Chapter 9  Corridors

This chapter covers the creation and modification of Corridors and Linear Templates.

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9A – INTRODUCTION TO CORRIDOR MODELING

Before creating a Corridor model, the User must create an Alignment, Profile, and Template. For a high-level overview of a Corridor model and the elements used to build a Corridor model, see 8A Introduction to Templates and the Corridor.

For detailed information on the elements used to create a Corridor, see the listed sections:

- **Alignment** – See 7C – Horizontal Geometry
- **Profile** – See 7E – Vertical Geometry
- **Template** – See Chapter 8 – Templates

### 9A.1 Corridor Processing Considerations

#### 9A.1.a Maximum Corridor Length Recommendation

For the current version of the ORD Software, it is recommended that a single Corridor entity does NOT exceed **2 Miles** in length. For example, if the mainline length of the project is 6-miles, it is recommended that three corridor entities are used. See 2E.2.a Alignment and Corridor Maximum Length Recommendation.

Corridors that are longer than **2 Miles** may experience LONG processing times when edits are made to any element that interacts with the Corridor. The complexity of the Alignment, Profile, and Template used for a Corridor will affect processing times. Similarly, a large Existing Ground Terrain Model will drastically increase Corridor processing times. For example, if the Template contains numerous Points, Components, and Display Rules, the Corridor processing times will be affected. See 2E.2.c ORD Element Processing Speed Considerations. Similarly, when Corridor Objects are used to manipulate the Corridor (i.e., Point Control, Parametric Constraints, End Condition Exceptions, Curve Widening, Superelevation, etc..), processing times will increase.
9A.1.b  Multiple ORD Files for Corridors

To increase speeds and allow multiple Users to work on a Project, it is recommended that longer Corridors and mainline Corridors are placed in their own individual ORD Files.

All intersections and approach roads along the length of the mainline can be placed in a single ORD File (typically named the _cvc.dgn file). However, it may be prudent to place more complex intersection models in an individual ORD File. Similarly, if a project contains numerous approaches/intersections along the mainline, it may be prudent to group together 10-15 approach models into a single ORD File.

If a roadway project contains a major site design feature – such as a parking lot – it is recommended that the site design model be given its own ORD File.

9A.1.c  Internal Processing of the Corridor

This subsection will explain the sequence in which the Corridor processes the Template and external elements – such as Point Controls. This information can be inciteful when trying to troubleshoot a Corridor that uses advanced Templates and numerous Corridor Objects (See 9C.1 Corridor Graphical Elements: Template Geometry and Corridor Elements).

When a Corridor is processed, the sequence at which Template data is applied at each Template Drop location is as follows:

1. The Template is applied at a given Template Drop location. The Template is placed according to the default Template Point Constraints set in the Template Editor.
2. Parametric Constraints are applied (See 9G.4 Parametric Constraints). If Parametric Constraints are setup in the Template and have been applied to the Corridor in the Template Drop location, then the corresponding Template Points will be rearranged accordingly.
3. Horizontal Feature Constraints are applied (See 8C.6.a.xiv Horizontal Feature Constraint). If Horizontal Feature Constraints are setup in the Corridor Template and found within the specified range, then Template Points will be rearranged accordingly.
4. Point Controls are applied (See 9G.5 Point Control). If Point Controls are applied to the Corridor at the Template Drop location, then the Template Points will be rearranged accordingly.
5. Display Rules are analyzed based on the current position of Template Points (See 8D.2 Display Rules). Display Rules are solved for and applied based on the Template Point after they’ve been rearranged according to Steps 1-4.
6. End Condition Template Points are solved for based on the position of all Template Points after being rearranged from steps 1-5.

9A.2  Models: Corridors vs Linear Template vs Surface Template

**Corridors** and **Linear Templates** are exactly the same in concept. They are both used to model features that are linear in nature - such as a road or retaining wall. However, Linear Templates are intended for simple modeling operations and do NOT contain advanced functionality that is available for Corridors. Before creating a Corridor or Linear Template, the User must create an Alignment, Profile, and Template.

**Surface Templates** are generally used to represent non-linear features – such as a parking lot. To create a Surface Template model, the User must draw an *enclosed* boundary element using MicroStation or ORD Elements. Then, the User must create a Profile for the enclosed boundary element – after which the boundary can be converted into a Terrain Model. The *Apply Linear Template* tool is used to infill the Terrain Model with material Components – such as asphalt and aggregate. See Chapter 11 – Site Layout.
Corridors are used to create MAJOR modeling features that are linear in nature - such as mainline roadways, approach/intersection roads, retaining walls, and major culverts. When compared to Linear Templates, Corridors can be manipulated into very complex models that can be manipulated to accommodate most design scenarios presented in roadway design.

Linear Templates are used to create MINOR modeling features that are linear in nature – such as the curb/sidewalk/end condition Template shown in the graphic below. A common placement of Linear Templates is along the boundary of a Surface Template and to model cut/fill around the returns of an approach/intersection. In that case, the boundary of the Terrain Model serves as the Alignment and Profile for the Linear Template.

Surface Template Models are used to create modeling features that are non-linear – such as an irregular shaped parking lot. Surface Template Models can also be used to model, quantify, and account for existing unsuitable materials – such as existing pavement, topsoil, and duff.
9A.3 Strategies for Addressing Deviations to the Corridor

It is extremely unlikely that a simple Corridor – containing a single Template – can accurately model all design scenarios presented in a roadway project. A Corridor model will need some modifications to address deviations that result from different design scenarios along the length of the project.

9A.3.a Major and Minor Deviations to the Corridor

In general, the varying design scenarios encountered along the length of the project can be classified as either MINOR or MAJOR deviations to the Corridor.

**BEST PRACTICE:** Anticipate MINOR and MAJOR deviations when creating the Project Template. See 8A.4.a Project Template Considerations and Best Practice.

**MINOR Deviation:** A design scenario that requires a MINOR deviation can be addressed by altering the Constraint values for certain Template Points contained in the Corridor Template. For information on Constraint Types and Values for Template Points, see 8C.6 Constraints. For example, the width of a road lane can be altered by changing the Horizontal Constraint value for the Template Point that controls the lane width. In this example, the Horizontal Constraint value can be altered in two different methods: numerically (Parametric Constraint tool) or graphically (Point Control tool).

In this MINOR deviation example, the value of the Horizontal Constraint can be altered numerical using the **Parametric Constraint** tool. A Parametric Constraint applied to the Template Point allows the user to numerical change the Horizontal Constraint value (i.e. from 12’ to 10’) for a station range. See 9G.4 Parametric Constraints. Alternatively, the Horizontal Constraint value can be altered graphically using the **Point Control** tool. The User can manually draft elements that will control the position of the Template Point. When the Point Control tool is applied to the Template Point, the Horizontal Constraint value will vary as necessary in order to follow the elements that the User has manually drafted. See 9G.5 Point Control.

**MAJOR Deviations:** Major Deviations are classified as design scenarios where the Corridor Template is significantly rearranged and/or Template Components are added. For example, a MAJOR deviation scenario would be a section of road that will be sub-excavated. To model the sub-excavation, Template Components representing sub-excavation materials would need to be added to the Corridor Template. This example of a MAJOR deviation can be addressed by creating a whole new Template that is only used in the vicinity of the MAJOR Deviation OR by creating a Template that can conditionally display sub-excavation Components using Display Rules and Null Point triggers. See 8F.3 Advanced Road Template with Guardrail and Display Rules.

A special case of a MAJOR deviation is when the End Conditions Components need to be significantly rearranged for a station range. The **End Condition Exception** tool can be used to add Template Points and change Constraint Types for the End Conditions Components. See 9G.6 End Condition Exception. Please note that the **End Condition Exception** tool CANNOT add Conventional Template Components to the ends of a Template. For example, it is NOT possible to add retaining wall Components to a Template with this tool.

### Tools For Addressing Deviations to the Corridor

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<th>MAJOR Deviation tools:</th>
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<td>Point Control tool (9G.5)</td>
<td>Create a NEW Template to be applied only in the vicinity of the deviation.</td>
</tr>
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<td>Horizontal Feature Constraint tool (8C.6.a.xiv &amp; 9G.10)</td>
<td>Create an advanced Template with Display Rules and Null Point triggers. (8D.2 &amp; 8F.3)</td>
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<td>Parametric Constraint tool (9G.4)</td>
<td><strong>End Condition Exception</strong> tool - End Condition Components ONLY (9G.6)</td>
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### 9A.3.b Approaches to Common Corridor Modeling Scenarios

In roadway modeling, there are often several tools and/or workflows that can address a single design scenario. The table below lists many design scenarios encountered in the roadway modeling and presents solutions to address these scenarios. When possible, the User is encouraged to find a modeling solution that does NOT involve creating a new Template or using the *Edit Template Drop* tool to override a Template.

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<th>Modeling Tools:</th>
<th>Description:</th>
<th>Pros:</th>
<th>Cons:</th>
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<td><strong>New Road Section:</strong> Significant change in Template dimensions and the need to add Template Points and/or Components. Examples include sub-excavation section or change in roadway width over a substantial length.</td>
<td>Create a New Template Drop Section <em>(9E.4)</em></td>
<td>A new Template is created in the Template Editor to represent the new Roadways section. The New Template Drop tool <em>(9E.4)</em> is used to apply the new Template to the Corridor.</td>
<td>All Templates are well organized in both the Template Library and Corridor.</td>
<td>More time consuming when compared to copying and overriding a Template.</td>
</tr>
<tr>
<td></td>
<td>Copy a Template Drop Section <em>(9E.5)</em> → Edit (Override) Template Drop tool <em>(9E.6)</em></td>
<td>A new Template Drop Section is made by copying an existing Template. The new Template Drop is configured with the Edit Template Drop Tool.</td>
<td>Allows the User to quick test and experiment with different Template configurations.</td>
<td>The overridden Template contains the same name as the original. See <em>(9E.5.a)</em>.</td>
</tr>
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<td><strong>Transition between differing Road Sections</strong></td>
<td>Create a Transition Section Between Template Sections <em>(9E.9)</em></td>
<td>A gap is placed between two Template Drop Sections. The Create Transition tool is used to automatically facilitate transition geometry.</td>
<td>Once Transition Sections are setup, they can be easily manipulated.</td>
<td>The Create Transition tool is NOT User friendly and can be difficult to function correctly.</td>
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<td></td>
<td>Point Control <em>(9G.5)</em> and/or Parametric Constraints <em>(9G.4)</em></td>
<td>Two Template Drop Sections are abutting. Point Controls and Parametric Constraints are used to manually facilitate transition geometry.</td>
<td>Custom transitions can be achieved – Such as non-linear transitions.</td>
<td>Time consuming to set up. Multiple Point Control and/or Parametric needed.</td>
</tr>
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<td><strong>Change in Road Width</strong> The road width needs to deviate for a short segments. Examples include tapering roadway or turn outs.</td>
<td>Parametric Constraint <em>(9G.4)</em></td>
<td>The Horizontal Constraint Value of the Template Point that controls width is numerically changed for a specified station range.</td>
<td>Quick to setup.</td>
<td>Only linear transitions and parallel sections can be created. Multiple uses may be required to achieve results similar to Point Control.</td>
</tr>
<tr>
<td></td>
<td>Point Control <em>(9G.5)</em> or Horizontal Feature Constraint <em>(8C.6.a.xiv &amp; 9G.10)</em></td>
<td>A graphical element is manually drawn by the User. The Template Point that controls width will follow the graphical element.</td>
<td>Custom transitions and edge of road shapes can be created</td>
<td>Can be more time consuming to setup.</td>
</tr>
<tr>
<td>Design Scenario:</td>
<td>Modeling Tools:</td>
<td>Description:</td>
<td>Pros:</td>
<td>Cons:</td>
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<td><strong>Change in Ditch Configuration:</strong> The depth, width, and/or slope configuration of a ditch needs to deviate for a short segment.</td>
<td><strong>Parametric Constraint (9G.4)</strong></td>
<td>The Horizontal, Vertical, or Slope Constraint Values that controls ditch geometry are numerically changed for specified station range.</td>
<td>Quick to setup.</td>
<td>Only linear transitions and constant Constraint values can be used.</td>
</tr>
<tr>
<td></td>
<td><strong>Point Control (9G.5)</strong></td>
<td>A graphical element is manually drawn by the User. The element is optionally given a Profile. Ditch Template Points will follow Horizontal and/or Vertical position of the graphical element.</td>
<td>Custom ditch lines can be created.</td>
<td>Can be more time consuming to setup.</td>
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<td><strong>End Condition Exception (9G.6)</strong></td>
<td>The ditch and entire End Condition Component can be completely replaced or reconfigured for a specified station range.</td>
<td>Entirely new ditch geometry can be created without creating a new Template</td>
<td>The different Modes for this tool can be confusing.</td>
</tr>
<tr>
<td><strong>Change Steepness of Cut/Fill Slopes</strong> The slope of the Cut/Fill needs to deviate for a short segment to avoid an undesirable catch location.</td>
<td><strong>Parametric Constraint (9G.4)</strong></td>
<td>The Slope Constraint Values that controls the Cut/Fill Slope steepness is numerically changed for a station range.</td>
<td>Quick to setup.</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>End Condition Exception (9G.6)</strong></td>
<td>The Cut/Fill Slope or End Condition Component can be completely replaced or reconfigured.</td>
<td>Entirely new Cut/Fill geometry can be created without creating a new Template</td>
<td>The different Modes for this tool can be confusing.</td>
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<td><strong>Undesirable Cut/Fill Catch Location for a Single Station Location</strong></td>
<td><strong>Single Station Template Override (Edit Station tool) (9F.5)</strong></td>
<td>A single Template Drop location is overridden to manually place the Cut/Fill catch point.</td>
<td>Can quickly rectify sliver fills and single station abnormalities.</td>
<td>The Template Drop location becomes static and will not react to edits to the Corridor. See 9F.5.</td>
</tr>
<tr>
<td></td>
<td><strong>Parametric Constraint (9G.4)</strong></td>
<td>The Slope Constraint Value that controls the Cut/Fill Slope steepness is numerically changed to catch in a desired location. Only applied over a very short segment.</td>
<td>This tool will not make the section static.</td>
<td></td>
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<td><strong>Guardrail Section</strong></td>
<td><strong>Create new Templates with Guardrail and Shoulder specific Components</strong></td>
<td>Multiple Templates are used in the vicinity of the Guardrail. Graphical elements are used to draw the transition geometry. Point Controls are used to follow the transition geometry.</td>
<td>This method is more accessible to the new User.</td>
<td>When guardrail sections are needed on both sides of the road, Template management becomes challenging.</td>
</tr>
<tr>
<td></td>
<td><strong>Create an Advanced Template with Display Rules to conditionally display Guardrail and Shoulder Components. (See 8F.3)</strong></td>
<td>A single Template is created that can accommodate both Typical road conditions and react to Guardrail segments. Graphical elements are drawn to represent the shoulder and guardrail position. The graphical elements are added to Corridor as Horizontal Feature Constraints.</td>
<td>This method provides a streamlined and organized way to model if multiple guardrail sections are needed for a project.</td>
<td>Can be time consuming and difficult to setup. Advanced Template concepts must be understood by the User.</td>
</tr>
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9B – CREATING CORRIDORS AND LINEAR TEMPLATES

9B.1 Create a New Corridor

This workflow demonstrates how to create a Corridor for a road with the New Corridor tool.

