show them on the profile. The Drawing models and sheet model will automatically also display this information. If there is a reference file you don't want to display shut off its display in View 3. *Save Settings* and *Save* the dgn, and refresh the 3D cut.

NOTE: The 3D cut will display all levels in a reference file. Levels can be turned off individually in the profile view, but you have to use *Level Display* and Expand the referenced *Default-3D* model's levels to do it. You cannot use *Off by Element*.

For a list of things that should be in the cut see the Profile construction plan check lists.

Profile Annotation

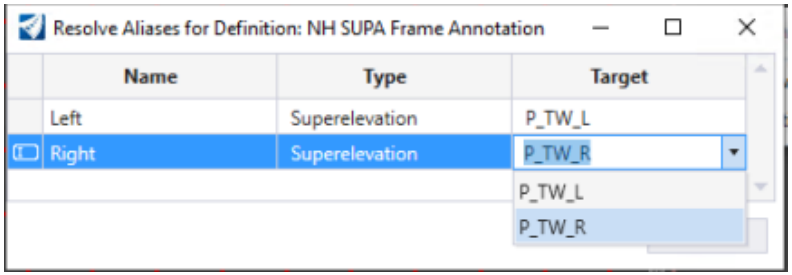
When profiles are created, they are annotated from the *Annotation Group* **NH Prof Grid** as selected in the *Create Drawing* Box. The alignments are also annotated by their assigned annotation group. If the proposed vertical alignment changes, cutsheets don't have to be regenerated unless you need them to be different length or have a sheet added. The annotation just needs to be updated.

Open one of the Drawing models. A drawing model is where the annotation is created. If you needed something moved, edited or added, this is where you need to work, in the Drawing model. To update an alignment's Annotation, the annotation first needs to be removed from the drawing. Set the workflow to *OpenRoads Modeling* > *Drawing Production* Tab > *Annotations* pane click on the bottom of the *Model Annotation* tool to show the dropdown menu and select *Remove Model Annotation*. Check the *All Drawing Models* box and click on the screen. To re-annotate the drawing select the dropdown again and select *Annotate Model*. Check the box for *All Models* and use the dropdown menu to select *NH Prof Grid*. Accept. If the SuperElevations were annotated previously they will need to be re-annotated also.

Adding SuperElevation Information

If Roadway Superelevation sections have been created, they can be used to create the superelevation schematic below the profile. The Superelevation drawing must be attached to the *Default* model for them to be present to annotate. Select the *Model Annotation* tool, Check the *All Models* box, and use the dropdown to select the *NH SuperElevations* annotation group. Click on the screen to accept.

The *Resolve Aliases* box will appear. Superelevation lanes need to be attached to the Left and Right profile schematic lines by selecting the Targets in the Target boxes. The names are from the SuperElevation control lines that were created and attached. After defining the second target it is important to click in another box to ensure the second target is actually defined. Click on the screen to Accept and create the schematics.



Note: Only a left and right are defined. Development will need to be done to annotate more than 2 lines.

P-6-6: Creating Drainage Profiles for Plotting

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Introduction – Create Drainage Profile - Video

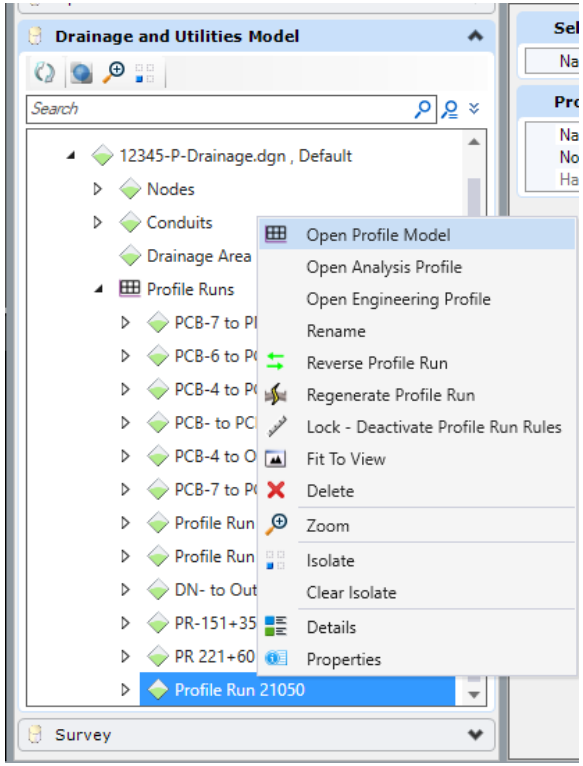
Drainage profiles are needed for complex drainage runs that cross other underground pipes and utilities. They can be used to determine limits of excavation as well as to review depth of cover. Not all drainage runs need to have profiles included in the contract.

Drainage profiles should be created by following the Section on P-8-1 - Creating Proposed Drainage Features – Drainage Profile View. The Actual Drainage profile needs to be created within the dgn that contains the Drainage and Utility Database. The Drawing and Sheet models can be located in a different dgn. These drawings can become rather large very quickly. It is recommended that different areas of the project get modeled separately to keep the files smaller and working well.

With the appropriate Proposed drainage drawing open use the Right click menu - *View Plan/Profile* then Cancel. Open Explorer from the home tab and then open the Drainage and Utilities Model view in the explorer. Expand the entries to get to the Profile Runs list. Select the profile run, then right click and select *Open Profile Model*. Click in the bottom view to open the profile.

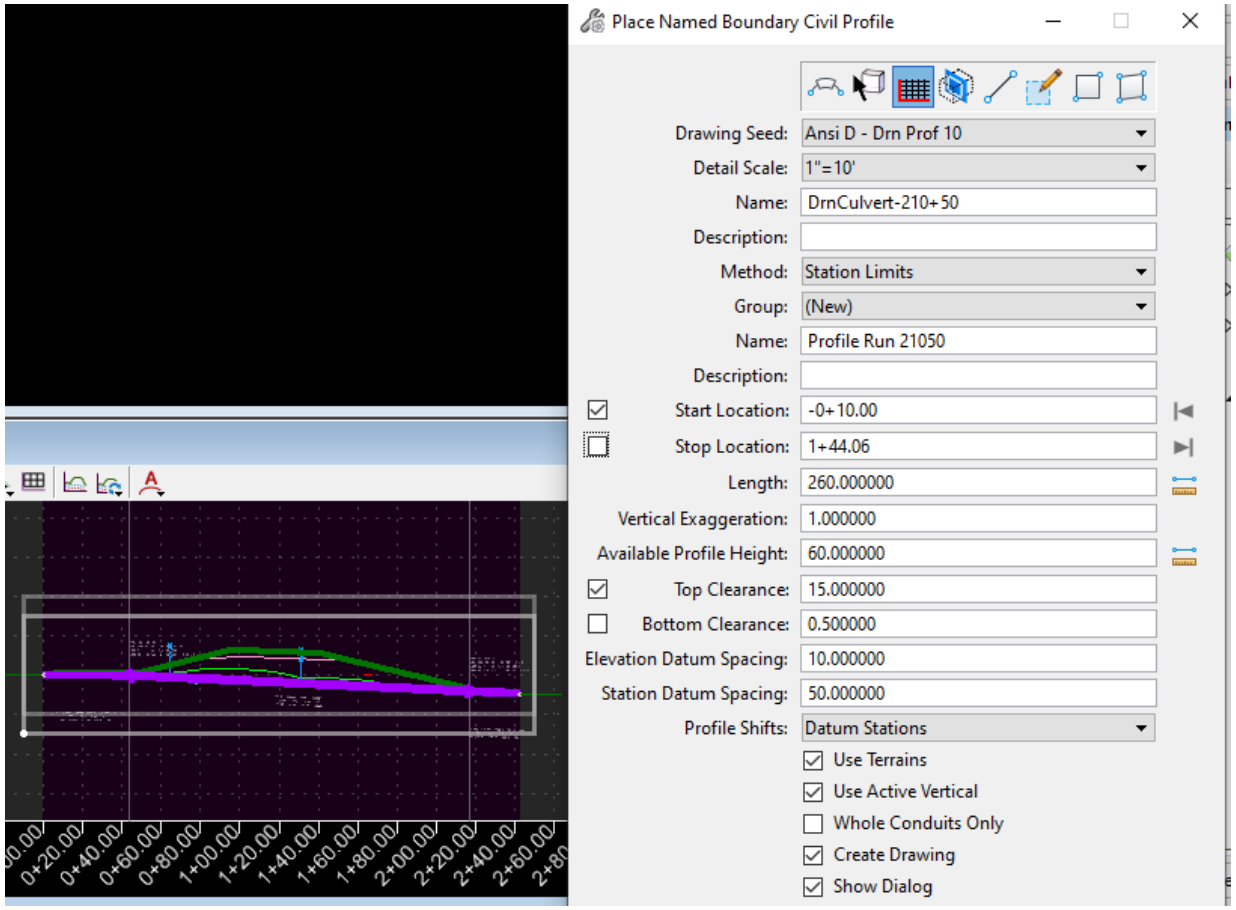
From the *View Attributes* tool change the Exaggeration to 1 and zoom into the profile. Use the *Annotate Elements* tool at the end of the view tools to annotation all elements in the profile. (May need to zoom out or in to see the annotation).