The following procedures must be completed BEFORE a Corridor is created with the New Corridor tool:

1. Create a Horizontal Alignment. See 7C – Horizontal Geometry.
2. Create a Profile and ensure that it is the Active Profile. See 7E – Vertical Geometry.
3. Create the desired Template(s) for the Corridor. Ensure that the Project Template Library has been loaded in the Template Editor. See Chapter 8 – Template Library.
Left-Click and hover over the Alignment with the mouse cursor to bring up *Pop-Up Icon Menu*. Select *Create Corridor.* (PREFERED METHOD)

ALTERNATIVELY:
Select the *New Corridor* tool from the Ribbon: [**OpenRoads Modeling → Corridor → Create**].

**Prompt: Locate Profile – Reset for Active Profile.** In the Profile Model of the Alignment, Left-Click on the desired Profile

ALTERNATIVELY: Right-Click (reset) in the View to automatically select the *Active Profile*.

**Prompt: Corridor Name.** Assign the Corridor a Name. Type in the desired Name. Left-Click in the View to advance to the next prompt. An example of an appropriate Corridor Name would be “COR_MAIN_Riverside”.

See [**3F – Naming Convention for Alignments, Profiles, Corridors, and Terrain Models**].

**Prompt: Select Template - <ALT> Down to Browse Templates.** Press the ALT key and DOWN ARROW key simultaneously to browse Templates within the currently loaded Project Template Library. Left-Click on the desired Template and press OK. Left-Click in the View to advance to the next prompt.

**WARNING:** Ensure the correct Project Template Library is loaded. If not, exit out of the corridor creation workflow. Enter the Template Editor and load the correct Project Template Library. See [**8A.1 Accessing the Template Editor and Template Libraries**].

**Prompt: Start Station. <ALT> Lock to Start.** With the mouse cursor, hover over the desired starting point for the corridor and left-click to accept.

OR

Press the ALT key to automatically make the starting point of the Alignment and Corridor coincide. Left-Click in the View to advance to the next prompt.

**Prompt: End Station. <ALT> Lock to End.** With the mouse cursor, hover over the desired ending point for the corridor and left-click to accept. It is recommend that the Corridor does NOT exceed 2-miles in length. See [**9A.1.a Maximum Corridor Length Recommendation**].

**Prompt: Interval.** Key-in the desired *Drop Interval*. Left-Click in the View to create the corridor.

The Template *Drop Interval* controls maximum distance between Template drop applications. The *Interval* controls how dense the Corridor Model is and affects processing requirements. For example, if the Interval is set to 10’, the Template will be applied/processed at least once every 10’.

**WARNING:** The Template Drop Interval will affect which cross section STATIONS are shown in Cross Section sheet production. See [**9E.2 Aligning Template Drop Interval for Cross Section Production**].

If the desire is to show Cross Sections at even stations of 50’ in production (i.e., 10+00, 10+50, 11+00), then the interval should be set to a number divisible by 50 (i.e., 10, 12.5, 25, 50).

**NOTE:** When a Corridor is initially created, it will be automatically assigned to the *Design Feature Definition* – which contains a *Template Drop Multiplier* of 2. The Feature Definition of the Corridor will affect Interval behavior with the *Template Drop Multiplier* and other properties such as *Densify Horizontal*. See [**9D.2 Corridor Handle Properties - Corridor Feature Definitions**].
9B.2 Create a New Linear Template

9B.2.a Linear Templates vs Corridors

Linear Templates operate similarly to Corridors. However, the key advantage to Linear Templates is that they have the ability to be reflected over the Alignment. See 9B.2.c Reflect a Linear Template After Creation. Using a Linear Template model, a single Template can be placed on the right or left side of an Alignment, no matter the right/left orientation of the Template in the Template Editor.

Also, Corridors have more manipulation functionality than Linear Templates. This is because Linear Templates are intended to model relatively simple features - such as simple curb/sidewalk, minor Culverts, and intersection/approach returns.

The following manipulation tools (Corridor Objects) are available for Corridors but NOT Linear Templates.

- **Template Drop Sections** (Multiple) – Only ONE Template can be used per Linear Template model.
- **Superelevation tools** – Superelevation Lanes CANNOT be applied to Linear Templates
- **Curve Widening** – Curve Widening CANNOT be applied to Linear Templates.
- **Key Station tools** – For Linear Templates, Template Drop locations can only be controlled by manipulating the Feature Definition
- **End Condition Exceptions** – End Condition Exceptions are NOT available.
- **Secondary Alignments** – Secondary Alignments are NOT available
- **Corridor Reports** – Reports can NOT be generated for Linear Templates
- **Overlay Vertical Adjustment** – This tool is NOT available for Linear Templates.

The ONLY manipulation tools available for Linear Templates are:

- **Parametric Constraints**
- **Point Controls**
9B.2.b Create a New Linear Template Workflow

Creating a Linear Template is almost the exact same process as creating a Corridor – with a few notable exceptions:

1. The Profile to be used with a Linear Template CANNOT be manually picked by the User. The Active Profile for the Horizontal Alignment is automatically used.
2. The Interval spacing for a Linear Template CANNOT be specified by the User. The Template Drop is automatically set and CANNOT be modified.
3. Templates can be reflected or mirrored over the Horizontal Alignment in Linear Template Creation.

**TIP:** After creation, if the Linear Template is position on the wrong side of Horizontal Alignment, then it can be flipped to the correct side in the Properties Box. Access the Properties Box for a Linear Template by selecting the Handle. See 9B.2.c Reflect a Linear Template After Creation.

This workflow demonstrates how to create a Linear Template with the Apply Linear Template tool. The Linear Template will be used to model a Curb/Sidewalk template that borders a parking lot.
**1. Left-Click and hover over the Alignment (in this case the Edge of Parking Lot) with the mouse cursor to bring up Pop-Up Icon Menu. Select Apply Linear Template. (PREFERRED METHOD)**

**ALTERNATIVELY**

Left-Click the Apply Linear Template tool from [OpenRoads Modeling → Model Detailing → 3D Tools].

**2. Prompt: Select Template - <ALT> Down to Browse Templates.** Press the ALT key and DOWN ARROW key simultaneously to bring up Templates. Left-Click on the desired Template and press OK. Left-Click in the View to advance to the next prompt.

**WARNING:** Ensure the correct Project Template Library is loaded. If not, exit out of the Linear Template creation workflow. Enter the Template Editor and load the correct Project Template Library. See 8A.1 Accessing the Template Editor and open a Project Template Library.

**3. Prompt: Start Station. <ALT> Lock to Start.** With the mouse cursor, hover over the desired starting point for the Linear Template and left-click to accept.

**ALTERNATIVELY**

Press the ALT key to automatically make the starting point of the Alignment and Linear Template coincide. Left-Click in the View to advance to the next prompt.

**4. Prompt: End Station. <ALT> Lock to End.** With the mouse cursor, hover over the desired ending point for the Linear Template and left-click to accept.

**WARNING:** Commonly, Linear Templates are used with enclosed Alignments – such as perimeter of a parking lot. For enclosed Alignments, the direction and start point can often be confused. Ensure that *End Station* is greater than the *Start Station* before advancing to the next step.

**5. Prompt: Select Side – Reflect Option Mirror - <Alt> Down To Select –** place the mouse cursor to the desired side of the Alignment for Linear Template placement. The dark orange hatch will signify on which side the Linear Template is placed.

If the ALT key and DOWN arrow are pressed simultaneously, then the Linear Template will be mirrored and placed on BOTH sides of the Alignment.

**TIP:** The Linear Template can be reflected, un-reflected, or mirrored after creation – through the Linear Template Handle Properties Box. See 9B.2.a Reflect a Linear Template After Creation.

**6. Prompt: Exterior Corner Sweep Angle –** This value has an impact on the model density of Linear Template around curves and corners. It is recommended to use the default value of 5°.

**7. Prompt: Description.** If desired, assign the Linear Template a Description.
9B.2.c Reflect a Linear Template After Creation

Occasionally, the Linear Template is created on the unintended side of the Alignment. Instead of deleting the Linear Template and trying to re-create it on the correct side, the Linear Template can be flipped or Reflected over the Alignment. The option to Reflect the Linear Template is listed in the Properties Box when the Linear Template Handle is selected. Similarly, the Linear Template can be Mirrored.

Reflect = True
The Linear Template is positioned ABOVE the Parking Lot

Reflect = False
The Linear Template is positioned BELOW the Parking Lot

Mirror = True
The Linear Template is MIRRORED on both sides of the Parking Lot
9C – GRAPHICAL DISPLAY OF CORRIDOR GEOMETRY

9C.1 Corridor Graphical Elements: Template Geometry & Corridor Objects

When a Corridor is created, there are two types of graphical elements that are also created – Template Geometry and Corridor Objects:

**Template Geometry** - graphical elements that correspond to the Points and Components found in the Template. Template Points and Components are discussed in Chapter 8. For example, Template Geometry could represent edge of road (Template Point) or a volume of aggregate (Template Component). For a graphical depiction of Template Geometry, see 8A.2.a Template Points and Components.

**Corridor Objects** - graphical elements that are used to manipulate the Corridor. When a Corridor is created, two *Base Corridor Objects* are created: the *Corridor Handle* and a single *Template Drop* section. The *Corridor Handle* represent the Corridor entity as a whole. Most edits and manipulations are performed by selecting the *Corridor Handle*. See 9D – The Corridor Handle and Corridor Object Menu.

**Template Geometry and Corridor Objects in the 2D and 3D Design Models**

When a Corridor is created and processed, Template Geometry is created in both the 2D Design Model and the 3D Design Model. In the 2D Design Model, Template Points are created as *Complex Element* entities. In the 3D Design Model, Template Points are created *3D Linear Element* entities.

*Corridor Objects* are only created and viewable in the 2D Design Model.

**IMPORTANT:** Template Point geometry is created in both the 2D and 3D Design Models. Every Template Point contained in a Template is created in the 3D Design Model as a *3D Linear Element*. Only some Template Points are created in the 2D Design Model as *Complex Elements*. Whether a Template Point is created in the 2D or 3D Model depends on the Feature Definition – which is set in the Point Properties within the Template Editor.

In the graphic shown above, notice that the Hinge Point line is ONLY shown in the 3D Design Model. This is because the Feature Definition of the Hinge Point (XS_TL_Subgrade) is NOT pre-configured to show in the 2D Design Model. See 9C.2.e.i Create Corridor Complex Elements - Workflow.
9C.2 Overlapping 2D and 3D Elements in the 2D Design Model

In an ORD File, the 3D Design Model 🔄 is referenced into the 2D Design Model 🔄. This means that the 3D elements - such as 3D Linear Elements and Template Components – may be displayed in the 2D Design Model 🔄.

It is important that the User understands how to differentiate between 2D Corridor Elements – such as Complex Elements and Corridor Objects – and 3D Corridor Elements.

By default, the 3D Design Model 🔄 reference Display is set to ON – which means the User is likely to see a combination of overlapping 2D and 3D elements when a Corridor is first created.
9C.2.a 3D Elements in the 2D Design Model – Best Practices Discussion

While working in the 2D Design Model, linework from the 3D Design Model (shown via reference) will drastically clutter up the View due to overlapping Linear Elements and distracting transverse lines (Template Components). Similarly, the linework from the 3D Design Model does NOT provide much new information or utility to the User.

**BEST PRACTICE:** Under normal circumstances, it is recommended that the 3D Design Model reference is tuned off while working in the 2D Design Model.

However, it is occasionally necessary for the User to reference a Template Point line that is only created in the 3D Design Model. Similarly, it may be informational to observe the transverse lines of a Template Component – which shows how the Corridor is processing Template Drops. In these cases, the User should simply turn on the 3D Design Model reference and isolate the Level of the desired 3D Element.

To quickly isolate and find the desired Level of an 3D element, the User should understand the prefix identifier used for Levels that originate from the FLH Level Library.

<table>
<thead>
<tr>
<th>FLH Level Library – Prefix Convention</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Prefix</strong></td>
</tr>
<tr>
<td>-----------------</td>
</tr>
<tr>
<td><strong>XS_TL</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>XS_TC</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>
9C.3  Corridor Complex Elements vs 3D Linear Elements

Every Template Point will be created as a **3D Linear Element**. Only the Template Points of importance relating to Plan Sheets or other modeling applications should be created as a **Complex Element** (2D).

Any Template Point in a Corridor Template can be created as a **Complex Element** (2D), but the User should determine if it is practical to do so. See **9C.4.e.i Create Corridor Complex Elements – Workflow**.

This subsection details the difference between **Complex Elements** (2D) and **3D Linear Element** to help the User decide if a Corridor Template Points should be created as a **Complex Element** (2D).

**Functionality** – **Complex Elements** (2D) are compatible with numerous Horizontal and Vertical ORD tools including:

- Offsets and Tapers tools
- Project Profile to Element
- Profile Intersection Point
- Quick Profile Transition

These tools are commonly used to create supplemental geometry and profiles by referencing a Corridor **Complex Element**. For example, the **Profile Intersection Point** can be used to vertically align an Approach Alignment with the **Corridor Complex Element** that represents the Mainline Edge of Road.

**3D Linear Elements** are mainly intended for visual reference and are NOT compatible with Horizontal and Vertical ORD tools.
Plan Sheets – For convenience and simplicity, Complex Elements (2D) should be created for lines that will be shown in the Plan Sheets – such as Edge of Road and Slope Stake Limits (Cut and Fill lines). It is possible to show 3D Linear Elements in Plan Sheets – but to do so requires referencing the 3D Design Model ( ), in addition to the 2D Design Model ( ). This appears redundant because the Corridor ORD File is listed twice in the Reference Manager.

In the graphic below, it appears that the Corridor ORD File (id-ad158061_cor.dgn) is referenced into the Sheet Model twice. Looking closer, the references are actually slightly different. The first reference corresponds to the 2D Design Model ( ) for the Corridor ORD File (Default Model type) – and is used to show Complex Elements. The second reference corresponds to the 3D Design Model ( ) (Default-3D) for the same Corridor ORD File and is used to show 3D Linear Elements.
9C.4 Complex Element Symbology and Behavior

The following section details the behavior of Corridor Complex Elements.

9C.4.a Symbology Properties of Corridor Complex Elements

The Symbology for a Complex Element is displayed in the Properties Box. These Properties set by the Feature Definition of the Template Point. Shown below, the Fill Slope Stake Complex Element is inspected.

1. The Create Template Geometry settings (See 9C.2.d.i) for a Feature Definition determines if a Template Point is created as a Complex Element entity. The element entity type is shown in the Properties Box.

2. The Feature Definition determines the Level that the Complex Element is placed on.

3. The Level will in turn control the symbology - Color, Line Style, and Weight - of the Complex Element.

4. It is common in the FLH Feature Definition Library for a Level and Feature Definition to have a common name. In the graphic below, the Feature Definition and Level are both called “XS_TL_Fill”.

**WARNING:** It is possible to manually change the Feature Definition or Level of a Corridor Complex Element in the Properties box. However, when the corridor is processed, the Feature Definition will revert back to the original Feature Definition that is set in Template Point Properties (within the Template Editor).
9C.4.b Alignment Complex Elements vs Corridor Complex Elements

As opposed to Alignment Complex Elements discussed in Chapter 7, Corridor Complex Elements are static elements. Alignment and Corridor Complex Elements are identified in the Properties Box. In the Properties box, an Alignment Complex Element will have a symbol. A Corridor Complex Element will have a symbol.

**NOTE:** The symbol signifies that a Complex Element does NOT contain Civil Rules and therefore is static. These Complex Elements CANNOT be directly edited through conventional means – such as grip-edits or Civil Manipulators. See 7B.3.a Civil Rules Example – Dialogue and Civil Rules Manipulator Inputs.

9C.4.c Manipulate or Override Edits to Corridor Complex Elements

Since Corridor Complex Elements CANNOT be directly edited, Corridor Objects are used to manipulate the shape of a Complex Element when the Template Point needs to deviate from the default Template geometry. For an explanation of all the different Corridor Object tools, see 9G - Corridor Objects.

A Corridor Complex Element can be converted into a MicroStation Element for direct, conventional manipulation through grip-edits and MicroStation tools – such as the Break Element or Move tools. See 9C.4.c.1 Convert a Complex Element to a Complex Chain for Direct Manipulation.

In the graphic below, the Edge of Road Complex Element is manipulated (widened) with a Point Control Corridor Object to create a turnout.

![Graphic](Image.png)
9C.4.c.i Convert a Complex Element to a Complex Chain for Direct Manipulation

Corridor Complex Elements are NOT editable through conventional means (i.e., grip-edits, Insert/Delete a Vertex, Rotate, Move). However, it is possible to use the Copy tool to create a Complex Chain from the Corridor Complex Element. The resulting Complex Chain copy has no association with the Corridor or Template, so it can be directly edited through conventional means.

This process could be used to create linework for calculating quantities manually or to manually adjust the Cut/Fill around a minor approach – as shown below.

**WARNING:** This process should only be used if it is unnecessary to create a 3D model of the approach for grading or earthwork calculations.

![Diagram showing the process of converting a Complex Element to a Complex Chain](image)

After this process is performed, Modify and Manipulate tools can be used on the Complex Chain. In this example, the Break Element tool would likely be used to split the Fill Slope Stake Limit in the vicinity of the approach.

9C.4.d Active Profiles for Corridor Complex Elements

Corridor Complex Elements are automatically assigned an Active Profile to represent the corresponding Template Point’s vertical position. The Profile behaves similarly to the Corridor Complex Element – meaning it CANNOT be directly edited by conventional means.
If the Template Point’s vertical position must deviate from the default position in the Template Editor, then the Corridor Object tools are used to manipulate the Profile of a Complex Element. For example, Vertical Point Control and Parametric Constraints can be used to create irregular ditch profiles for a ditch Complex Element. See 9F Corridor Objects – Manipulation of the Corridor.

**TIP:** Because Corridor Complex Elements contain Active Profiles, they can be used with the following Vertical ORD Element tools:

- Project Profile to Element (See 7E.4.c)
- Project Profile Range to Element (See 7E.4.d)
- Profile Intersection Point (See 7E.4.f)
- Quick Profile Transition (See 7E.5.a)

### 9C.4.e Advanced Behavior of Corridor Complex Elements

The following sub-sections demonstrate the functional effects of Template Point Symbology on the creation and behavior of Corridor Complex Elements. For Template Point Symbology information, see 8C.2 Point Symbology Properties.

Template Point Symbology properties include:

- **Name** (See 9C.4.e.ii Effect of Template Point Name on Corridor Complex Elements)  
  (See 9C.4.e.iv Identical Template Point Names across Template Drop Sections)

- **Feature Definition** (See 9C.4.e.i Create Corridor Complex Elements – Workflow)

- **Feature Name Override** (See 9C.4.e.iii Effect of Name Overrides on Slope Stake Limits Elements)
9C.4.e.i Create Corridor Complex Elements - Workflow

This workflow demonstrates how to create a Complex Element from a Template Point – if the Feature Definition is NOT already set up to do so. In this demonstration, the Feature Definition for the road Hinge Point (XS_TL_Subgrade) is altered Complex Element in the 2D Design Model.

If the XS_TL_Subgrade Feature Definition was left unaltered, then the Hinge Point would ONLY be created as a 3D Linear Element in the 3D Design Model.

1. Determine the Feature Definition of the Template Point to be displayed. The Feature Definition is identified and changed in the Point Properties in the Template Editor. In this example, the Feature Definition is XS_TL_Subgrade.
Locate the Feature Definition in the Project Explorer. Template Point Feature Definition settings are located under:

Project Explorer → OpenRoads Standards → Current DGN Name (Default) → Linear

In this example, the XS_TL_Subgrade Feature Definition is located under:
OpenRoads Standards → Current DGN Name (Default) → Linear → Modeling → Template Points → Subgrade

Left-Click on XS_TL_Subgrade to bring up the Feature Definition properties in the Properties Box.

In the Properties Box, change Create Template Geometry from False to True. When the Corridor is reprocessed the Hinge Point will be created as a Complex Element in the 2D Design Model.
Hinge Point Template Point now shown in 2D Design Model
Effect of Template Point Name on Corridor Complex Elements

The Name or Name Override of the Template Point (See 8C.2.2 Point Symbology Properties) will affect the behavior and display of the corresponding Corridor Complex Element. When Template Points are Named the same - or Overridden to have the same name - the result is a SINGLE Complex Element – even if visual gaps appear in the line.

Similarly, When a corridor uses multiple Template Drop sections that contain Template Points with identical Names - then a SINGLE Complex Element will be created across the Template Drop sections. Even when there are visual gaps in the line, it is still considered a singular Complex Element entity by the software. See 9C.4.e.iv Identical Template Point Names across Template Drop Sections – Demonstration.
9C.4.e.iii Effect of Name Overrides on Slope Stake Limits Elements

Use Feature Name Overrides are necessary to correctly display symbology corresponding to the Cut/Fill Slope Stake Limits. See 8C.2 Point Symbology Properties.

WARNING: If Feature Name Overrides are not used in the Corridor Template, then the cut and/or fill lines may be shown incorrectly. See 8C.7.b Feature Name Override Convention for End Condition Points.

Name Overrides are necessary to create a SINGLE Complex Element corresponding to Cut and a SINGLE Complex Element corresponding to Fill – for the entire length of the Corridor. If Name Overrides are NOT used, then a separate Complex Element – with a gap between them - is created for each Cut or Fill configuration (steepness). For example, Feature Name Overrides are used to create a SINGLE Complex Element for the Fill Slope – even when the Fill Slope changes from 1V:4H to 1V:2H.

NOTE: At this time, the software does not have an automatic method for creating transition lines between Cut and Fill elements. If transition lines between Cut and Fill elements must be shown in the plan set, the User will have to manually draft them.
9C.4.e.iv Identical Template Point Names across Template Drop Sections – Demo

If Template Points are *Named* identically, then the corridor will process the Template Points as a single, continuous Complex Element entity – even if the Feature Definitions are different across a Template Drop section. To demonstrate this concept, the Feature Definition and Name for the Template Point corresponding to Edge of Road is altered.

To begin this demonstration – the Corridor shown below contains two Template Drops – BUT – these Template Drops are using identical Templates. Notice that the Template Point that represents the Edge of Road is continuous – even across the Template Drop change. This is because the Name for this Particular Template Point is identical.

1. **Stationing Direction**
   - Stationing Direction
   - Template Point is continuous across Template Drop
   - Template Drops using identical Templates

2. Next, the Template in the right Template Drop (down station) is edited with the Edit Template Drop tool.
The Feature Definition of the Template Point is changed – but the Name remains the same for this point across both Template Drops.

Despite the edit made to Feature Definition, there is no change in the symbology of the Template Point for the down station Template drop. Also, the Template Point remains continuous across the Template Drop.
5 The down station Template Drop is edited again. The Name of the Template Point is changed.

6 After the Name is changed, the Template Points are separated across the Template Drop.
Corridor Models are manipulated in the 2D Design Model with graphical elements called Corridor Objects. When a Corridor is initially created, two Base Corridor Objects are automatically created: the Corridor Handle and a single Template Drop section.

**Corridor Handle** – is the master Corridor Object for manipulating the corridor. The Corridor Handle is represented by the ticks or handles that surrounds the Corridor. The Corridor Handle provides access to the Corridor Object Menu - which houses and organizes all Corridor Objects. Additionally, all corridor symbology properties - such as Corridor Feature Definition and Corridor Name - are found by selecting the Corridor Handle.

**Template Drop** – represents the horizontal range a single Template is applied. Template Drop sections are represented by the dashed boxes that surround the corridor. Multiple Templates can be applied along the alignment of a corridor by creating additional Template Drop sections. Templates can be switched out or overridden by selecting the desired Template Drop Section. See 9E – Template Drops.

**TIP:** Access tools pertaining to the Corridor Handle and Template Drop sections through the Pop-Up Icon Menu. See Chapter 1: Popup Icon Menu. In this chapter, the preferred method for accessing Corridor tools is through the Pop-up Icon Menu.

**WARNING:** The Corridor Handle is also selected by clicking on the exterior Template Point line (Complex Element) – which typically corresponds to a Cut or Fill End Condition. The exterior Template Point line and Corridor Handle elements are actually overlapping – but this overlap is not indicated visually. The User can switch between the overlapping elements by hovering over the elements and right-clicking until the desire element is shown, then left-clicking to accept. See Chapter 1: Selecting Overlapping Elements.
9D.1 Corridor Object Menu

The Corridor Objects Menu organizes and lists all Corridor Objects – such as Templates and Point Control. The Corridor Objects Menu is divided into nine sub-menus – which corresponding to the different types of Corridor Objects. See 9G – Corridor Objects – Manipulation of the Corridor. Corridor Objects can be created and edited from within the Corridor Objects Menu.

9D.1.a Access the Corridor Objects Menu

The Corridor Objects Menu is accessed through the Corridor Objects tool - which is represented with a bucket icon. The Corridor Objects tool is found under the Corridor Creation Tools drop-down – which is represented with a hammer icon .

There are THREE ways to access the Corridor Objects Menu – as shown in three colors below:

1. Select the Corridor Objects tool from the Ribbon.
2. Right-Click on the Corridor in the Properties Box.
3. Select Corridor Objects located under the Corridor Creation Tools drop-down.

Left-Click on the Corridor Handle and momentarily hover over it to bring up the Pop-Up Icon Menu.
9D.2 Corridor Handle Properties - Corridor Feature Definitions

Similar in concept to ORD Elements, Corridors contain a Feature Definition – which is found in the Properties box. The Feature Definition controls Corridor processing settings. The main difference between the Corridor Feature Definition types relate to the spacing of Template Drops and whether the Corridor will display contours. The Corridor Feature Definition type can be identified and changed in the Properties Box when the Corridor Handle is selected.

The FLH Feature Definition Library contains only three types of Feature Definitions for Corridors.

**Design** – Contains a Template Drop Interval Multiplier of 2. This means the Template is applied at twice the Interval distance specified in the Corridor Objects Menu – which speeds up corridor processing. The Design Feature Definition is intended for earlier stages of the corridor modeling process to speed up processing times as more frequent edits are made.

**Final** - Contains a Template Drop Interval Multiplier of 1. This means the applied Template Interval matches up with the Interval specified in the Corridor Objects Menu. This Feature Definition will add time to the Corridor Processing but produces a denser model due to the more frequent Template application. **IMPORTANT:** The Corridor should be placed on the Final or Final w/ Contours Feature Definition before the creating final deliverables – such as Finished Grade surfaces and Corridor Reports.

**Final w/ Contours** – This Feature Definition is the same as Final – but additionally shows proposed contours generated automatically from the Corridor Model.
9D.2.a Corridor Feature Definition Properties

Corridor Feature Definitions are viewed and edited through the Explorer. **NOTE:** The 2D Design Model (Default) must be the active View before navigating the Explorer.

*Explorer → OpenRoads Standards → Standards → <Current DGN Name> → Feature Definitions → Corridor*
The table below shows some key Corridor Feature Definition Properties that affect corridor processing speeds and model density.

<table>
<thead>
<tr>
<th>Property:</th>
<th>Description:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Template Drop Interval Multiplier</strong></td>
<td>If set to a value other than 1, the Template Interval distance (found in the Corridor Objects Menu) will be increased or decreased by a factor of the Multiplier value.</td>
</tr>
<tr>
<td><strong>Horizontal/Vertical Cardinal Points</strong></td>
<td>If set to TRUE, a Template is applied at all horizontal and vertical cardinal points on the alignment and profile, such as: PC, PT, VPC, VPT, PI, VPI.</td>
</tr>
<tr>
<td><strong>External Control Points</strong></td>
<td>External Control Points refer to the cardinal points for External References. If set to True, a Template is applied at all horizontal and vertical cardinal points found on an Externally Referenced alignment.</td>
</tr>
<tr>
<td><strong>Densify Horizontal and Vertical</strong></td>
<td>If set to TRUE, Template Interval distance in the vicinity of horizontal and vertical curves is automatically decreased to provide more density to the Corridor model in curved segments. Setting these properties to TRUE increases corridor model processing requirements and times. Setting these properties to False results in Template Point lines that appear jagged or “chorded” around Horizontal Curves.</td>
</tr>
</tbody>
</table>
| **Enable Clipping**                | If set to TRUE, Clipping References are used to clip the Corridor Model. If set to FALSE, Clipping References can still be added as Corridor Objects, but will not be processed. Corridor will not be clipped until set to TRUE.  
  
  **TIP:** For the Design Feature Definition, set Enable Clipping to FALSE. For the Final Feature Definition, set Enable Clipping to TRUE. |
| **Top/Bottom Mesh Display**        | If set to TRUE, the Top or Bottom Mesh will be displayed in the 3D Design Model. For more information, see 9I.1 Top and Bottom Meshes. |
| **Include Null Point Linear Features Display** | If set to TRUE, Null Points are created as Complex Elements in the 2D Design Model. If set to FALSE, a graphical element is NOT created for Null Points. This needs to be set to TRUE to display Null Points that represent guardrails.  
  
  For more information on Null Points, see 8C.1 Template Point Types and Identification. |
| **Major/Minor Contour Display**    | If set to TRUE, proposed contours will be created in the 3D Design Model. |
Template Drop sections represent the range along an alignment to which a Template is applied. A Corridor Model will only be created within the range of a Template Drop section. Template Drop sections can be manipulated in the 2D Design Model. Similarly, all information relating to Template Drops for a Corridor can be found and manipulated in the Corridor Object Menu within the Template Drops sub-menu.

### 9E.1 Template Drop Sub-Menu Overview

**NOTE:** Template Names are shown in Black, Red, or Blue text depending if the Template Drop is synchronized with the currently loaded Template Library. See 9E.8.a Template Synchronization in the Corridor Objects Menu.

<table>
<thead>
<tr>
<th>Number</th>
<th>Description</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><strong>Template Drop Section</strong></td>
<td>Represents a single section in which a single Template Drop is applied.</td>
</tr>
<tr>
<td>2</td>
<td><strong>Transition Section</strong></td>
<td>Represents a transition between two different Template Drop sections. <strong>NOTE:</strong> Transition Sections will NOT be named. The corresponding cell will be blank under the Template Name list.</td>
</tr>
<tr>
<td>3</td>
<td><strong>Single Station Template Override</strong></td>
<td>Created with the Edit Station tool. Creates a Template override at a single station. An example usage is to alter the Fill Slope for a single station that slightly misses the top of the targeted embankment. Single Station Template Overrides are always listed at the end of the Template Drop list.</td>
</tr>
<tr>
<td>4</td>
<td><strong>Switch Template Button</strong></td>
<td>This button is used to access the Template Library to switch the Template for the section.</td>
</tr>
<tr>
<td><strong>Template Drop Interval</strong></td>
<td>This sets the frequency that a Template is applied within the section. The Template Drop frequency is also affected by Corridor Feature Definition properties – such as Interval Multiplier and Densify Horizontal/Vertical.</td>
<td></td>
</tr>
<tr>
<td>---------------------------</td>
<td>--------------------------------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td><strong>Template Drop Section Station Range</strong></td>
<td>Displays the Station Range along the alignment in which a Template Drop Section, Transition, or Single Station Override is applied.</td>
<td></td>
</tr>
</tbody>
</table>

**9E.2 Aligning Template Drop Interval for Cross Section Production**

To display correctly, Template Drops must coincide with the station values that will be shown in Cross Section Production. This is accomplished by manipulating the Template Drop Interval value.