From the View tools select the *Create 3D Cut* tool and set to *Corners* accept and then drag a box around the profile to place it. This will display all the elements from the *Default-3D* model into the Profile.

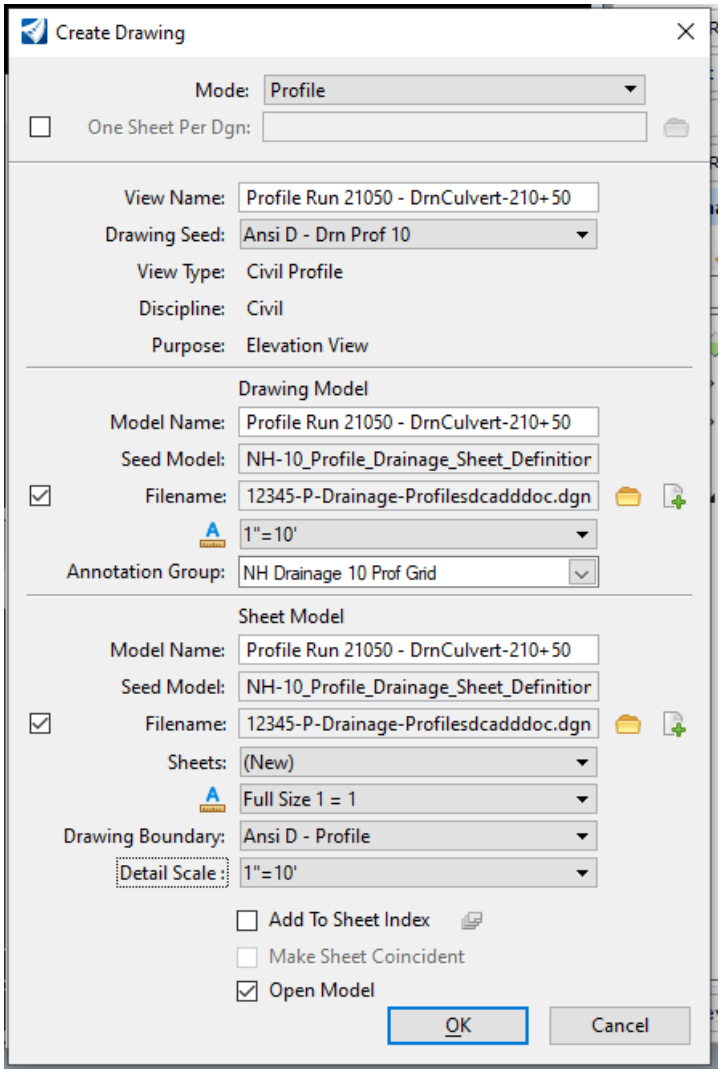


Change to the Drawing Production Tab and select *Create Named Boundary*. Drawing seed = **Ansi D – Drn Prof 10,** Detail Scale **1”=10’**, Vertical Exaggeration = **1**, and then click inside the profile view. Next update the start station Setting it to -10, left click to accept (a box should then be shown), set the Profile Height = **50**, and update the length as needed to encompass the profile. The Length should not exceed 300 as that is what fits on a landscape border. The height and the top clearance can be adjusted to get the profile centered in the Box. Update the name of the detail to include the station to station (or crossing station) value of the drainage run.

Left click inside the view to accept each entry and bring up the Create Drawing Box.



The drainage profile models can be created in the same dgn or in a separate dgn. Check the boxes next to the Filename and in the Drawing model use the green + to create a new drawing or the folder to select a previously created drainge profile drawing. In the sheet model section use the folder to select the just create drawing to contain the profiles. Set the annotation group to NH Drainage 10 Prof Grid and set the detail scale at bottom to 1”=10’. Click OK.



The profile drawing and sheet models will be created in the designated drawing. Text and labels can be added in the Drawing model and in the Sheet model, the reference file can be moved to the desired location.

If adding an additional profile to an existing sheet the Sheets: toggle can be changed from (New) to the actual sheet name already created

P-6-7: Contour Creation (CTR and PCN) for plans from Terrain

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This documentation has been included in a separate document – Creating Plan Contours from a Terrain

Creating Proposed Terrain Models

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Introduction

Proposed terrain can be created from Elements using a graphic filter or by selecting the elements desired. On long slopes this method can result in some slope waffling as the triangles try to connect to the nearest points of each feature rather than going from the top of slope straight to the bottom. It is for this reason the preferred method is to build Proposed Terrain Models from the corridor meshes.

The process is to reference all the meshes into the dgn, review them and copy any that need to be edited into the dgn. They can be moved into different levels so they can be displayed independently and edited easily using the Edit Mesh tools. Large meshes can be split into smaller pieces. These referenced and edited meshes are then used to create a Terrain from Elements.

If the referenced corridors or drives are updated in the future the terrain model can be updated by selecting it and updating from source. Previously copied mesh elements can be removed from the terrain model, the updated ones copied back into the drawing, edited and then added back into the Terrain.

A third method is to reference the design files and use the ***Create Terrain Model from Design Meshes***. The meshes don't need to be displayed as part of the corridor feature definition, it will find and create the Top or Bottom Terrain from all the design mesh elements in the dgn's that are referenced. The drawback is that the Terrain may need to be edited which is harder than editing copied meshes.

P-7-1: Creating Proposed Terrain Models from Mesh Elements

Copy and Edit the Meshes

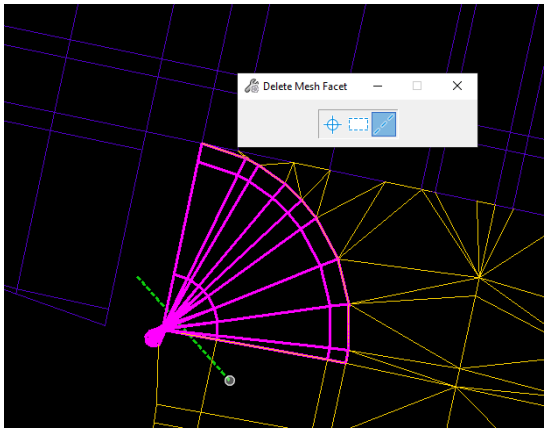
The Corridor's Feature definitions on your project need be set to either Concept 5X w/ Meshes or Final w/ Meshes so that the P-Mesh-Top and -Bottom meshes are created. This can be done on a Corridor by Corridor basis or the Explorer - OpenRoads Model tab can be used. For linear Templates set them to Final w/ Meshes. Surface templates have components for Top and Bottom Mesh elements.

Open the *P-Terrain.dgn*. Attach all files that are to be included in creating the Terrain such as the corridor and drive files as well as any other special plan files needed.

NHDOT CAD/D Connect Documentation

Open the *Default-3D* model. In level display select all the reference files and turn off all levels and then turn on the *P-Mesh-Top*. Create a new level called **1-mesh**, set the color, and then make active. Review the mesh elements, copy any that need to be edited into the dgn. Change their Level and color so they can be identified separately from others.