For example, if the intent is to produce cross sections every 25’ for the plan set (i.e., 10+00, 10+25, 10+50), then Template Drop Interval must be set to a number divisible by 25 (i.e., 25, 12.5, 5).

**WARNING:** The Corridor Feature Definition also affects the placement of Template Drops due to the Template Drop Multiplier. See **9D.2 Corridor Handle Properties – Corridor Feature Definitions**.

Occasionally, the beginning station limit for a project may be an odd value – such as 9+85.36. In that case, it is conventional to show a cross section at the beginning 9+85.36 – and show all subsequent cross sections at round station values (i.e., 10+00, 10+25, 10+50). In that case, the Template Drop Interval should still be a divisible value of the round station. The software will place a Template Drop at the odd beginning station and then automatically adjust to place subsequent Template Drops at round stations.

**WARNING:** When viewing a cross section that does not directly align with a Template Drop, the Cut/Fill End Condition will NOT be shown as intercepting the Existing Ground.
When viewing a Cross Section that is not exactly aligned with a Template Drop, the Cut/Fill End Condition will likely not be shown as intercepting the Existing Ground.
9E.3 Adjust the Station Range of a Template Drop Section

The Station Range for a Template Drop Section can be adjusted graphically using grip-edits – OR – the new Station Range can be keyed-in numerically in the Template Drop sub-menu.

**WARNING:** If enabled, Persist Snaps are applied to Template Drop sections when Grip-Edit method is used. See 7B.2 Persist Snaps.

**Graphically change the Start or End Station of the Template Drop section with Grip-Edits**

1. In the 2D Design Model, *Select* the Template Drop Section that is to be adjusted.
2. Left-Click on the Station Range Grip-Edit Handle – shown above as an orange arrow.
3. Place the mouse cursor in the desired new location for the Start or End Station. Left-Click to accept the new position.

**Numerically change the Start or End Station**

1. Access the Corridor Objects menu through the Corridor Handle Pop-Up Icon Menu. See **9D.1.a Access the Corridor Objects Menu**.
2. In the Template Drop sub-menu, highlight the desired Template Section and key-in the new Start or End Station. Press the Enter key to accept.

1. In the 2D Design Model, *Select* the Template Drop Section that is to be adjusted.
2. Left-Click on the **Orange Text** near the Start or End of the Template Drop Section. Key in the desired new Start/End Station value. Press the Enter key to accept.
9E.4 Create a New Template Drop Section

A new Template Drop section can be created directly in the 2D Design Model with the New Template Drop tool – OR – through the Template Drop sub-menu with the Add New button. Prior to this workflow, ensure that the Project Template Library has been loaded in the Template Editor.

In the Ribbon, Left-Click on the New Template Drop tool. Ribbon Location: OpenRoads Modeling workflow → Corridor tab → Create panel.

Prompt: Locate Corridor – Left-Click on the Corridor that will receive the new Template Drop Section.

Prompt: Select Template - <Alt> Down To Browse Templates – Simultaneously press the ALT and Down Arrow key to view the Project Template Library. Select the desired Template and press OK.

If the desired Template is displayed in the Dialogue Box, then Left-Click in the View.

Prompt: Start Station <Alt> Lock To Start – Key-in the desired starting station for the new Template Drop section and press the Enter key to lock it. Left-Click in the View to accept.

Alternatively – Graphically select the Start Station by placing the mouse cursor in the desired location and then Left-Clicking. When doing so, ensure that the Start Station is not LOCKED in the Dialogue Box.

Prompt: End Station <Alt> Lock To End - Key-in the desired end station for the new Template Drop section and press the Enter key to lock it. Left-Click in the View to accept.

Alternatively – Graphically select the End Station.

Prompt: Interval – Key-in the desired Template Drop Interval for the section and Left-Click in the View.
9E.5 Copy a Template Drop Section

Instead of creating a whole new Template Drop Section, it may be more convenient to COPY a Template Drop found in the Corridor. The result is a new Template Drop section that contains the same cross sectional Template configuration. This workflow is commonly performed as a precursor to editing/overriding a Template within a Template Drop section. See 9E.6 Edit (Override) Template Drop.

**Prepared** – Left-Click on the Template Drop section to be copied and summon the Pop-Up Icon Menu. Left-Click on the Copy Template Drop tool.

**Alternatively** – Left-Click on the Copy Template Drop tool in the Ribbon
Ribbon Location: OpenRoads Modeling workflow → Corridor tab → Create panel.

Prompt: Start Station <Alt> Lock To Start – Key-in the desired starting station for the new Template Drop section and press the Enter key to lock it. Left-Click in the View to accept.

**Alternatively** – Graphically select the Start Station by placing the mouse cursor in the desired location and then Left-Clicking. When doing so, ensure that the Start Station is not LOCKED in the Dialogue Box.

Prompt: End Station <Alt> Lock To End - Key-in the desired end station for the new Template Drop section and press the Enter key to lock it. Left-Click in the View to accept.

**Alternatively** – Graphically select the End Station.
9E.6  Edit (Override) Template Drop tool

The Edit Template Drop tool is used to make override edits to a Template contained in a specific Template Drop Section. The original Template found in the Project Template Library is NOT affected when this tool is used. Similarly, the overridden Template will not be automatically included into the Project Template Library.

**WARNING:** The Edit Template Drop tool should be used sparingly. See 9E.6.a Overriding Template Drop Sections WARNING and BEST PRACTICE. This tool is great for quickly testing or experiment with a new Template configuration. If the overridden Template experiment is successful, then the User should incorporate the overridden Template into the Template Library. See 9E.8 Synchronize with Library tool. If the overridden Template experiment is unsuccessful, the User can return to the original Template configuration by resyncing with the Library. See 8B.7 Transfer Templates between Project Template Libraries.

**BEST PRACTICE:** Instead of overriding a Template, make edits/adjustments to a Template in the Project Template Library (in the Template Editor). Next, use the Synchronize with Library tool to sync the Template in the Template Drop section with the Template in the Project Template Library.

**BEST PRACTICE:** Instead of overriding a Template, use Corridor Objects, such as Point Controls, Parametric Constraints, or End Condition Exceptions to accommodate minor deviations from the Template.
9E.6.a Overriding Template Drop Sections WARNING and BEST PRACTICE

**WARNING:** The *Edit Template Drop* tool should be used sparingly because an overridden Template Drop section is NOT readily identifiable. The overridden Template retains the EXACT same Name as the original, unaltered version found in the Template Project Library or in other sections of the Corridor.

This is problematic because the User has to remember which Template Drop Sections have been overridden when viewing the Template Drop. Similarly, a different User working on the Corridor could only identify the overridden Template Drop section by inspecting Points and Components in the Editor.

**BEST PRACTICE:** If a Template is overridden, transfer it into the Project Template Library with the *Template Library Organizer* tool. See [8B.7 Transfer Templates between Project Template Libraries](#).

Once the overridden Template is transferred into the Project Template Library, rename the overridden Template appropriately.

For the overridden Template Drop Section, change the Template to the corresponding overridden Template in the Project Template Library.
9E.7 Switch the Template for a Template Drop Section

The Template for a Template Drop Section can be switched in the Template Drop sub-menu (in the Corridor Objects Menu) or in the Properties Box when a Template Drop Section is selected.

1. Open the Properties Box
   Select the Template Drop Section that will be switched

2. Press the Switch Template Button

3. Select the desired Template to be switched to

4. Press OK to complete the switch
9E.8 Synchronize with Library tool

If a Template used in a Corridor is edited in the Project Template Library, the corresponding Template in the Template Drop section will NOT automatically update to reflect the edits. The Synchronize with Library tool is necessary to sync the Template Drop Section with the Project Template Library.

**TIP:** Every Template Drop used in the Corridor will be synchronized if the tool is accessed through the Ribbon. See the orange step markers in the graphic below.

**TIP:** In the Corridor Objects Menu, the User can determine if Templates out of sync with the currently loaded Template Library. See the next page.

Access the Synchronize with Library tool through the Pop-Up Icon Menu

1. Select the Template Drop Section to synchronize and summon the Pop-Up Icon Menu.
2. Select the Synchronize with Library tool.

Synchronize Every Template in the Library:

1. Select the Synchronize with Library tool from the Ribbon.
   Ribbon Location: OpenRoads Modeling workflow → Corridor tab → Miscellaneous panel.
2. Prompt: Locate Template Drop or Corridor – Left-Click on the Template Drop Section to synchronize.
3. Alternatively – Left-Click on the Corridor Handle to synchronize all Template Drop sections in the Corridor.
9E.8.a  Template Synchronization in the Corridor Objects Menu

From the Corridor Objects Menu, the User can determine which Corridor Templates are synchronized with the Project Template Library.

The Template Name listed in the Template Drop Sub-Menu (found in the Corridor Objects Menu) is color-coded to inform the User which Templates are synchronized with the currently loaded Template Library. To open and load a Project Template Library, see 8A.1 Accessing the Template Editor and Template Libraries.

**Black Template Name Text:** The Corridor Template is synchronized with the corresponding Template found in the Template Library. In other words, the Template in the Corridor is EXACTLY the same as the Template (containing the same Name) found in the loaded Template Library.

**Red Template Name Text:** The Corridor Template is NOT synchronized with the corresponding Template found in the Template Library. Although the Corridor Template and Template in the Library have the same name, the configuration of Template Points and Components do NOT match up. Red Template Name Text can typically be attributed to an overridden Corridor Template (resulting the Edit Template Drop tool – see 9E.6) or when the Project Template Library has not been loaded in the current ORD session.

**Blue Template Name Text:** Blue Template Name text can signify two different scenarios. The first scenario is when a Corridor Template does NOT exist within the currently loaded Template Library. In the loaded Template Library, there is no Template that contains the same name as the Corridor Template. This often occurs when the Project Template Library has not been loaded in the current ORD session. The second scenario is when a single cross-section has been edited in the Dynamic Cross Section Viewer with the Edit Station tool (see 9E.5). Single Station Template Overrides will always be shown with a Blue Template Name.

Although these Template Drops have the same Template Names, the Template Drop shown in Red is not synchronized with the currently loaded Template Library. The Template Drop with red text has been overridden with the Edit Template Drop tool.

This Template Drop originates from a Template Library that is different than the one currently loaded. Load the original Template Library and the text will change to black.

This Template Drop represents a Single Station Template Override.

This Template Drop is different than the Template found in the Library (unsynchronized).
Create a Transition Section between Template Drop Sections

Transition Sections are used between two Template Drop Sections that are relatively similar - in terms of Template Point and Component configurations and naming. For example, it would be inappropriate to use a Transition Section if the surfacing material changes from asphalt to gravel between two Template Drop sections.

NOTE: It is NOT required to have a Transition Section between Template Drop Sections. It can be advantageous to have Template Drop Sections abut directly against each other – with Corridor Object such as Point Controls – to accommodate transitional features.

Transition Sections work well in the following situations:
- Change (taper) in road width between Templates.
- Transition between Templates with different shoulder configurations
- Transition from a typical Template into a Template with Sub-excavation components

In this workflow, a Transition Section is created between a “Typical Project Template” and a Sub-Excavation Template. The Sub-Excavation Template contains a narrower road width and an additional sub-excavation component. The Transition Section will taper the road width and transition the sub-excavation component from zero depth to full sub-excavation depth.
Ensure the two Templates are configured as desired. Also, ensure that the Template Drop Section stations are set as desired.

Select the Create Transition tool from the Ribbon.

Prompt: Locate First Template Drop – select the Template Drop Section that is down station.

Prompt: Locate Second Template Drop – select the Template Drop Section that is up station.

After Step 3, the Transition Section has been created. However, the transition is not displayed correctly – as seen with the abrupt change in road width. The Edit Transition tool is used to define how Template Points will behave in the Transition.

Select the Edit Transition tool from the Ribbon and Left-Click on the Transition Section.

Ribbon Location: OpenRoads Modeling workflow → Corridor tab → Create panel.

The Edit Transition tool will bring up the Edit Transition screen.

**NOTICE:** Abrupt change in Road Width. Transition has to be calibrated with the Edit Transition tool.
In the **Edit Transition Screen**, draw a Transition Line for each Template Point at the bottom of the Sub-Excavation Component. The Transition line need to go from the bottom Sub-Excavation Points (Sub-Excavation Template) to the bottom of aggregate Points (Typical Project Template). Create six new Transition Lines in total.

If all Transition Lines appear in order, select OK.
In the **Edit Transition Midpoint Screen**, delete both constraints from the template points shown.

**IMPORTANT:** The template points that are transitioning/moving need to be UNCONSTRAINED. In this case, the bottom sub-exavation points and edge of pavement points are transitioning.

If all constraints appear in order, select OK.

**Tip:** Use the transition slider to preview the transition section behavior.

**Resulting Transition Section**
The *Dynamic Cross Section Viewer* is used to view the cross sections of a Corridor.

### 9F.1 Accessing the Dynamic Cross Section Viewer

There are two ways to access the *Dynamic Cross Section Viewer* for a Corridor.

Access the Dynamic Cross Section Viewer through the Pop-Up Icon Menu

1. Select the Corridor Handle to summon the Pop-Up Icon Menu. Select the *Open Cross Section Model* icon.

2. Open an additional *View* window. This *View* window will show the Corridor Cross Sections.

3. Left-Click in the newly opened *View* window.

Access the Dynamic Cross Section Viewer through the Ribbon

1. In the Ribbon, Left-Click on the *Open Cross Section View* tool.

   **Ribbon Location:** *OpenRoads Modeling* workflow → *Corridor* tab → *Review* panel.

2. **Prompt:** *Locate Corridor or Alignment* – Left-Click on the Corridor Handle that belongs to the desired Corridor.

3. Open an additional *View* window. This *View* window will show the Corridor Cross Sections.

4. Left-Click in the newly opened *View* window.
9F.2 Dynamic Cross Section Viewer Basics

When reviewing Corridor Cross Sections in the Dynamic Cross Section Viewer, it is advised to also have open a View showing the 2D Design Model.

The two Views can be automatically arranged in the screen using the Tile tool.

Ribbon Location: OpenRoads Modeling workflow → View tab → Window panel.

TIP: Use the Tile tool to automatically arrange both Views in the screen.

Cross Sections Stations that will be displayed are based on the Template Drop Interval and the Corridor Feature Definition.

Corridor Feature Definition Settings that affect Cross Sections:
- Template Drop Interval Multiplier
- Horizontal/Vertical Points
- Densify Horizontal
- Densify Vertical
9F.3 Dynamic Cross Section Viewer Overview

1. **Go to First/Last Cross Section**
   - The buttons will go to the first or last cross section station in the Corridor.

2. **Go to Preceding/Next Cross Section**
   - The buttons will go to the preceding or next cross section station.