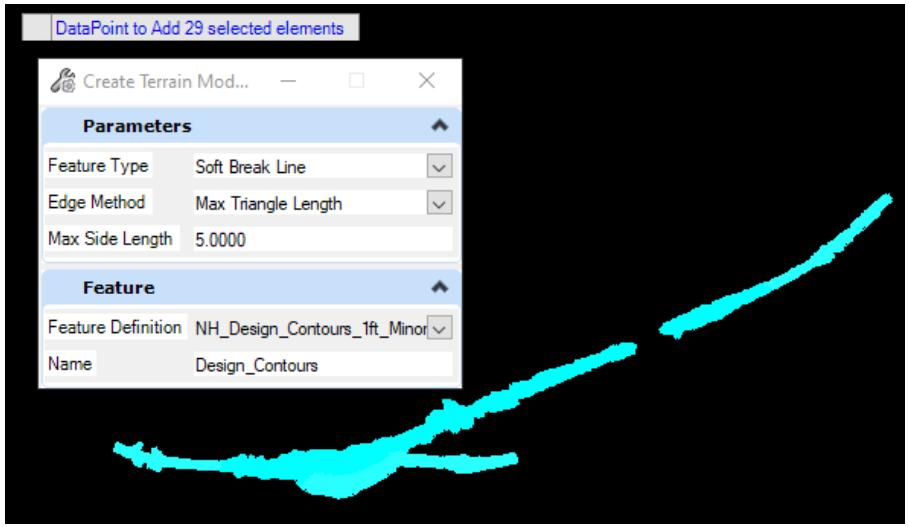
Shut off the display of all the referenced files in the *Default_3D* display. Create a new level called **2-mesh**, set the color, set Active. Use *Change Element Attributes* to modify the display of alternating Mesh pieces. Continue until no adjoining meshes are the same.



WF > *Drawing* > *Mesh* Tab > *Modify Meshes* pane. Select the *Delete Mesh Facet* tool. Set the *Type* on the tool to **Line**. Select the mesh to edit such as a drive radii mesh and draw a line across the overlapping slopes at the toe. **Accept**! This will remove the overlapping mesh elements.

Continue Zooming and rotating your view, identifying all areas of overlapping mesh elements and deleting the overlaps from the appropriate mesh. Use any other mesh editing tools needed to update the models. The *Split Mesh* tools can be used to separate mesh elements that cross a bridge area so that terrain for each side can be edited\created independently. The *Mesh Utilities* tab has the *Cleanup Mesh* tool that removes many facets of a terrain simplifying it.

To view the results of your manipulations you can create a terrain model from elements and turn on the contours or flow arrows to view an area. Delete the terrain when done and keep moving to other areas that need attention.



When finished editing the meshes, turn on the display of any Reference files that contain mesh elements that did not need to be edited. Fit view. Select all the meshes needed for the terrain. Use WF > *OpenRoads Modeling* > *Terrain* Tab > *Create from Elements* tool. Feature type - **Soft Break Lines**, max triangles **20'** Feature **NH_Design_Contours_1'_Minor**, Accept.

Shut off the all the mesh levels. Review the terrain. If any meshes were missed add them in. The referenced Design files linear features can be displayed to help review the terrain. Right click and open 3 Views. Use the *Default* view to select the main corridor and Display Dynamic sections. Move through the sections comparing the surfaces.

Editing Terrain Created from Meshes

When Corridors or drives are updated the associated meshes are updated but the copied and edited meshes and the terrains created from them are not. In some cases, it may be beneficial to just recreate from scratch depending on the amount of changes that have occurred since the Terrain was created. If there are specific areas that need to be updated that can be easily accomplished.

Open the DGN's Default 3D model. Select the terrain model and ***Update from Source*** to refresh the referenced mesh elements. Turn on the display of the reference files and compare the numbered mesh levels that it was created from. Delete any outdated mesh elements. Select the updated mesh elements from the referenced files. Copy them into the view. Edit the copied terrains if needed. Use the *Add Features* tool to add them to the Terrain model.

P-7-2: Creating Proposed Terrain from Graphic Filter

Design and Subgrade terrain model surfaces need to be created for the cross sections. These will also be exported in LandXML format for turnover to construction. The Design terrain model and the existing terrain will also be combined to create a Composite terrain model for use with Drainage & Utility tools to design Proposed Drainage.

When included with cross sections, the design and subgrade will be displayed with line weight **4** that the proposed sections should be drawn with.

When a design is created by using one of the corridor templates, feature definitions are assigned to the elements being created (edge of pavement, top of slope, toe of slope, etc). The process which is described here is dependent on the drawing containing those features. Graphical filters select the features that would be used for a specific surface definition. For example, the NHDOT *Subgrade By Features* filter selects features defining the bottom of the subgrade and toe of slope.

- Open the **12345-P-Terrain.dgn**, Open the ***Default-3D*** model. Turn on the display of all proposed corridors created during the design process including drives.
- Set the active level to **Terrain_Coutour_Imported**, color=**9**, linestyle **0** and line weight **3**.
- From the *Terrain Model* Task menu, select *Create Terrain by Graphical Filter*. See the sample form below while following the next few steps.
- Select the **...** button next to *Graphical Filter Group* and pick the filter group to use, **NHDOT Design by Features**. Hit *Preview* to view selected features. Under *Triangulation Options*, set the *Edge Method* to **None** or Max Triangle Length = **15**. The *Edge Method* can be modified through element properties after the process is complete if the desired result isn't achieved on the first try. More details below.
- Select feature definition - **NH_Design_Triangles** under the *Terrain Display* category. Accept through the prompts.

Other Proposed Graphic Filters

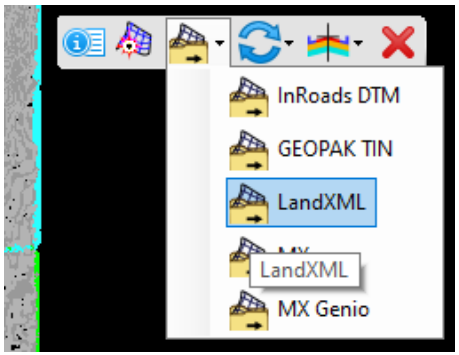
Repeat the above steps using the settings shown in the table below to create the Subgrade terrain model. Filters have also been created for creating surfaces representing the bottom of pavement and toe of slope boundary.

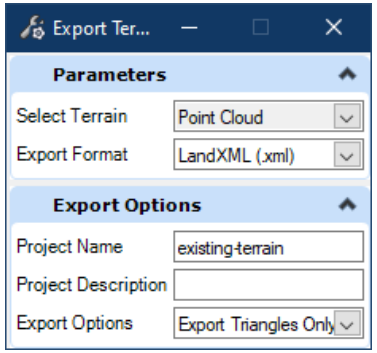
Filter	Feature	Edge Method
NHDOT Design by Features	NH_Design_Triangles	Max triangle Length = 15
NHDOT Subgrade By Features	NH_Subgrade_Traingles	Max Triangle Length = 15
NHDOT Bottom Pavement	NH_SubPavement_Triangles	Max triangle Length = 15
NHDOT Toe Boundary	NH_SubPavement_Triangles	None

The *Maximum Triangle Length* should be changed until the you have all triangles displayed... but so you do not have large slivers. The *Maximum Triangle Length* can be changed from the *Edge Method* section of the Element Information panel.

The *NHDOT Toe Boundary* filter creates a terrain that only follows the *Toe* features. Use the *Extract Boundary* tool to Extract Graphic which creates a Line String boundary from the terrain model. It will put it in the active level and element attributes. Use the Add Feature task to add the line string to design and subgrade terrains as a Boundary to more effectively clip out unwanted triangles.

When the project is finalized and going to Construction, select the Design terrain model and right-click to display the Context Sensitive menu. Choose the *Export to LandXML* option. Fill in the prompts. Repeat the *Export* for the *Subgrade Terrain* model.





P-7-3: Terrain Tasks - Create Terrain Model from Design Meshes

Reference the design files and use the ***Create Terrain Model from Design Meshes***. The meshes don't need to be displayed as part of the corridor feature definition, it will find and create the Top or Bottom Terrain from all the design mesh elements in the DGN's that are referenced. The drawback is that the Terrain includes all mesh elements even from components that are set to not be part of the top and bottom mesh line like the roundings. Editing a terrain is much harder than editing copied meshes. To edit the terrain you need to drop the rules. This still does not really allow you to use the *Edit Mesh* tools with any dependency. The resultant Terrain can be dropped. This will reduce it to a mesh element which can be edited with the mesh editing tools making it much easier to trim down but deleting the roundings can take time along the whole project. Prior to creating the terrain, all roundings could be set to 0 in the corridors so they are not part of the terrain but that would take a lot of time.

The resultant terrain cannot be updated from source if the design is changed, they would need to be deleted and recreated. This is a fast way to create the Terrain's but may not be the best.

Drainage and Utilities

P-8-1: Creating Proposed Drainage - Node and Link Features

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Introduction

Drainage and Utilities features are created for underground elements that need to be designed and shown on the cross sections. Drainage and Utilities features use both 2D and 3D cells (models) to represent their graphics. The *Default* model of the drawings should be referenced into plan sheets and the *Default-3D* model referenced into the Cross Sections and Drainage Profiles.

Bentley's OpenRoads Designer offers a Product Add-in for design and analysis of Drainage and Subsurface Utilities. At the NHDOT we are not using the design and analysis functionality of this software at this time.

This documentation will cover plotting proposed drainage and utility features, creating Drainage profiles and creating reports of these elements.

Drainage and Utilities

Nodes can be placed onto a surface (or other elements) to get the grate elevation. Follow the documentation for creating the Proposed Terrain model as well as creating a Composite Terrain model to be used by D&U.

Open the *12345-P-Drainage.dgn*, open the *Default* model. *Reference Attach* the *Combined.dgn* with live nesting = 1 if not already attached. Reference Attach the *12345-Composite-Terrain.dgn* with no nesting. Attach the Geometry, E-Terrain and any other drawings needed for the Design. Use level display to set up your view as you want it and set the composite terrain model as the active surface. Shut off the display of the existing terrain model so it is not accidently selected when trying to hit on the composite terrain model.

Project Properties

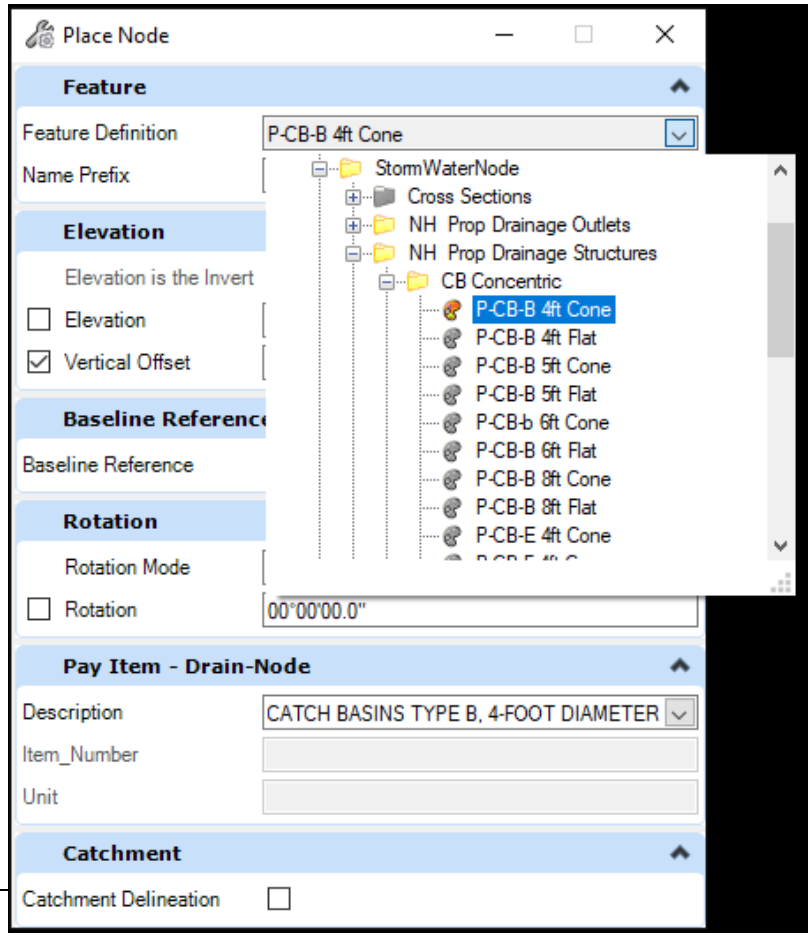
The first order of business is to create the D&U database for the dgn by selecting from the *Drainage and Utilities* WorkFlow > *Tools* > *Project tools* > *Project* > *Project Properties*. If this is the first time using D&U in the drawing, it will create the Utility model. Accept. Fill in the Project Properties, then click OK.

Proposed Drainage - Analyze Surface

In Terrain Modeling task use the *Analyze Trace Slope* command (both Up and Down) to see where water is flowing. The results should coincide with the displayed Catchment centroids from MX. Turning on the High and Low points as well as the flow arrows from the composite terrain model will also help you determine the location of proposed structures. It is suggested that you work in 3 Views when laying out nodes and pipes.

Place Nodes

Open the *Drainage and Utilities* WorkFlow *Layout* Tab > *Place Node* command to place the first node. Select the appropriate proposed node such as **P - CB 4ft Cone** and follow the prompt to select a reference element for elevation by selecting the Composite Terrain model. Accept the Placement Type, *By Minimum Depth*. You can now use a data point on the screen to place the node, or activate Civil Accudraw, Station-Offset, tab to highlight the Offset, then type an **O** (origin) and hit on the alignment as the reference element and then use the station and offset fields to type in a location to place the node. Move the cursor around to define the nodes rotation and accept. When using Civil Accudraw's Station/Offset to place a node, the node will have manipulators for the station and offset to easily move it in the future.



The command will continue to allow you to place additional nodes. Just select the next feature definition you want to place and continue placing. Reset when done placing nodes. Nodes should be placed for all structures including headwalls and end sections. For links to be placed you must have a node for each pipe end. In order for outlet ditch links to be placed, use the *Conduit Drainage Node* or *Conduit Drainage Node Outfall* to locate the end of the ditch or channel.

For basins in pavement, the Vertical offset can be set to -0.08333 to achieve an accurate elevation. Recall also that basins on pavement or

in ditches are set 1' inside the edge of pavement or CL of ditch respectively. When placing Headwalls and End Sections use the -Pipe Diameter for the vertical offset.

Nodes – Name and Base Reference

A node is named from its Feature definition name base. This is incremented for each one placed. After placing all the nodes they should be *Baseline Referenced* to an alignment. In the Drainage and Utilities Model section of the Explorer – expand the Nodes. select all nodes placed along a particular alignment. In the properties box expand the *Utility* pane and click in the *Baseline Reference* box and then select the alignment to associate. The *Station* and *Offset* boxes should populate. Next select each node, one node at a time and update the node name from an incremented value to the station value. (PCB-1… to PCB-207+50). This will help identify nodes when creating reports as well as Profile Runs that are generated.

Place Conduit

Use the *Place Conduit* command to place the pipes or ditches. Select the feature definition (type of pipe) and then the size. Each node has a connection area so when hitting on the node pay attention to where you are hitting on the outside of basins so they connect to the edge of the outside wall closest to the next node. Place a pipe from the upstream node to the downstream node. Continue placing Conduit until all nodes are connected.

Selecting a pipe will allow you to bring up the hydraulic properties.by clicking on *Open Utility Properties*. The Drainage properties for links contain all the hydraulic information about the link including the physical as well as the results after analysis/design has been performed. A true/false switch is also available to tell the software if it is a culvert.

Default settings for Proposed pipes have the *Set Invert to Start* and *Set Invert to Stop* set to *True*. This means that when placing a pipe, it's inverts will take on the invert of the node they are attaching to which could result in pipe not flowing down hill. This setting can be changed (set to False) on a pipe by pipe basis or it can be changed in the Prototypes for all proposed pipes within the dgn.

After placing pipes, select it and bring up the profile and change the inverts as necessary to get it to flow correctly. A profile of the entire run can be generated from the Layout tab of the Drainage and Utilities workflow. Either from the outlet or by nodes or links. The Drainage Profile run will be shown in the Explorer's Drainage and Utilities Model tab. Right click on it to select it and then Open Profile model. The nodes and pipes should be selectable and editable within the profile view.

Drainage ditches are Conduit links and can be placed from the last outlet structure to a *Pipe End Drainage Node* placed on the surface of the terrain. Bring up the profile and modify as needed. With the pipe selected the Trench can be turned on to create a corridor. Selecting this and drilling down into it allows you to see the Template it is using and change it to what you need.