3. **Dynamic Cross Section Properties**
   - Press the button to reveal the Dynamic Cross Section Properties.

4. **Zoom Options**
   - **Fit Section**
     - The zoom is automatically adjusted to fit the entire Corridor Cross Section in the View.
   - **Center Backbone**
     - The zoom is automatically adjusted according to the Backbone Screen Width.
   - **Center on Current Offset**
     - When changing between Cross Section stations, the zoom is NOT automatically adjusted.

5. **Backbone Screen Width**
   - Works in conjunction with the Center Backbone Zoom Option. The Backbone refers to the width of the corridor cross section. For example, if the value is 0.8, then 80% of the View width will be occupied by the corridor cross section.

6. **Vertical Exaggeration**
   - The vertical axis of the cross-section grid is exaggerated by typing in the desired factor. Alternatively, the exaggeration can be changed by holding down the CTRL key and scrolling with the Mouse Wheel.

7. **Display Null Points**
   - If ENABLED, Null Points will be shown with a red cross.
9F.4 Graphically Go to a Cross Section with Locate Station Via Datapoint

The Locate Station Via Datapoint tool is used to graphically select a cross section station by clicking in the 2D Design Model or Profile Model of the Corridor Alignment. Before performing this workflow, open a View for the Dynamic Cross Section Viewer and a View for either the 2D Design Model or Profile Model.

**Prompt:** Select Plan or Profile View – Left-Click in the 2D Design Model or Profile Model of the Corridor Alignment. In this example, a View showing Corridor within the 2D Design Model is used.

Select the Station Graphically – Left-Click at anywhere in the 2D Design Model View to display the cross section at that point.

Select the Station Numerically - Type in the desired cross section station and press the Enter Key. Left-Click anywhere in the 2D Design Model View to complete the command.

**WARNING:** If the cross section station selected does NOT coincide with a Template Drop, then the cross section graphic shown is interpolated between the two adjacent Template Drops. When a cross section is interpolated, the End Condition points will NOT be shown as intercepting the Existing Ground.

1. Right-Click anywhere within the Dynamic Cross Section Viewer and select the Locate Station Via Datapoint tool.
2. Select Plan or Profile View – Left-Click in the 2D Design Model or Profile Model of the Corridor Alignment. In this example, a View showing Corridor within the 2D Design Model is used.
3. Select the Station Graphically – Left-Click at anywhere in the 2D Design Model View to display the cross section at that point.

Select the Station Numerically - Type in the desired cross section station and press the Enter Key. Left-Click anywhere in the 2D Design Model View to complete the command.
9F.5 Single Station Template Override (Edit Station tool)

The *Edit Station* tool is used to manually override a single cross section station. This tool can be used to override a single cross section station in order to manually rectify a sliver fill that overshoots the road embankment.

**WARNING:** When the *Edit Station* tool is used on a cross section – that cross section will become STATIC. The Cross Section will remain in the overridden position even when changes to the Alignment, Profile, or Template are made. This tool should only be used in the later stages of design – when it’s certain that the Alignment, Profile, and Template will NOT be altered.

**BEST PRACTICE:** When possible, use *Corridor Objects* - such as *Parametric Constraints* or *End Condition Exceptions* – to make slight override edits to an individual cross section or range. Using Corridor Objects will still allow cross sections to react to changes to the Alignment, Profile, and/or Template.

**TIP:** Cross Sections that have been overridden with the *Edit Station* tool will be marked with a *Corridor Object Graphic* in the shape of a white line. Similarly, the overridden cross sections can be identified in the Template Drop Sub-Menu. See *9E.1 Template Drop Sub-Menu Overview*.
Edit Station Menu

3. Right-Click on the Fill Slope Catch Point
   Select Move Point

4. Place the Fill Slope Catch Point at the desired location along the Existing Ground
   Left-Click to accept the location

WARNING: In the Edit Station Menu, End Condition Points will be UNCONSTRAINED and do NOT attempt to intercept the Existing Ground terrain model after edits are made. End Condition Points have to be manually moved into the desired position along the Existing Ground. Then, constraints can be assigned to the Point.

6. Left-Click on the desired Parent Point
   Select OK

5. Right-Click on the Fill Slope Catch Point in the new location
   Add Constraint > Full Constraint

7. When edits are finished, select OK to reprocess the cross section
9F.6 Horizontal and Vertical Dimensions

In the Dynamic Cross Section Viewer, the User can place temporary dimensions for informational purposes only. These temporary dimensions are only displayed in the Dynamic Cross Section Viewer – and are NOT displayed in Cross Section Sheet Production. Cross Section Sheets are labeled with Cross Section Model Annotations. See Chapter 16 - Cross Section Production.

Horizontal and Vertical Dimensions will provide distance and slope information between two Template Points in a cross section. These temporary dimensions will adjust in values when scrolling through Cross Section stations.

**NOTE:** Horizontal and Vertical temporary dimensions can only be placed on the Corridor shown in the currently active ORD File. Corridors shown from referenced files cannot be dimensioned.

**Horizontal Dimensions** – provide the *horizontal distance* (as measured along the x-axis of the Dynamic Cross Section Viewer grid) and *slope* information between two Template Points.

**Vertical Dimensions** – provide the *vertical distance* (as measured along the y-axis of the Dynamic Cross Section Viewer grid) between two Template Points.

Temporary Dimensions are useful to monitor Template Point values that change when scrolling through cross sections. Template Point values that are subject to change include: pavement slope due to superelevation, pavement widths due to curve widening, and cut/fill heights and widths.

**Placing Horizontal and Vertical Dimensions:**

Right-Click in the Dynamic Cross Section Viewer
Select Place Horizontal Temporary Dimension or Place Vertical Temporary Dimension
Prompt: **Start Point** – Left-Click near the first Template Point to define the dimension.

**WARNING:** Ensure that the intended Template Point is selected. It is a common mistake to inadvertently select a Template Point directly beneath the intended Point.

Prompt: **End Point** - Left-Click on the second Template Point to define the dimension.

Prompt: **Dimension Height** – Left-Click at the desired text placement location for the dimension.

**NOTICE:** Dimension values have changed from previous cross section (19+50.00)

Change in Fill Height and Width

Remove all Temporary Dimensions will clear the screen of all dimensions

Superelevation Slope change

Curve Widening Width change
Corridor Objects are used to manipulate the Corridor in situations where the Template must deviate from the geometry set in the Template. There are nine types of Corridor Objects which correspond to the nine Sub-Menus found within the Corridor Objects Menu. When a Corridor Object is created, it will be listed in the corresponding Sub-Menu within the Corridor Objects Menu. Corridor Objects can be created, edited, and deleted from the Corridor Objects Menu.

When a Corridor Object is created, a corresponding Corridor Object graphic is also created in the 2D Design Model 📖. The Corridor Object graphic signifies the station range and location to which the Corridor Object is applied. The Corridor Object graphic is also interactive – meaning it can be selected and manipulated through grip-edits or Property box edits. The exceptions are Parametric Constraints, External Reference, and Clipping References – which do NOT generate Corridor Object graphics – but can be edited through the Corridor Objects Menu.
Corridor tools – such as Point Control and Add Corridor Reference – require the User to manually create ORD Elements that will interact with the Corridor. ORD Elements created by the User must NOT contain Civil Rule Dependencies to any Template Point lines generated from the Corridor. See 7B.3.b Civil Rules Example – Civil Rule Dependencies. Similarly, ORD Elements that will interact with the Corridor must NOT be Persist Snapped to the any Template Point lines. See 7B.2 Persist Snaps.

For example, when creating ORD Elements for a turnout, it may be tempting to use the Offset and Tapers tools in conjunction with the proposed Edge of Road Template Point (generated by the corridor). The resulting ORD Elements should NOT be used by the Corridor as Point Controls or Added as a Corridor Reference – because such a configuration would be considered a circular reference.

**ORD Element created from Single Offset Partial tool referencing a Corridor Template Point Line**

This ORD Element Depends On the Corridor Template Point Line. Therefore, the ORD Element can NOT be used as Point Control or Added as a Corridor Reference.

**ORD Element to be drawn to the Corridor Template Point Line using the Near Snap with Persist Snaps enabled.**

This ORD Element can NOT be used as a Point Control or Added as a Corridor Reference because such a configuration would result in a Circular Reference.
9G.1.a Circular Reference Tips and Workarounds

**TIP 1:** Disable Persist Snaps when creating ORD Elements for use with Point Control or Add Corridor Reference tools. See 7B.2.a Persist Snap Creation.

**TIP 2:** Use the Corridor Alignment in conjunction with the Offset and Tapers tools to create ORD Elements for Corridor interaction. ORD Elements that depend on the Corridor Alignment will not be considered Circular References by the Corridor.

**TIP 3:** Sometimes it is absolutely necessary to create ORD Elements that initially depend on a Corridor Template Point line. An example would be using a Corridor Template Point line to create a circular fillet with the Arc Between Element – Simple Arc tool. Use the Remove Rule tool to strip the ORD Element of Dependencies BEFORE use with Point Control or Add Corridor Reference tools. See 7B.3.c.i Removing Civil Rules.
9G.2 Secondary Alignments

By default, Template Drops are processed *perpendicular* to the Alignment. A *Secondary Alignment* is used to skew the processing direction of the Template drop. If a Secondary Alignment is used, then the Template Drop processing will be perpendicular to the Secondary Alignment – as opposed to the main Alignment.

For example, it is common that the Edge of Road tapers and is not parallel to the main Alignment. By default, the Embankment Slope is calculated perpendicular to the alignment. This can be problematic because, in roadway construction, it is desirable to measure and construct Embankment Slopes relative to the Edge of Road.

The *Point Control* tool has optional *Secondary Alignment* functionality built in. The *Secondary Alignment* tool is used with other tools that have the capability of skewing a Template Point Line relative to the Alignment. These tools include: Horizontal Feature Constraints, Parametric Constraints, and Template Transitions.
9G.2.a Secondary Alignment - Workflow

In this workflow, a single Template (using Horizontal Feature Constraints and Display Rules) is used to model both the highway and the off-ramp.

The Off-Ramp Alignment (drawn by the User) represents the inside Edge of Pavement. It is intended for the Outside Edge of Pavement to be set at a 2% slope relative to the Off-Ramp Alignment. By default, the 2% slope is processed perpendicularly to the Highway Alignment. The Off-Ramp Alignment must be added to the Corridor as a Secondary Alignment in order to process the 2% slope in the intended direction - which is radially from the Off-Ramp Alignment.
Select the Corridor Handle to summon the Pop-Up Icon Menu. Select the *Create End Condition Exception* icon.

2 Prompt: *Locate Secondary Alignment* - Left-Click on the ORD Element to be used as the Secondary Alignment. In this case, the Off-Ramp Alignment is selected.

Prompt: *Start Station* <Alt> *To Start* – Key-In the desired Start Station for the Secondary Alignment and press the ENTER key to lock. Left-Click in the *View* to advance to the next prompt.

In this case, the Off-Ramp Alignment begins at exactly 15+00.00 (relative to the Highway Alignment).

Prompt: *End Station* <Alt> *To End* - Key-In the desired End Station for the Secondary Alignment and press the ENTER key to lock. Left-Click in the *View* to advance to the next prompt.

In this case, the ALT key was pressed to Lock to the mainline End Station.

Prompt: *Start Offset* = 0.0000.

The *Start* and *End Offset* are used to horizontally offset where the Secondary Alignment processing directions starts and end. In this case, a value of 0.0000 is used for both Start and End Offset because the intent is to change the processing direction exactly at the Off-Ramp Alignment.

Prompt: *End Offset* = 0.0000.

---

**NOTE:** Secondary Alignments do not produce a *Corridor Object Graphic*. Secondary Alignments are edit/deleted from the *Secondary Alignment Sub-Menu* (found in the Corridor Objects Menu).
9G.3 Key Station

A Key Station is a User-specified location for the Corridor to process a Template Drop. This tool allows the User to better define and densify the Corridor model in specific areas – which can be usefully when the Template Drop Interval is spaced at large increments.

As shown below, it is possible for the Corridor to skip over areas of importance that do not align with the set Template Drop Interval. This often happens in the vicinity of culvert/stream crossings. Key Stations are added around the culvert to provide a denser model in this area. As shown below, Key Stations help to refine the model to more accurately portray the Fill Line in the culvert area.

**Fill Line** is poorly modeled because the Corridor does NOT apply a **Template Drop** in the area of the Culvert

**Template Drops** spaced at 50' - as set by **INTERVAL**

**KEY STATIONS** added. As a result, the **Fill Line** is more defined in the area of the Culvert

**Key Station** Corridor Object Graphics
9G.3.a  Key Station - Workflow

This workflow demonstrates how to place a Key Station.

1. Select the Corridor Handle to summon the Pop-Up Icon Menu. Select the Key Station icon.

2. Prompt: Station - Key-In the desired Station for the Key Station and press the ENTER key to lock. Left-Click in the View to place the Key Station.

Alternatively, ensure the Station value is unlocked. Left-Click in the desired location for the Key Station.
9G.4 Parametric Constraints

A Parametric Constraint is used to override a default *Constraint Value* belonging to a Template Point. *Constraint Types* and *Constraint Values* are found in the *Template Point Properties* and they determine the position of a Template Point line. See 8C.6.a Constraint Types.

The Parametric Constraints tool works by referencing a *Constraint Label*. Each *Constraint Type* and *Value* can be assigned a label. Most pre-made FLH Templates will already have *Labels* created – however, the User can also create new *Labels* or edit pre-made *Labels*. See 8C.6.a.xiii Label for the creation and manipulation of Constraint Labels.

In the graphic shown below, the right-side pavement width is overridden from 10’ to 15’ from 14+00 to 15+00.

In the demonstration shown above, the pavement width changes abruptly from 10’ to 15. It would be practical to create two additional Parametric Constraints to model the back and ahead tapers. Tapering sections are created by varying the Parametric Constraint *Start* and *Stop Values*. 
9G.4.a  Parametric Constraint - Workflow

In this workflow, a sliver fill is eliminated by slightly steeping the right Shoulder Foreslope over a short range. To accomplish this, a Parametric Constraint is applied to the Right Hinge Point from 11+00 to 11+50. The Slope Constraint Value for the Right Hinge Point will be changed from 25% to 30% over this range.
Create the Constraint Label in the Template Editor:

For more information on Constraint Labels, see 8C.6.a.xiii Label.
Use the Parametric Constraint tool to Override the Constraint Value:

5. Select the Corridor Handle to summon the Pop-Up Icon Menu. Select the Create Parametric Constraint icon.

Prompt: Start Station = 11+00.00
Prompt: End Station = 11+50.00

6. Key-in the desired Start and End Station (press the ENTER key to Lock) to set the override range for the Parametric Constraint. Left-Click in the View to advance to the next Prompt.

Prompt: Constraint Label

7. In the Dialogue Box, expand the Constraint Label drop-down and select the appropriate Label. This is the SAME Label created in STEP 3. In this case, the Constraint Label is “Shdr Slope_R”. When the appropriate Label is displayed, Left-Click in the View to advance to the next Prompt.

Prompt: Start Value = 30%.

8. The Start Value sets the Constraint Value at the Start Station of the Parametric Constraint. Key-in the desired value and press the ENTER key to Lock. In this case 30% is used to override the default value of 25%.

Prompt: Stop Value = 30%.

9. The Stop Value sets the Constraint Value at the End Station of the Parametric Constraint. In this case 30% is used to override the default value of 25%.
NOTE: The Parametric Constraint tool does not produce a Corridor Object Graphic in the 2D Design Model.