There are several Ditch templates that can be used. Selecting the corridor object tools then the corridor allows you to control all aspects of the ditch. The V ditch shapes level **P-Util-Drainage-Conduits-Ditch-3D** can be turned off in the *Default-3D* model leaving only the trench corridor displayed.

Drainage Profile View

A profile of the entire run can be generated from the Layout tab of the Drainage and Utilities workflow. Either from the outlet or by nodes or links. Set the Feature definition to **Geometry Pipe Run**. The Drainage Profile run will be shown in the Explorer's *Drainage and Utilities Model* tab. Right click on it to select it and then Open Profile model. The nodes and pipes should be selectable and editable within the profile view. The pipe run should be renamed to the Start and End Station node values so it is easily identifiable. Update the scale and create a 3D cut to see the referenced 3D model information along the profile. The annotation button (all elements) can be used to show the Pipe and Link annotation. You may need to turn on *Annotation Scale* and set the scale to see it.

Cover or subsidiary excavation depth can be checked from the profile view by either the measure distance command or by the *Profile Creation* tool – Profile from surface. The vertical offset from the Existing Ground terrain can be used to create a profile line 4 feet below for cover as well as a second line 9 feet below to check for excavation areas. The line styles and other symbology can be updated for clarity of those lines.

Selecting the Profile run in Explorer allows you to update the *Node Draw Type* to slice if you have it set to something less desirable. Drainage profiles should show the Proposed ground the existing ground as well as all subsurface features from the project. What is globally displayed in the *Default-3D* model is what is displayed in the profiles' 3D cut. (may need to be updated though). To shut off the display of say the corridors select materials, open the Level Manager, (If needed Turn on the column for Global Display by Right clicking in the top line of the level view and checking next to Global Display.) In the Tree, select the drawings 3D entry to display the levels in that corridors drawing and Turn off the levels for XC-CRGR , XC-Gravel, and XC-Sand by unchecking them. Save Settings, Save the dgn and it may require reopening the dgn as well as refreshing the 3D profile cut for the view to sync.

See the Cut Sheet documentation to learn about creating sheets of the profiles.

P-8-2: Existing and Proposed Utility Poles

Return to Index

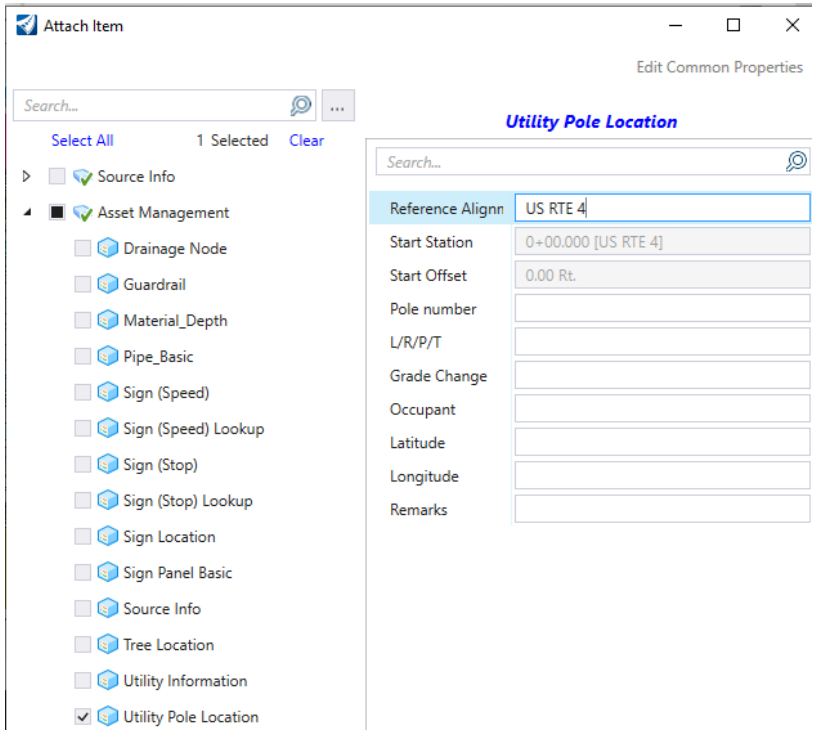
Introduction

Item Type information can be attached to the Existing poles in the *12345-Survey.dgn* as well as the proposed poles to help with annotation as well as with Reporting. Upon Receipt of the Utility pole relocation sheets this can be started. Proposed poles should be plotted in the *12345-P-Utility.dgn* using Civil Accudraw to ensure the station and offsets are correct as well as to have them as manipulators if they need to move in the future.

Existing Utility Poles – Add Item Type Utility Pole Location

Open the *Survey.dgn's Default-3D* model and use *Element Selector* to select all Annotation Cells and then switch to level and unselect everything that is not a utility pole. Use the *Attach Item* tool and add the *Utility Pole Location Item* to all the poles. Set the alignment name when attaching the item type.

The XS-Detail procedures should have been followed to create and label tick marks for the existing point detail features.



Open the *Survey.dgn - Default-3D* model

Use Element Selector and select all Cells, then unselect all levels that are not utility poles.

Use the Attach Item tool, Select – Utility Pole Location, enter the Alignment name and accept to add the item type to the poles.

OpenRoads Modeling > Utilities Tab > Reports > Cell Reports > Pole Locations. Review the results and the pole locations and save to an Excel file. Open the Excel file on the side.

NHDOT CAD/D Connect Documentation

Open the Geometry dgn and create an Event point list for the existing poles (and Proposed poles if available). Create a new drawing Pole Xsections and attach the corridor, and or the P-Terrain geometry drives and such. Create sections at the poles locations using the event point list. Cut and fill depths can be scaled from the sections and added to the excel report which can be used to update the item type information that was added to the poles.

Open 3 views - place dynamic section in the lower view. Alternately, you could add Event points to the geometry and use that to cut section at the pole locations.

Locate station via data point - select the first pole.

In the section view, go to the pole offset and scale the cut or fill amount and fill in on the Excel table.

Repeat for each pole location.

When done, set the *Default-3D* view active - shut off all but the poles and then select each one and add the cut / fill height to the Pole Location item.

If in *Top View* you could also attach the ETXT dgn and add pole numbers to the item info

When done create a new report.

The report can be used in the Geometry dgn to create an event point list of all the poles so a set of sections can be cut showing the cut & fill amounts for utility sections use.

If the XS-Detail has been created, the even station sections could be used.

Give the report to the utilities engineer with pdf sections for pole L/R determination format in Excel

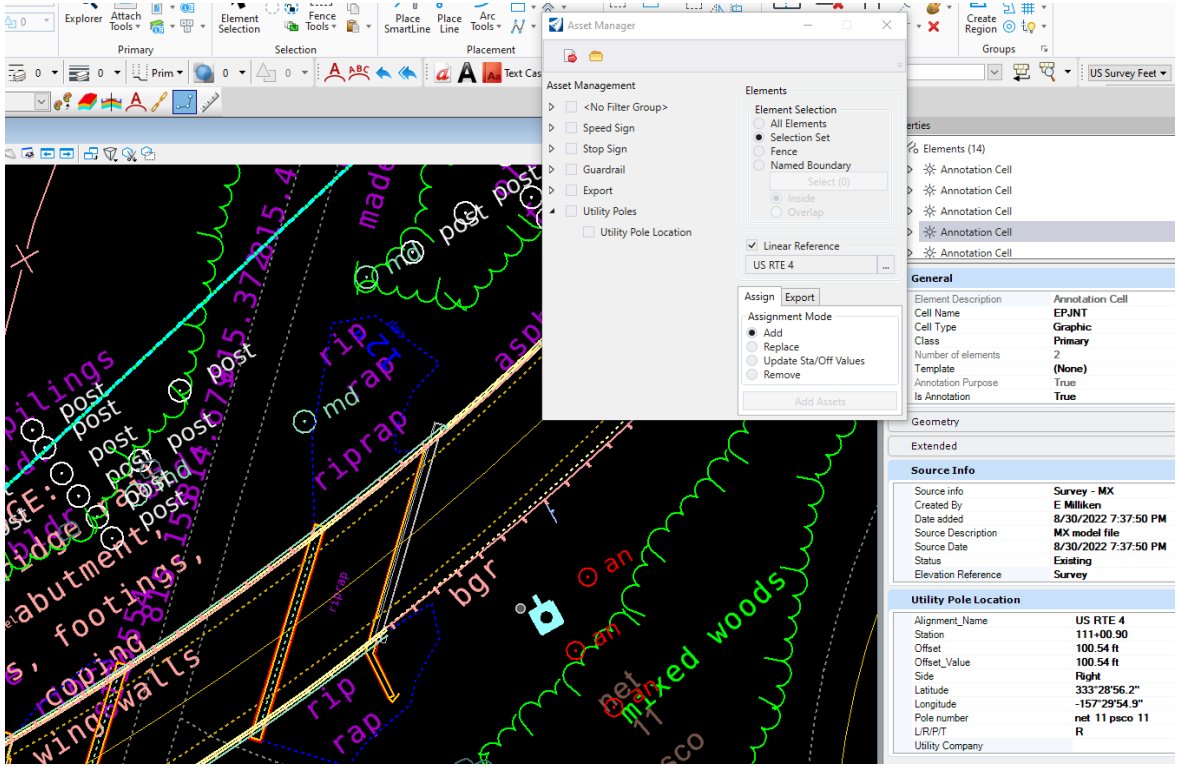
NHDOT CAD/D Connect Documentation

When you receive the pole relocation sheets, open the *Default-3D* model select each pole and add the L/R information to them.

Reselect poles that are not on a particular alignment and then use *Asset Manager* to attach a Linear Reference. Repeat for each Road that has poles on it.

Reselect all the poles and use the Utility Pole Relocation sheet and the Properties Box to move thru the list of poles and Assign a **L/R/P/T** - Leave or Remove label to each. These designations are also used to Label the poles in the *P-Utilities.dgn*. With the *ETXT.dgn* attached, the Pole number can be added as ItemType information as you move down the list. Right click on the Annotation Cell and Zoom to each particular pole in top view to see the pole numbers.

View dynamic sections to review the Grade Change information and add to the Item Type entry and verify on the Relocation sheets. Use the View Station Via Data point and hit on each pole with an Origin Hit code to view the section.

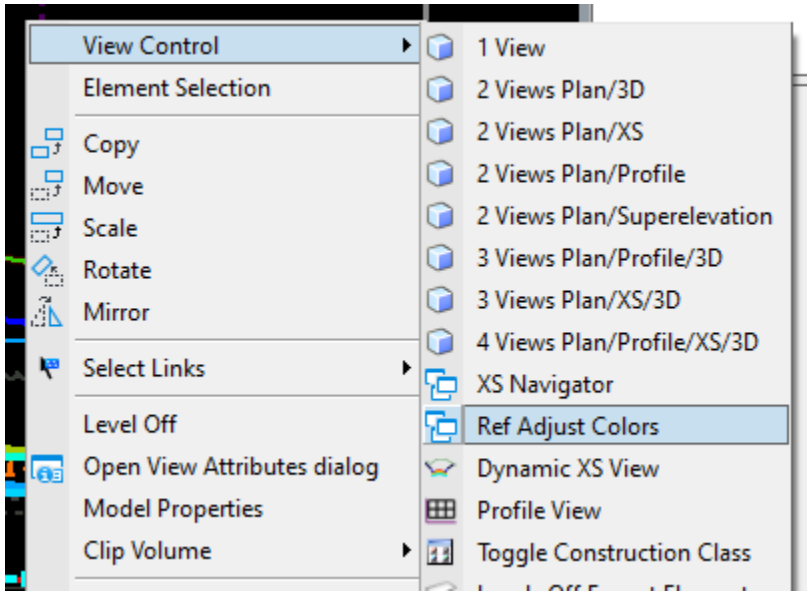


Plotting Proposed Utility Poles

Open the *Drainage and Utilities* WorkFlow *Layout* Tab > *Place Node* command to place the first node. Select the appropriate proposed node such as Electric Nodes > **P_Joint Pole** and follow the prompt to select a reference element for elevation by selecting the Composite Terrain model. Accept the Placement Type, *By Minimum Depth*. You can now use a data point on the screen to place the node, or activate Civil Accudraw, Station-Offset, tab to highlight the Offset, then type an **O** (origin) and hit on the alignment as the reference element and then use the station and offset fields to type in a location to place the node. Accept or change the Rotation Mode, then move the cursor around to define the nodes rotation and accept. When using Civil Accudraw's Station/Offset to place a node, the node will have manipulators for the station and offset to easily move it in the future.

The command will continue to allow you to place additional nodes. Just select the next feature definition you want to place and continue placing. Reset when done placing nodes.

When working on poles it is sometimes hard to differentiate between existing and proposed. Use the right click menu and select *View Control > Ref Adjust Colors* to tone down all the reference files and more easily see the proposed poles.



NHDOT CAD/D Connect Documentation

can open the geometry.dgn and add all proposed pole stations from the Pole Relocation sheets to a proposed pole event point list

Open P-Utilities.dgn

Attach alignment corridors and existing terrain

Default view.

D&U place node

use civil accudraw and place poles

attach station and offset - Node item type or pole location item type.

Dynamic sections could be viewed to determine cut/fill height at the proposed locations

create a PFSONEE report of the proposed pole vs the alignment

open the xs - detail dgn and create all the ticks for all detail or just for the proposed poles

create sections of the proposed and existing pole locations could leave the named boundaries in the p-util and save the sections to a different dgn

remember that pole tick marks are at the even station not at the pole station.

Attach the Gen Plans Cut sheet drawing for Sheet Named Boundary locations. rotate to the first sheet.

Use the PUT task list to label each existing and proposed pole location.

For existing poles... manipulate levels... then "highlight" reference file

NHDOT CAD/D Connect Documentation

For proposed.... asks for identify element.... tentative on the alignment then accept to highlight it.... then use origin code on the proposed pole.

Rotate to each sheet.