RESULTS

Sliver Fill eliminated in Parametric Constraint range

Parametric Constraints are shown in the Dynamic Cross Section Viewer with a Green Box

Parametric Constraints are listed in the Corridor Objects Menu. Delete and Edit Parametric Constraints in the sub-menu
9G.5 Point Control

Point Controls are used to manipulate the horizontal and/or vertical position of a Template Point line to match the position of a User-created ORD Element and/or Profile. In this sub-section, Point Control Geometry refers to the User-created ORD Elements to be used as Point Controls for the Corridor. The graphic below shows a simple application of a Horizontal Point Control – to accommodate a deviation in road width.

**NOTE:** Point Controls are only compatible with ORD Elements that contain a Feature Definition and Name. Point Controls are not initially compatible with MicroStation Elements – such as SmartLines – because they do not contain Feature Definitions and Names. However, the User can create Point Control geometry with MicroStation Elements and then assign the MicroStation Elements a Feature Definition and Name by using the Complex By Element tool or Set Feature Definition tool.

**WARNING:** When creating Point Control Geometry, do NOT create ORD Elements that will result in a Circular Reference. See 9G.1 WARNING – Creating Circular References (Recursive Solutions).
9G.5.a Point Control - Modes

There are three types of Point Controls that are available in Corridor modeling: **Horizontal**, **Vertical**, and **Both**. All three types require the User to create Horizontal ORD Elements. However, the **Vertical** and **Both** modes require the Horizontal ORD Elements to contain a Profile. The User can create a Profile using Vertical ORD Elements – OR – use a Profile from a Terrain Model – such as the Existing Ground.

**Horizontal Mode** – The Template Point will extend or contract as necessary to match the horizontal position of the Point Control ORD Element. The Template Point will continue to honor its slope vector when extending or contracting from its default position. The Corridor Object Graphic for Horizontal Point Controls is identified with a perpendicular tick mark:

**Vertical Mode** – The Template Point will extend or contract as necessary to match the vertical position of the Profile within the Point Control ORD Element. The Template Point will continue to honor its slope vector when extending or contracting from its default position. The Corridor Object Graphic for Horizontal Point Controls is identified with a diagonal tick mark:

**Both Mode** – The Template Point will match both the horizontal and vertical position of the Point Control ORD Element. The Template Point will move in any direction necessary and NOT honor the slope vector. The Corridor Object Graphic for Horizontal Point Controls is identified with a bow-tie shaped tick mark:

A common application of Point Control is to manipulate the Flow Line of a Ditch – as represent below by the Ditch Bottom Point – with Point Control Geometry. The graphic below shows how the different **Modes** of would hypothetically affect the location of the Ditch Bottom Point when subjected to Point Control.
9G.5.b Point Control – Control Types

The Control Types determine how Point Control Geometry is selected.

**IMPORTANT:** For the Feature Definition and Corridor Feature Control Types, all Point Control Geometry elements must be added to the corridor as a reference using the Add Corridor Reference tool. See 9G.9 Corridor References.

Using different Control Types will present the User with different Dialogue Options.

**Linear Geometry** – The User must manually create a single Point Control Geometry element. The Point Control element is then manually selected by the User in Point Control creation.

The Dialogue Options available for the Linear Geometry Control Type are discussed in the following workflows: 9G.5.C and 9G.5.d.

**Feature Definition** – This Control Type is used to automatically select multiple Point Control Geometry elements that are placed on a common Feature Definition.

**Example Use:** The User creates multiple Point Control Geometry elements to represent road widening segments at different locations along the corridor. A single usage of the Point Control tool can then be used to incorporate the multiple road widening segments into the Corridor Model.

<table>
<thead>
<tr>
<th>Feature Definition – Dialogue Options</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Option</strong></td>
</tr>
<tr>
<td>Feature Definition</td>
</tr>
<tr>
<td>Range</td>
</tr>
</tbody>
</table>

**Corridor Feature** – This Control Type is used to locate Point Control geometry from a DIFFERENT CORRIDOR. For this Control Type, a Template Point line from a different Corridor are used as the Point Control Geometry.

**Example Use:** If two Corridors are generally running in parallel – a Corridor representing the Road and the other representing a Trail - then the Corridor Feature type can be used for interaction between the Corridors. For example, if the Road Corridor already has an established Ditch Bottom Template Point line, then the Trail Corridor can use the Template Point line as a Point Control geometry element.

<table>
<thead>
<tr>
<th>Corridor Feature Definition – Dialogue Options</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Option</strong></td>
</tr>
<tr>
<td>Corridor</td>
</tr>
<tr>
<td>Reference Feature</td>
</tr>
</tbody>
</table>
In this workflow, a road turnout is created using Horizontal Point Control.

**Create the Point Control Geometry:** Using the *Single Offset Partial* tool, create the back edge of the turnout.

The CORRIDOR ALIGNMENT is offset -32.0000 from 10+50 to 12+50.

**WARNING:** When creating Point Control geometry, do NOT create ORD Elements that will result in a Circular Reference. See *9G.1 WARNING – Creating Circular References (Recursive Solution)*.

**BEST PRACTICE:** Place Point Control Geometry on a different Feature Definition than the Template Point Line. This makes the Point Control Geometry and Template Pont Line easily distinguishable because they are placed on different Levels with different Symbology properties. When the Point Control process is completed, the Point Control Geometry and Template Pont Line will be overlapping – so it is difficult to distinguish the lines if they contain the same Feature Definition.
Create the Point Control geometry: Using the Variable Offset Partial tool, create the back and ahead tapers for the turnout.

Ahead Taper: The CORRIDOR ALIGNMENT is offset -12.0000 from 10+00 and -32.000 from 10+50.

Back Taper: The CORRIDOR ALIGNMENT is offset -32.0000 from 12+50 and -12.000 from 13+00.

Create the Point Control Geometry: For demonstration purposes, the Simple Arc tool is used to create Circular Fillets (with 100.0000 radii) between the tapers and the Template Point Line (Edge of Road). If left as is, the Circular Fillets would result in a Circular Reference because they Depend On the Template Point Line. The Dependency is removed in the next step.

Do NOT Trim/Extend the Template Point Line. Use the Back option and choose the Taper lines first.
Create the Point Control Geometry: Use the Remove Rules tool to remove the Dependencies from the Circular Fillets.

Create the Point Control Geometry: After the Remove Rules tools is used, the trimmed portions of the tapers reappear. Use Grip-Edits to manually re-position the Taper on the end point of the Circular Fillet.

Explanation: The Remove Rules tool removes the all Civil Rules for Circular Fillet - including the Fillet Rule that controls the trimming of the Taper Interval. See 7B.3 Civil Rules and 7B.1 Base ORD Elements and Intervals.
Create the Point Control Geometry: Using the Complex By Element tool, combine all elements created thus far into a single Point Control alignment.

**BEST PRACTICE:** Give the Point Control alignment an identifiable Name. This will help to organize Point Control entities within the Point Control Sub-Menu (found in the Corridor Objects Menu).

**Point Control Creation:** Select the Corridor Handle and summon the Pop-Up Icon Menu. Select the Create Point Control tool.
**Prompt**: Start Station = 9+75.00  
**Prompt**: End Station = 13+25.00  

Key-in the *desired* Start and End Station (press the Enter key to Lock) for the Point Control or graphically select the Start and End locations. Left-Click to accept the location and advance to the next prompt.

**TIP**: It is not necessary for the Start and End Station to exactly match the Start and End of the Point Control Geometry element. If the Start and End station overshoots the Point Control Geometry element, the Template Point line will remain in its default position in the overshot segments. In this example, the Start and End Station is intentionally overshot to ensure the entire Point Control Geometry element is completely encompassed in the Point Control range.

**Prompt**: Control Description – If desired, give the Point Control a description. The description will be viewable in the Point Control Sub-Menu within the Corridor Objects Menu.

**Prompt**: Locate Point – Graphically select the Corridor Template Point line to be manipulated OR select the Template Point by Name from the Point drop-down in the Dialogue Box.

In this case, the *Pavt_ETW_LayerTop_L* is the desired Template Point.
**Prompt: Mode** – Use the UP and DOWN arrow keys to select the desired Point Control Mode. See [9G.5.a Point Control - Modes](#). Left-Click in the View to advance to the next prompt.

In this case, the **Horizontal** Mode is used.

**Prompt: Control Type** – Use the UP and DOWN arrow keys to select the desired Control Type. See [9G.5.b Point Control - Control Types](#). Left-Click in the View to advance to the next prompt.

In this case, the **Linear Geometry** Control Type is used.

**Prompt: Locate Plan or Profile Element** – Graphically select the Point Control Geometry element OR select the Point Control Geometry element by Name from the Plan Element drop-down in the Dialogue Box.

In this case the “Turnout Alignment” is selected.

**Prompt: Use as Secondary Alignment** – Use the UP and DOWN arrow keys to select either YES or NO. If YES is selected, the Point Control Geometry element is used as a **Secondary Alignment**. See [9G.2 Secondary Alignments](#) for the definition of a Secondary Alignment. Left-Click in the View to advance to the next prompt.

**Prompt: Priority** – The Priority is used when a Template Point is assigned multiple Point Control Geometry elements that overlap for a station range. The Point Control Geometry element with the numerically lower Priority value will be targeted first.

The default Priority value of 1 is used. In this case, the Priority value is inconsequential since there will not be overlapping Point Control Geometry elements.

**Prompt: Horizontal Offset Start = 0.0000.**  
**Prompt: Horizontal Offset End = 0.0000.**

If this value is NOT 0.0000, then Template Point line will be Horizontally Offsets from the Point Control Geometry element by the specified value. In this case, a value of 0.0000 is used for both Start and End Horizontal Offset because the intent is to place the Template Point line in the same horizontal position as the Point Control Geometry element.

![Corridor Template Point Line now matches the position of the Point Control Geometry](image)

The **Point Control Geometry** does NOT get deleted in this process. It can still be selected and edited. If the **Point Control Geometry** is edited, the **Corridor Template Point Line** will react to the edits.

**Horizontal Point Control Corridor Object Graphic**
9G.5.d VERTICAL and BOTH Point Control Workflow – Ditch

In this workflow, the Landscape Island located directly adjacent to the road will be re-graded to drain to the center of the island (Proposed Low Point). Two instances of the Point Control tool will be used to manipulate the Ditch Point and the Daylight Point.

POINT CONTROL 1 (Vertical): The Ditch Point (Template Point Line) will extend along the Ditch Foreslope Vector to intercept the elevation of the Ditch Profile (Point Control Geometry). VERTICAL Point Control will be used to maintain the default Ditch Foreslope of 1V:4H (25%).

POINT CONTROL 2 (Both): The Daylight Point (Template Point Line) will intercept the Horizontal and Vertical position of the existing Back Edge Island (Point Control Geometry). BOTH Point Control will be used – which means the default Ditch Backslope Vector will be varied as necessary to intercept the Back Edge Island horizontal and vertical position.

NOTE: In default FLH Templates, the Ditch Point is typical set to the XS_TL_Slopes Feature Definition. This Feature Definition is not pre-configured to Create Template Geometry in the 2D Design Model. The Ditch Point Template Line is viewed and selected via the 3D Model.
Create the Point Control Geometry for the Ditch Alignment and Profile Elements:

**Use Horizontal ORD Elements to create the Ditch Alignment:**

Since a **Vertical Point Control** will be used, the horizontal position of the **Ditch Alignment** is not of critical importance. The ends of the Alignment are placed at the intersection of the Daylight Point Line and Island perimeter line. A PI (vertex) is placed at the desired location of the Proposed Low Point. By doing so, a reference line will be provided in the Profile grid.

**Use Vertical ORD Elements to create the Ditch Profile:**

The Ditch Profile ties into the existing ground at either end, with a VPI (vertex) placed at the desired Proposed Low Point elevation. **Activate** the Ditch Profile before moving on to the next step.

**TIP:** To help in determining the proper horizontal and vertical locations for Ditch Alignments and Profiles, the **Dynamic Cross Section Viewer** can be conveniently related to **2D Design Model** using Horizontal ORD Lines (Line Between Points tool).

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Use Horizontal ORD Elements to create the Ditch Alignment: Since a <strong>Vertical Point Control</strong> will be used, the horizontal position of the <strong>Ditch Alignment</strong> is not of critical importance. The ends of the Alignment are placed at the intersection of the Daylight Point Line and Island perimeter line. A PI (vertex) is placed at the desired location of the Proposed Low Point. By doing so, a reference line will be provided in the Profile grid.</td>
</tr>
<tr>
<td>2</td>
<td>Use Vertical ORD Elements to create the Ditch Profile: The Ditch Profile ties into the existing ground at either end, with a VPI (vertex) placed at the desired Proposed Low Point elevation. <strong>Activate</strong> the Ditch Profile before moving on to the next step.</td>
</tr>
</tbody>
</table>
Create the VERTICAL Point Control for the Ditch Point:

1. **Control Description**:
   - Island Ditch

2. **Control Type**:
   - Linear Geometry

3. **Priority**:
   - Priority: 1

4. **Start Station**:
   - 11+20.00

5. **End Station**:
   - 13+40.00

6. **Mode**:
   - Vertical

7. **Ditch Front L**
   - Corridor Template Point Line

8. **Ditch Profile**
   - Point Control Geometry

9. **Vertical Offsets**:
   - Start: 0.0000
   - Stop: 0.0000
**Point Control Creation:** Select the Corridor Handle and summon the Pop-Up Icon Menu.

Select the **Create Point Control** tool.

**Prompt:** **Start Station** = 11+20.00  
**Prompt:** **End Station** = 13+40.00

Key-in the *desired* Start and End Station (press the Enter key to Lock) for the Point Control or graphically select the Start and End locations. Left-Click to accept the location and advance to the next prompt.

**TIP:** In this case, the Start and End Station are intentionally placed beyond the Start and End Points of the Point Control Geometry. This configuration will NOT result in erratic behavior and ensures the entirety of the Point Control Geometry is within range.

**Prompt:** **Control Description** – If desired, give the Point Control a description. In this case, the description is “Island Ditch”.

**Prompt:** **Locate Point** – Either graphically select the Corridor Template Point line to be manipulated OR select the Template Point by Name from the **Point** drop-down in the **Dialogue Box**.

In this case, the **Ditch_Front_L** is the desired Template Point.

**NOTE:** In default FLH Templates, the Ditch Point is typical set to the **XS_TL_Slopes Feature Definition**. This Feature Definition is not pre-configured to **Create Template Geometry** in the **2D Design Model**. The Ditch Point Template Line is viewed and selected via the **3D Design Model**.

**Prompt:** **Mode** – Use the UP and DOWN arrow keys to select the desired Point Control Mode. See **9G.5.a Point Control - Modes**. Left-Click in the **View** to advance to the next prompt.

In this case, the **Vertical** Mode is used.

**Prompt:** **Control Type** - Use the UP and DOWN arrow keys to select the desired Control Type. See **9G.5.b Point Control – Control Types**. Left-Click in the **View** to advance to the next prompt.

In this case, the **Linear Geometry** Control Type is used.

**Prompt:** **Locate Plan or Profile Element** - Graphically select the **Ditch Profile** Point Control Geometry element from the Profile View of the **Ditch** alignment.