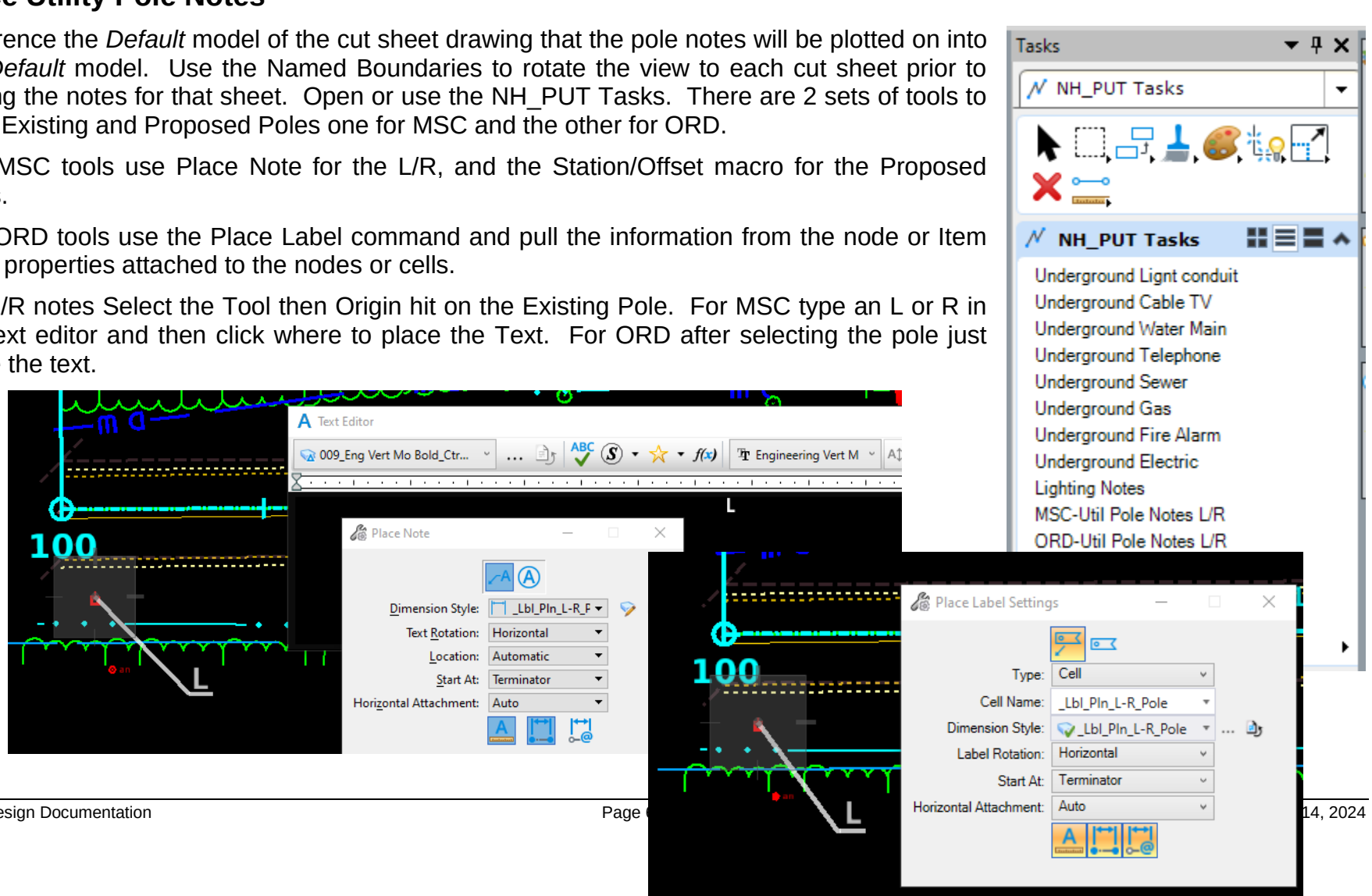
Place Utility Pole Notes

Reference the *Default* model of the cut sheet drawing that the pole notes will be plotted on into the *Default* model. Use the Named Boundaries to rotate the view to each cut sheet prior to adding the notes for that sheet. Open or use the NH_PUT Tasks. There are 2 sets of tools to label Existing and Proposed Poles one for MSC and the other for ORD.

The MSC tools use Place Note for the L/R, and the Station/Offset macro for the Proposed poles.

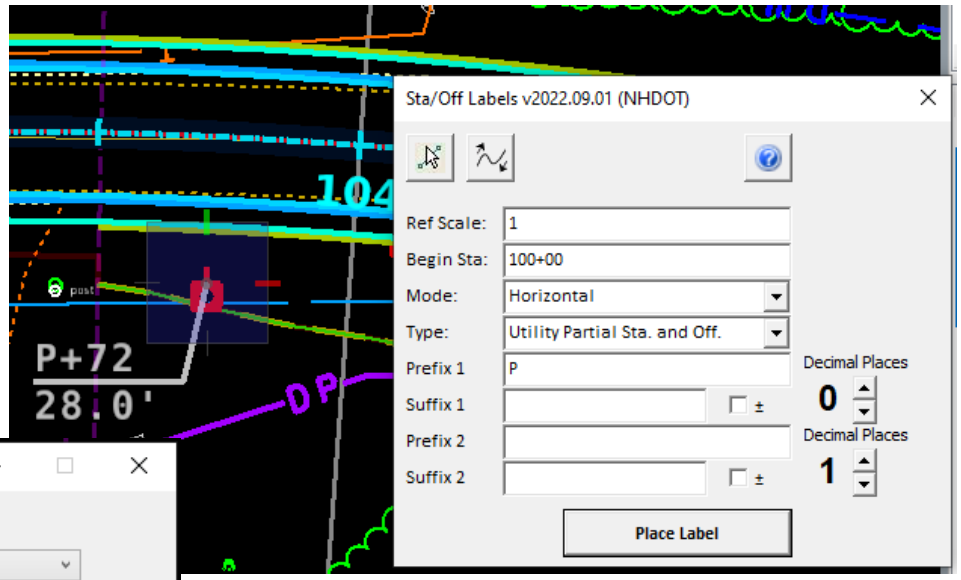
The ORD tools use the Place Label command and pull the information from the node or Item Type properties attached to the nodes or cells.

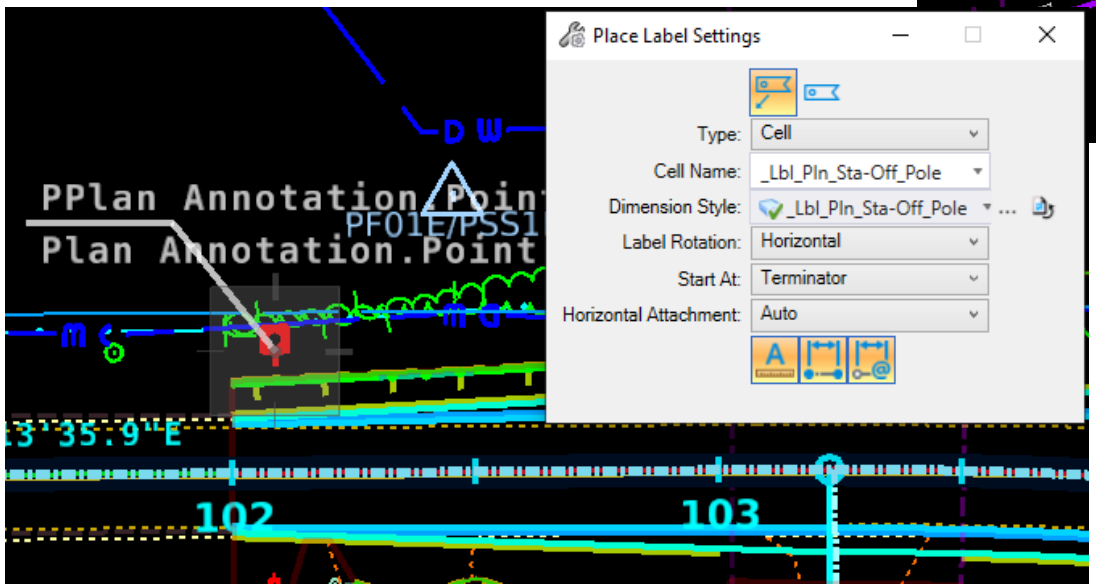
For L/R notes Select the Tool then Origin hit on the Existing Pole. For MSC type an L or R in the text editor and then click where to place the Text. For ORD after selecting the pole just place the text.



NHDOT CAD/D Connect Documentation

For the *MSC Proposed Utility Pole Notes* the tool will Open the Station/Offset Macro. Use the Select Center Line Element and select the alignment, and accept. Update the *Begin Station* and change the *Type* to **Utility Partial Sta. and Off.** Click Place Label and use an *Origin* hit on the pole and then place the label. Repeat for each Proposed Pole. Remember to rotate to each cut sheet as you proceed.





For the *ORD Proposed Utility Pole Notes* the tool will Open the Place Label tool. In the bottom left it will prompt you to **Identify Element** or Data Point. *Tentative Snap* to the alignment to highlight it then *Left Click* to select it and again to accept it. Next use an *Origin* hit on the pole and then place the label. Repeat for each Proposed Pole. Remember to rotate to each cut sheet as you proceed.

When finished Save Settings, and Save the DGN.

Label Cross Section Slope

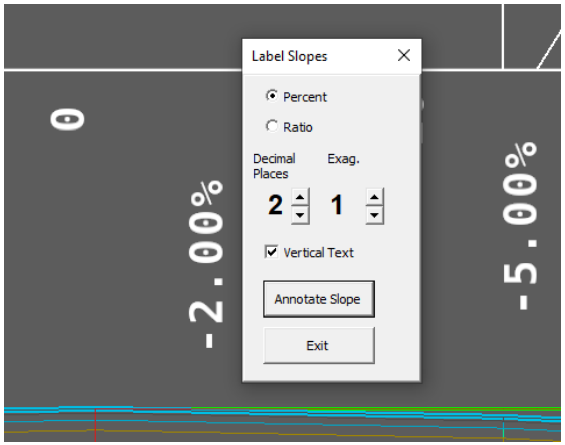
Macros

It is suggested to match element attributes as well as text attributes to another slope label prior to using the macro.

To Label a slope on a Cross Section that did not get labeled. WF > Drawing > Utilities Tab > Macros Pane > SlopeSet <PLAY>

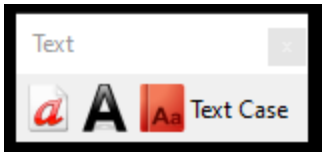
Update the settings as desired.

Command text will show in the message center indicating *Select First Point*, *Select Second Point*, then *Select Text Location*.



Rotate Cells – Envision CADD

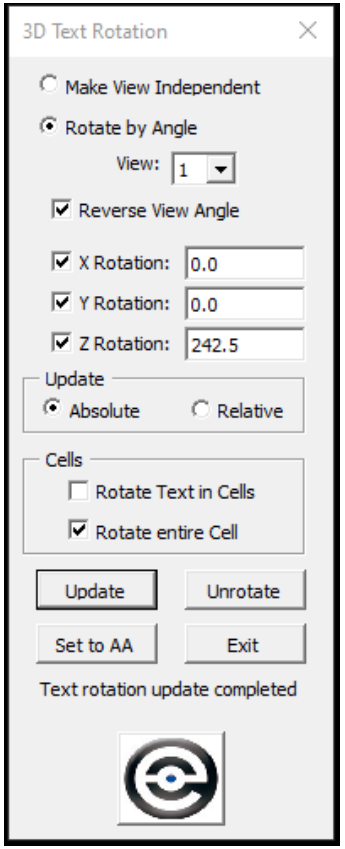
Introduction – EnvisionCadd – Rotate Text and Cells - Video



The Envision CADD software has been added to the NHDOT Workspace. If using the default setup a Text ToolBox with 3 tools will be available, *Label Areas*, *Rotate Text* and *Change Case*.

There is also anEnvisionCAD workflow to get these and other utilities.

EnvisionCad - https://nhgov.sharepoint.com/:b:/r/sites/DOT-ProjectCentral-Home/CADD%20Document%20Library/envision_text-rotation.pdf?csf=1&web=1&e=QEERut



This tool is intended to rotate Text (**Cells**) to the View Angle. So first rotate the view along the roadway. In a 3D model rotate by 3 points. Hit all points in space so they get the same elevation, the first 2 define the rotation, the last point hit above the other two. Return to Top rotation and re-rotate if you hit on an element and tilted the plane.

Use *Element Selector* to drag box around cells or text you want to rotate. Click on the **A** *Rotate Text* tool and use the following Settings - *Rotate by Angle*, *Reverse View Angle* - uncheck/check to update view angle, Absolute, check ***Rotate entire Cell***, click *UPDATE* to Rotate them. Note that poles on the bottom side of the roadway will need to be selected again. In the Tool add **180** to the *Z Rotation* value and then Update.

Quantity Computations

P-9-1: NHDOT Suggested Practices

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Introduction

With good 3D modeling comes good quantities! That is not to say that errors won't occur and we do describe a bug below. Create Quantity dgn files for your work. if you already have Cross section dgn's, make copies of them for quantities so the main project's dgn files are not disturbed.

For Select materials and such use, Corridor Component quantities. Any clipped areas will need to be adjusted by hand.

Earthwork Quantities from the Cross Sections

Quantities from Cross Sections is the historical method of computing the earthwork. But, in order to compute complex areas around bridge pay limits and side roads with match lines, a separate set of sections should be created just for Quantity Calculation purposes. These special sections can be cut with additional half width areas to accommodate Back and Ahead areas to more accurately compute the volumes. Alternately, Plan name boundaries can be created 50 feet long and half to the left and another group to the right. The shapes can be modified and the resultant cut and fills computed. QML lines drawn along the edges in the plans will show on the cross sections.

Earthwork Quantities from Named Boundaries

Quantities from plan named boundaries allow for computing odd shapes around bridges and sideroads. They can also include the drive components. By creating them at a 50-foot interval as well as on the left and right of the CL allows them to be easily modified to ensure coverage of the whole project.

NHDOT CAD/D Connect Documentation

BUG – Select Materials – Sand, Gravel, and Crushed Gravel

ORD 2021 Release 2 has a bug when computing quantities that have component name override locks active. The intent of the name override is to fill in the gaps between component drops making the quantities more accurate. But this is giving incorrect results from End Area Volume Reports from the cross sections as well as the Plan Named Boundaries.

From XSections AverageEndAreas

Totals:

XC - 403_11 - HBP Base:	888.89	888.89
Total XC - 403_11 - HBP Base:	888.89	888.89
XC - 403_11 - HBP Binder:	617.28	617.28
Total XC - 403_11 - HBP Binder:	617.28	617.28
XC - 304_3 - CRGR:	3741.67	3741.67
Total XC - 304_3 - CRGR:	3741.67	3741.67
XC - 304_2 - Gravel:	3504.99	3504.99
Total XC - 304_2 - Gravel:	3504.99	3504.99
XC - 403_11 - HBP Wearing:	370.37	370.37
Total XC - 403_11 - HBP Wearing:	370.37	370.37
Volumes_Cut:	34187.40	34187.40
Total Volumes_Cut:	34187.40	34187.40
Volumes_Fill:	20758.89	20758.89
Total Volumes_Fill:	20758.89	20758.89
XC - 304_1 - Sand:	3291.31	3291.31
Total XC - 304_1 - Sand:	3291.31	3291.31

From Component Quantities

Totals:

Total XC - 641_ - Loam:	0.00	0.00
XC - 403_11 - HBP Binder:	615.24	615.24
Total XC - 403_11 - HBP Binder:	615.24	615.24
XC - 403_11 - HBP Base:	886.82	886.82
Total XC - 403_11 - HBP Base:	886.82	886.82
XC - 304_3 - CRGR:	4353.53	4353.53
Total XC - 304_3 - CRGR:	4353.53	4353.53
XC - 403_11 - HBP Wearing:	368.35	368.35
Total XC - 403_11 - HBP Wearing:	368.35	368.35
XC - 304_2 - Gravel:	4423.45	4423.45
Total XC - 304_2 - Gravel:	4423.45	4423.45
Total XC - Rounding:	0.00	0.00
Total Design:	0.00	0.00
Total XC - 641_ - Loam Cut:	0.00	0.00
XC - 304_1 - Sand:	4546.75	4546.75
Total XC - 304_1 - Sand:	4546.75	4546.75
Total Subgrade:	0.00	0.00
Volumes_Cut:	34178.76	34178.76
Total Volumes_Cut:	34178.76	34178.76

From plan Named Boundaries

Totals:

Cut Volume:	34195.77	34195.77
Total Cut Volume:	34195.77	34195.77
Fill Volume:	20773.89	20773.89
Total Fill Volume:	20773.89	20773.89
Mesh\XS Components\XC - 304_1 - Sand:	4712.62	4712.62
Total Mesh\XS Components\XC - 304_1 - Sand:	4712.62	4712.62
Mesh\XS Components\XC - 304_2 - Gravel:	4521.78	4521.78
Total Mesh\XS Components\XC - 304_2 - Gravel:	4521.78	4521.78
Mesh\XS Components\XC - 304_3 - CRGR:	4401.73	4401.73
Total Mesh\XS Components\XC - 304_3 - CRGR:	4401.73	4401.73
Mesh\XS Components\XC - 403_11 - HBP Base:	888.89	888.89
Total Mesh\XS Components\XC - 403_11 - HBP Base:	888.89	888.89
Mesh\XS Components\XC - 403_11 - HBP Binder:	617.28	617.28
Total Mesh\XS Components\XC - 403_11 - HBP Binder:	617.28	617.28
Mesh\XS Components\XC - 403_11 - HBP Wearing:	370.37	370.37
Total Mesh\XS Components\XC - 403_11 - HBP Wearing:	370.37	370.37

NHDOT CAD/D Connect Documentation

The errors seem to be contained to components that have display rules for multiple component decision making. Meaning Transition components for Sand, Gravel, and Crushed Gravel. While Component Quantities seem to be the most accurate “Clipping is not Considered in Quantities”, and adjustments have to be made by hand to any clipped areas. Corridor Component Quantities should only be created in the same dgn as the Corridor. Incorrect results are returned when reporting on a referenced corridor. This seems to be caused if the terrain is not set active.

After using *Create EarthWork Volumes* then the Cut and Fill volumes from the XSections Average End Areas are correct and can be used. For areas with side roads and drives that may need a Quantity Match the *Plan Named Boundaries* can be placed and modified. The resulting volumes for cut and fill from the plan *Named Boundary* can be used/incorporated into the *Average End Area* report to compupte the final numbers.