**Prompt:** **Priority** – Use the default Priority of 1. Left-Click in the **View** to advance to the next prompt.

**Prompt:** **Vertical Offset Start** = 0.0000  
**Prompt:** **Vertical Offset End** = 0.0000

Use the default values of 0.0000. Left-Click in the **View** to advance to the next prompt.
Create the Point Control Geometry for the Back Edge Island Element:

4. **Copy** the existing Island Perimeter linework

5. Use the **Break Element** tool to trim down the Island Perimeter to an appropriate length

5. **Delete** the excess linework

**NOTE:** The resulting line is an unnamed MicroStation Element with no Feature Definition. A Name and Feature Definition is necessary for an Element to be used as Point Control Geometry.

5. Use the **Break Element** tool with the Island Perimeter line to trim it down to the appropriate length for Point Control. **Delete** the excess linework.
Use the Set Feature Definition tool to give the Element a Name and Feature Definition. In this case, the Name is set to Back Edge Island. The Feature Definition is set to AUX_01.

Enter the Profile Model for the Back Edge Island element. Assign the Existing Ground profile as the Active Profile.
Create the BOTH Point Control for the Daylight Point:
**Point Control Creation:** Select the Corridor Handle and summon the Pop-Up Icon Menu. Select the *Create Point Control* tool.

| Prompt: Start Station = 11+20.00 |
| Prompt: End Station = 13+40.00 |

Key-in the desired Start and End Station (press the Enter key to Lock) for the Point Control or graphically select the Start and End locations. Left-Click to accept the location and advance to the next prompt.

| Prompt: Control Description – If desired, give the Point Control a description. In this case, the description is “Island Edge”. |

| Prompt: Locate Point – Graphically select the Corridor Template Point line to be manipulated OR select the Template Point by Name from the *Point* drop-down in the *Dialogue Box*. |

In this case, the *Slope_Stake_Cut_L* is the desired Template Point.

| Prompt: Mode – Use the UP and DOWN arrow keys to select the desired Point Control Mode. See 9G.5.a *Point Control - Modes*. Left-Click in the *View* to advance to the next prompt. |

In this case, the *Both* Mode is used.

| Prompt: Control Type - Use the UP and DOWN arrow keys to select the desired Control Type. See 9G.5.b *Point Control – Control Types*. Left-Click in the *View* to advance to the next prompt. |

In this case, the *Linear Geometry* Control Type is used.

| Prompt: Locate Plan or Profile Element - Graphically select the *Island Back Edge* Point Control Geometry element from the 2D Design Model. |

| Prompt: Use as Secondary Alignment - Select NO. A Secondary Alignment would have no effect in this case, because there is no Template Geometry past the *Slope_Stake_Cut_L* point being used. Left-Click in the *View* to advance to the next prompt. |

| Prompt: Priority – Use the default Priority of 1. Left-Click in the *View* to advance to the next prompt. |

| Prompt: Horizontal Offset Start = 0.0000 |
| Prompt: Horizontal Offset End = 0.0000 |

Use the default values of 0.0000. Left-Click in the *View* to advance to the next prompt.
9G.5.e Results

**NOTICE:** The Corridor Template Point Line (GREEN) and Point Control Geometry (BLUE) for the Ditch do NOT coincide. This is because a VERTICAL Point Control Mode was used.

The Mode can be changed in the Properties box of the VERTICAL Point Control Corridor Object Graphics.

If the Mode was changed to BOTH, then horizontal position of the lines would coincide, but the Foreslope Vector would be adjust from its default value.

**NOTICE:** Backslope Vector NOT honored because the BOTH Point Control Mode was used.

**Daylight Point:** The Corridor Template Point Line and Point Control Geometry COINCIDE.

**Island Back Edge Daylight Point location**

**Ditch Point Control Geometry**

**Ditch Corridor Template Point**

**Foreslope Vector** honored because the VERTICAL Point Control Mode was used.

**Properties**

- **General**
  - **Extended**
  - **Station Range**

- **PointControl**
  - **Mode**
    - **Horizontal**
    - **Vertical**
    - **Both**
  - **Control Description**
    - Island Ditch
  - **Control Type**
  - **Point**
  - **Plan Element**
  - **Profile Element**
  - **Priority**
  - **Vertical Start Offset**
  - **Vertical Stop Offset**
9G.6 End Condition Exception

End Condition Exceptions are used to reconfigure the End Condition Components of a Template – while keeping the Backbone of the Template unaltered. End Condition Exceptions can be used for minor changes to an End Condition – for example – changing the steepness of a Fill Slope from 1H:4V (25%) to 1H:2V (50%). Also, End Condition Exceptions can handle a major reconfiguration of an End Condition – for example – changing the ditch type and geometry for a Cut End Condition.

There are three different types of End Condition Exceptions that can be applied to either the right or left side of the Template:

<table>
<thead>
<tr>
<th>End Condition Exception Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Left Override / Right Override</td>
<td>The default End Condition can be reconfigured or completely recreated for a specified range along the corridor. Override changes to the End Condition can be minor or major in nature.</td>
</tr>
<tr>
<td>Left Transition / Right Transition</td>
<td>Used to transition from an End Condition Override (Left or Right) back to the default End Condition or vice-versa. If Transitions are NOT used between the Default and Overridden End Conditions, then an abrupt change in the Slope Stake Limits line will likely be shown in the 2D Design Model graphics. IMPORTANT: Left/Right Transitions are created and operate under the same principles as Template Drop Transitions. See 9E.9 Create a Transition Section between Template Drop Sections. Both tools use a similar Edit Transition Menu and an Edit Transition Midpoint Menu and the same concepts apply.</td>
</tr>
<tr>
<td>Backbone Only (Left) / Backbone Only (Right)</td>
<td>This End Condition Exception type will completely DELETE an End Condition Component for a specified range along the corridor. An example of where this might be used is for a bridge section – where cut/fill earthwork will not be performed.</td>
</tr>
</tbody>
</table>

NOTE: The Backbone refers to all Components EXCEPT for the Cut/Fill End Conditions Components within a Template.
9G.6.a  End Condition Exception Override and Transition Workflow

In this workflow, the right End Condition will be overridden to change the ditch type. The default ditch type – trapezoidal flat bottom ditch – will be overridden to a V-shaped ditch from 10+80 to 11+80. This End Condition Exception Override is used to avoid a large cut into the hillside that results when the default End Condition is used – as shown below.
9G.6.a.i End Condition Exception Override:

1. Select the Corridor Handle to summon the Pop-Up Icon Menu. Select the Create End Condition Exception icon. ▶️ → 📌

2. Prompt: ECException Name – Assign the End Condition Exception a Name. In this case, the Name assigned is "V-Ditch Right". Left-Click in the View to advance to the next Prompt.

3. Prompt: Apply ECEException To – Using the UP and DOWN arrow keys, choose the End Condition Exception Type. In this case, the type to be used is the Right Override. Left-Click in the View to advance to the next Prompt.

4. Prompt: Start Station – Key-in the desired Start Station and press the ENTER key to lock. In this case, 10+80 is used. Left-Click in the View to advance to the next Prompt.

5. Prompt: End Station – Key-in the desired End Station and press the ENTER key to lock. In this case, 11+80 is used. Left-Click in the View to advance to the next Prompt.

6. To create the V-shape, one of the Template Points from the flat bottom part of the ditch must be deleted. In this case, the Template Point on the back-slope is deleted. Right-Click on the Template Point and select Delete Point.
The End Condition interception point is UNCONSTRAINED. Assign Constraints to the Interception Point to define the V-shaped ditch geometry.

The **Slope Value** is set to 50% relative to the *Ditch_Front_R* (Parent 1) point.

The **Vertical Value** is set to 10.0000 relative to *Ditch_Front_R* (Parent 1) point.

**NOTE:** Since the *End Condition is Infinite* box is checked, the **Vertical Value** is inconsequential. The End Condition interception point will extend infinitely to intercept the Existing Ground Terrain Model.

Left-Click on **OK** to complete the End Condition Exception command.

**NOTE:** In the *End Condition Exception Override Menu*, Template Points are added, deleted, and manipulated in the same manner as in the Template Editor.
Return to the End Condition Override Menu through the Pop-Up Icon Menu

End Condition Exception Override Corridor Object Graphic

Overridden End Condition
9G.6.a.ii End Condition Exception Transition:

Select the Corridor Handle to summon the Pop-Up Icon Menu. Select the *Create End Condition Exception* icon.

**Prompt:** *ECException Name* – Assign the End Condition Exception a Name. In this case, the Name assigned is “V-Ditch Right Transition”. Left-Click in the *View* to advance to the next Prompt.

**Prompt:** *Apply ECException To* – Using the UP and DOWN arrow keys, choose the End Condition Exception Type. In this case, the type to be used is the *Right Transition*. Left-Click in the *View* to advance to the next Prompt.

**Prompt:** *Start Station* – Key-in the desired Start Station and press the ENTER key to lock. In this case, 10+50 is used. Left-Click in the *View* to advance to the next Prompt.

**Prompt:** *End Station* – Key-in the desired End Station and press the ENTER key to lock. In this case, 10+80 is used. Left-Click in the *View* to advance to the next Prompt.
<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Draw a Transition Line from the back point of the flat bottom (Default) to the V-point (Overridden). Left-Click on the Template Points shown above to draw the Transition Line. <strong>NOTE:</strong> For more information on the Edit Transition Menu, see 9E.9 Create a Transition Section between Template Drop Sections.</td>
</tr>
<tr>
<td>7</td>
<td>When each Template Point has at least one Transition Line, select OK.</td>
</tr>
<tr>
<td>8</td>
<td>Ensure that all Template Points that need to transition are UNCONSTRAINED. In this case, all Template Points are already unconstrained, so no action is necessary. Use the Transition Slider to preview the transition. If the transition looks appropriate, select OK. <strong>NOTE:</strong> For more information on the Edit Transition Midpoint Menu, see 9E.9 Create a Transition Section between Template Drop Sections.</td>
</tr>
</tbody>
</table>
The Edit Transition Midpoint Menu operates the same as the Template Drop Transition tool. All Template Points that are transitioning need to be unconstrained. In this case, all Template Points are already unconstrained, so no action is necessary.
9G.7 Curve Widening

The Curve Widening tool is an automated form of Point Control used to widen an edge of the road around curves. The Curve Widening tool references the curve radius and relates it to a User-created Curve Widening table. The table automatically returns the appropriate curve widening value. Also, transitions sections are created to transition from the typical lane width to the full Curve Widening width.

The Curve Widening tool works in conjunction with an external text file – which is identified by file extension type “.wid” – and is referred to as the Curve Widening File. The Curve Widening File contains a simple Curve Widening Table which determines the additional width to be added to a curve and the length to transition.

Curve Widening Files are located in the FLH WorkSpace folder at the locations shown in the graphic below. The Curve Widening File needs to be copied from the FLH WorkSpace and placed into the Project Folder. See 2D.2 Curve Widening File Creation. Currently there are two Curve Widening Files in the FLH Workspace – a file for Simple Curves (No Spirals) and a file for Spiral Curves.

**IMPORTANT:** These default Curve Widening Files in the FLH WorkSpace folder should be thought of as a starting template because must be modified for specific project curve widening requirements. Project requirements the affect curve widening values include Design Speed, Design Vehicle, Lane Width, Number of Lanes, and whether Simple/Spiral Curves are used.

![Diagram of Curve Widening tool and file locations]
9G.7.a Modifying the Curve Widening File for Project Requirements

Before making modifications, copy a Curve Widening File from the FLH Workspace and place it in the Project Folder. See **2D.2 Curve Widening File Creation**.

To make edits to the Curve Widening File, open it with the Notepad software.

How the Table Works: The Radius value of a curve (Rad) is inputted to the Curve Widening table and values for Wi, Li, Wo, and Lo are returned and used to widen and transition the curve accordingly.

<table>
<thead>
<tr>
<th>Radius (Rad)</th>
<th>Inside Lane Width (Wi)</th>
<th>Inside Lane Transition Length (Li)</th>
<th>Outside Lane Width (Wo)</th>
<th>Outside Lane Transition Length (Lo)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>3.5</td>
<td>175</td>
<td>3.5</td>
<td>175</td>
</tr>
<tr>
<td>600</td>
<td>3.0</td>
<td>150</td>
<td>3.0</td>
<td>150</td>
</tr>
<tr>
<td>700</td>
<td>2.6</td>
<td>130</td>
<td>2.6</td>
<td>130</td>
</tr>
<tr>
<td>800</td>
<td>2.0</td>
<td>120</td>
<td>2.0</td>
<td>120</td>
</tr>
<tr>
<td>900</td>
<td>1.5</td>
<td>100</td>
<td>1.5</td>
<td>100</td>
</tr>
<tr>
<td>1000</td>
<td>1.2</td>
<td>0</td>
<td>1.2</td>
<td>0</td>
</tr>
<tr>
<td>5000</td>
<td>0.0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

**NOTE:** Lines that begin with a semi-colon (;) are ignored by the ORD software. Lines that begin with a semi-colon are used for information only.

**Note:** No Curve Widening will be applied to radii greater than the last entry in the table (in this case, 5000).

**WARNING:** In conventional highway design, a simple curve is widened only for the inside edge of road. Spiral curves are generally widened on both the inside and outside edge. **For simple curves, the “Wo” and “Lo” columns should have a value of 0.0 for all entries.** This ensures that curve widening does NOT take place on the outside edge of road.

**NOTE:** For Radii value that fall between rows, Return Values (Wi, Li, Wo, and Lo) are not interpreted. For example, if a radius of 750’ was inputted in to the table shown above, then the return values would be Wi=3.0, Li=150, Wo=3.0, and Lo=150. These values correspond to a 700’ radius in the table above.

Before using the Curve Widening tool in the ORD software, ensure the Curve Widening Table values are adjusted for Project requirements. Curve Widening values can be found in the AASHTO Green Book.
Select the Corridor Handle and summon the Pop-Up Icon Menu. Select the Create Curve Widening tool.

Prompt: Start Station <ALT> Lock To Start = 9+41.37 (Locked to Start)
Prompt: End Station <ALT> Lock To End = 14+46.91 (Locked to End)

NOTE: Curve Widening is only applied if the Curve is completely enveloped within the Station range.

In this case, the intention is to apply the Curve Widening to every qualifying Curve in the corridor. This is accomplished by locking the Station range to the Start and End of the alignment.

TIP: If an alignment contains a mixture of simple and spiral curves, it may be necessary to apply separate Curve Widening Tables to the different curve types. In that case, the Curve Widening tool would be used as many times as necessary to isolate station ranges that contain simple curves and station ranges that contain spiral curves.
Prompt: Control Description – Provide a description for the type of Curve Widening to be used. The description will be viewable in the Point Control Sub-Menu within the Corridor Objects Menu.

Prompt: Locate Point – Either graphically select the Corridor Template Point line that the Curve Widening will be applied to OR select the Template Point by Name from the Point drop-down in the Dialogue Box.

In this case, the Pavg_ETW_LayerTop_L is the desired Template Point.

NOTE: Since only one Corridor Template Point can be selected per usage, the Curve Widening tool is typical used twice. The Curve Widening is used twice to be applied to a Corridor Template Point on the left side and a Template Point on the right side.

Prompt: Percent Transition on Tangent – Specify the location for the transitions. In this case 66.66% is used

-If 100% is used, then the entire transition takes place on the tangent. For example, for the entry transition, the Lane would be at full curve widening width at the PC of the Curve.
-If 0% is used, For example, for the entry transition, the Lane would be at the default width at the PC of the Curve and the entire transition to full curve widening width would occur along the curve.
-If 50% is used, half of the transition to full curve widening width would be on the tangent and the other half would occur along the curve.

TIP: In conventional highway design, the transitions for superelevation and curve widening will coincide.

Prompt: Use Spiral Length for Transition – This prompt is only consequential if the alignment contains spirals.

If YES is used and the alignment contains spirals, then the transition will begin at the Tangent/Spiral point (default lane width) and end at the Spiral/Curve point (full curve widening width). The Percent Transition on Tangent value (specified in the last step) and Transition Lengths found in the Curve Widening File is ignored.

If NO is used and the alignment contains spirals, then the Percent Transition on Tangent value and Transition Lengths from the Curve Widening File are used and applied relative to the Spiral/Curve point.

Prompt: Overlap – This prompt is only consequential if the alignment contains curves in close proximity – such that transition lengths would overlap.

Shift Maximum Widening Points onto Curve – The transition lengths for the overlapping curves are NOT altered from the values found in the Curve Widening File. The overlapping transition are shifted in the direction of their respective curves – such that they do not overlap. In this case, the Percent Transition on Tangent value specified in Step 5 is ignored.

Shorten Transition Lengths - The transition lengths for the overlapping curves are altered and shortened as necessary – such that the do NOT overlap. The Transition Length values found in the Curve Widening File are ignored but the Percent Transition on Tangent value specified in Step 5 is ignored.
Prompt: *Priority* – The *Priority* is only consequential if the curve widening Template Point (in this case, *Pavt_ETW_LayerTop_L*) is also assigned to a Point Control in the vicinity of a curve. For example, if there is a road turnout near a curve – the Template Point CANNOT follow the road turnout Point Control Geometry AND simultaneously widen.

The Point Control Geometry element with the numerically lower *Priority* value will be targeted first.

Prompt: *Widening Table* - <Alt> Down To Select File – Simultaneously press the ALT and DOWN ARROW key to summon a File Explorer window. Navigate to the Project Folder and select the project Curve Widening File.

**Results:** The Curve Widening tool is an automated form of Point Control. There are three *Horizontal Point Controls* are created per curve. A *Point Control* for the full Curve Widening section and a *Point Controls* for each of the Transition sections. The individual Point Controls are shown in the *Point Control Sub-Menu* (found in the Corridor Objects menu), but CANNOT be edited or manipulated – except for the Station Range.

The parameters and Curve Widening File in the Curve Widening tool preliminary usage can be viewed and changed in the *Curve Widening Sub-Menu.*
**9G.8 Target Aliasing**

By default, End Condition Points will ONLY intercept the *Target Type* listed in the End Condition Component Properties – which is typically set to the *Active Surface* Terrain Model. See [8D.7.a End Condition Target Types](#). The *Target Aliasing* tool is used specify MULTIPLE Targets for a single Corridor. The *Target Aliasing* tool can be used to specify a combination of the following Target Types:

- **Corridors, Linear Template Models, and Surface Templates**
- Additional Terrain Models
- ORD Elements/Profiles (See [8D.7.a.i Target and ORD Element with End Conditions – Workflow](#))

A very useful feature of the *Target Aliasing* tool is the ability to target an adjacent Corridor model – which is not possible through conventional End Condition Components. In the graphic below, the Target Aliasing tool is used with Corridor (on the left-side) to target and intercept the Adjacent Corridor model.

The *Target Aliasing Menu*, is used to specify and prioritize Targets that a Corridor will attempt to intercept. When it is possible to solve for more than one target, then the order of the Aliases List (found in the Target Aliasing Menu) determines which solution is used.

In the example shown above, the Existing Ground Terrain Model and Adjacent Corridor are both specified as targets – but the Adjacent Corridor has priority because it is further up in the Aliases List. If possible, the Corridor will solve for and intercept the Adjacent Corridor. If the Corridor CANNOT solve the Adjacent Corridor, then the Existing Ground Terrain Model will be used. The order of Targets in the *Aliases List* determines the which Target is solved, if it’s possible to solve for multiple targets.

---

**Corridor using the Target Aliasing tool to target the Adjacent Corridor**

**Adjacent Corridor**

**End Condition Point** Intercepts the **Adjacent Corridor** instead of the *Existing Ground* Terrain Model

**TIP:** Use the Add Clipping Reference tool to trim the excess portion of the **Adjacent Corridor**

---

**Define Target Aliasing** for Corridor (on the left-side)

**Aliases**
- Add ->
- <- Remove
- Move Up
- Move Down

---

**Aliases List**
9G.8.a Target Aliasing Menu

The Target Aliasing Menu is used to choose and prioritize End Condition Targets. The Target Aliasing Menu is accessed through the Pop-Up Icon Menu of the Corridor Handle.

**Target List**

Lists the available Terrain Models, Corridors, and Linear Templates that can be targeted.

Targets must be moved over to the **Aliases List** for before targeting will occur.

Use the **Add ->** and **< Remove** buttons to move targets from **Target List** to the **Aliases List**

**Aliases List**

The order of the **Aliases List** determines the target priority.

The End Condition point will seek out the FIRST target in the **Aliases List**.

If that FIRST target CANNOT be solved for, then the NEXT target is sought out.

Use the **Move Up** and **Move Down** buttons to manipulate the list order

**Target Type Drop-down**

Switches to Linear Element target types.

If the **Use Closest** box is checked, then the order of the **Aliases List** becomes inconsequential.

The End Condition Point will intercept the closest target - regardless of the **Aliases List** order

**NOTE:** Even though the Existing Ground terrain model is **ACTIVE** - it still has to be added to the **Aliases List** to be targeted.
9G.8.b Target Aliasing and Add Corridor Clipping Reference - Workflow

In this workflow, the *Target Aliasing* tool will be used with the *Road Corridor* to target and intercept upon the *Trail Corridor*. The excess portion of the *Trail Corridor* will then be clipped with the *Add Corridor Clipping Reference* tool. See 9G. 10 Corridor Clipping References.

In the **Aliases List**, highlight the *Trail Corridor*.  
Use the *Move Up* and *Move Down* buttons to ensure the *Trail Corridor* is at the top of the **Aliases List**.

**NOTE:** If the Existing Ground Terrain Model is above the *Trail Corridor*, then there is NO EFFECT because the *Road Corridor* will solve for the Existing Ground before attempting to solve for the *Trail Corridor*.
RESULTS OF TARGET ALIASING

The Road Corridor now targets and intercepts the Trail Corridor

Overlap

The Trail Corridor must be clipped.

Portion of Trail Corridor to be clipped

NOTE: Clipping Reference that have been added to a Corridor are listed in the Clipping References Sub-Menu (in the Corridor Objects Menu).

Clipping Reference can be added and removed directly from the Clipping References Sub-Menu

5 Summon the Pop-Up Icon Menu for the Trail Corridor

Select the Add Clipping Reference tool

6 Left-Click on the Road Corridor

14

15
9G.9 Corridor References

The Add and Remove Corridor References tools work in conjunction with the Horizontal Feature Constraint tool found in the Template Point Properties. See 8C.6.a.xiv Horizontal Feature Constraint.

IMPORTANT: The only purpose of the Add/Remove Corridor References tools is to inform the Horizontal Feature Constraint tool on which User-created Horizontal ORD Elements to use. If a Horizontal ORD Element is NOT Added as a Corridor Reference, then it will NOT work with The Horizontal Feature Constraint tool.

Horizontal Feature Constraints and Corridor References are commonly used to model: retaining walls, guardrails (as shown in 8F.3 Advanced Road Template with Guardrail and Display Rules), road turnouts, and irregular ditch lines. In general, anything that can be modeled with Horizontal Point Controls – can be modeled in a slightly more stream-lined fashion with Horizontal Feature Constraints/Corridor References.

To Add or Remove a Corridor Reference:

NOTE: After a Corridor Reference has been added, it will be listed in the External Reference Sub-Menu (found in the Corridor Objects Menu).
9G.10 Corridor Clipping References

**WARNING:** Excessive use of Corridor Clipping References may significantly increase Corridor processing times; or in some cases, corrupt a Corridor Model and/or Corridor File (_cor.dgn). For the current version of the software, Bentley intends that a Corridor Model is clipped no more than 4-5 times.

The Add and Remove Corridor Clipping References tools are used to trim out unwanted portions of a Corridor model. The Add Corridor Clipping References tool is used when the Corridor overlaps with a different modeling feature; such as a Corridor, Linear Template, or Surface Template. See 9G.8.b Target Aliasing and Add Corridor Clipping – Workflow.

Additionally, the User can create a custom clipping shape by creating an enclosed SmartLine and converting it to a Complex Shape. This technique is shown in 9G.10.a Corridor Clipping References - Workflow to clip a skewed bridge from a Corridor.

**WARNING:** Corridor Complex Elements created in the 2D Design Model (see 9C.3 Corridor Complex Elements vs 3D Linear Elements) are NOT visually affected by Corridor Clipping References. In other words: Corridor Complex Elements appear unchanged - even with a successful usage of the Corridor Clipping References tools. ONLY 3D Linear Elements – which are created in the 3D Design Model - will been shown as “clipped”. See 9G.10.b Displaying Corridor Clipping References – WARNING.

9G.10.a Corridor Clipping References - Workflow

In this example, custom clipping shape is used to clip a skewed bridge out of the Road Corridor.
Using a SmartLine, create the desired shape to be clipped out of the Corridor. Ensure that the SmartLine is enclosed by snapping the end point to the start point.

Use the Create Complex Shape tool to convert the SmartLine into a Complex Shape.

Left-Click on the Complex Shape

Summon the Pop-Up Icon Menu
Select the Add Clipping Reference tool.

See the next page for the results and Displaying Corridor Clipping References - WARNING
9G.10.b Displaying Corridor Clipping References - WARNING

Corridor Complex Elements that are created in the 2D Design Model (see 9C.3 Corridor Complex Elements vs 3D Linear Elements) are NOT visually affected by Corridor Clipping References.

The graphic below, shows the results of the 9G.10.a Corridor Clipping References – Workflow. Only Corridor Complex Elements (created in the 2D Design Model) are displayed. The 3D Design Model reference DISPLAY is turned OFF. The Corridor was successfully clipped – however- the Corridor Complex Elements are visually unaffected. Notice below, that the Slope Stake Fill Line is unclipped.

In the graphic below, still shows 2D Design Model, however the display for all Corridor Complex Elements has been turned OFF. The 3D Design Model reference display has been turned ON. Notice, that all the 3D geometry from the corridor is correctly clipped.
9H.1 Locking and Processing the Corridor

When the Corridor is locked, it means the Corridor will not process or update – even when edits are made or new Corridor Objects are created. When in the locked position, the Corridor model will remain static. Edits and manipulations can be applied to the Corridor when it is locked, however, they will not be visualized until the Corridor is unlocked and the Corridor manually processed with the Process Corridor tool.

Corridors that are long and/or contain a high degree of complexity will suffer from long processing times when edits are made to the Corridor of any element that interacts with the corridor – such as the Alignment or Point Control geometry.

Before making a series of edits to a slow-processing Corridor, it is advantageous to Lock it. After all edits are made, the Corridor will be Unlocked. However, the Corridor will have to manually re-processed to reflect edits made in the Locked stated.

**Lock the Corridor:** The Lock – Deactivate Rule tool is used to Lock the Corridor (shown in Red).

**Unlock the Corridor:** The Unlock - Active Rule tool is used to Unlock the Corridor (shown in Blue).

**Process the Corridor:** The Process Corridor tool is used to Process the Corridor (shown in Green).
9H.2 Change the Alignment or Profile for a Corridor (Reattach Tool)

The *Reattach* tool has two operational usages relating to switching out the Corridor Alignment and Profile:

1. It can be used to entirely switch the Alignment for the Corridor. For example, if an alternate Alignment is created, the *Reattach* tool is then used to switch the original Corridor onto the alternate Alignment. All *Template Drop* sections and *Corridor Objects* are transferred to the Alternate Alignment – with the Station Ranges kept intact.
2. The Corridor Alignment is unchanged but the Profile is switched. This is used to apply an alternate Profile to the Corridor.

**WARNING:** The Original Alignment and Alternate Alignment should have similar stationing values.

In this example, both alignments start at the same point at STA 10+00
9H.3 Overlay Vertical Adjustment tool

Similar in concept to the Define Profile By Best Fit tool (See 7E.3.d Define Profile By Best Fit), this tool is used to automatically and optimally calculate a Profile – specifically intended for Milling/Overlay designs.

**DISTINCTION:** The Define Profile By Best Fit tool (7E.3.d) only analyzes the mainline Profile Point. This tool analyzes all Template Points in a processed cross-section (Template Drop) in relation to the Existing Ground. The result is a vertically adjusted Profile that does not exceed specified Milling and Overlay tolerances at any lateral point in a given processed cross-section.

**WARNING:** Do NOT access this tool through the Pop-Up Icon Menu of the Corridor – because the software will likely abort the tool operation midway through. Instead, access this tool through the Ribbon.

**WARNING:** This tool can be useful for creating a graphic that for visual reference. However, it is unlikely that this tool will create a Profile that is appropriate to show in a plan set. The resulting Profile element from this tool will be a series of serrated Lines segments, NOT smooth Lines connected by Curves.

**WARNING:** This tool only works if the Alignment and Corridor are created in the same ORD File. In other words, this tool will NOT work if the Alignment is in [_ali.dgn] file and the Corridor is a [_cor.dgn] file.

**NOTE:** Although, this tool is intended for Milling/Overlay designs, it is NOT necessary for the Corridor Template to contain Milling/Overlay Template Components for this tool to function. However, Milling/Overlay quantities will NOT be correct unless the proper Components are used. For more information on Milling/Overlay Components, see 8D.8 Overlay/Striping Components.

The Overlay Vertical Adjustment tool contains two operational modes: **Minimum Overlay** mode and **Minimum Milling** mode. Both modes analyze the Backbone Datum in relation to the Existing Ground to automatically place the Profile Grade Point. In the cross-sectional view, the vertical position of the Backbone Datum is manually set by the User by specifying the Backbone Thickness parameter value. For the intended usage of this tool, the Backbone Datum should be placed at the subgrade or at the top of the leveling component. The table on the next page explains all parameters used in this tool, including the different types of Modes and Backbone Thickness.
<table>
<thead>
<tr>
<th>Options:</th>
<th>Description:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Vertical Name</strong></td>
<td>Name given to the resulting vertically adjusted Profile created with this tool.</td>
</tr>
<tr>
<td><strong>Start/Stop</strong></td>
<td>Sets the Station range limits for the resulting vertically adjusted Profile.</td>
</tr>
<tr>
<td><strong>Backbone Thickness</strong></td>
<td>The <em>Backbone</em> is the Overlay section. Examples of a <em>Backbone</em> may consist of:</td>
</tr>
<tr>
<td></td>
<td>- A single asphalt component layer</td>
</tr>
<tr>
<td></td>
<td>- Multiple asphalt component layers of different binder courses</td>
</tr>
<tr>
<td></td>
<td>- An asphalt component and an aggregate component</td>
</tr>
<tr>
<td></td>
<td>The <em>Backbone Thickness</em> should equal the combined thickness of the all layers in the Overlay section. Although the Backbone is intended to correspond with the Overlay section, the User can any value – regardless of the actual Component depths found in the Template. The <em>Backbone Thickness</em> is measured relative to the Profile Grade Point.</td>
</tr>
<tr>
<td></td>
<td><strong>NOTE:</strong> This value should be <strong>POSITIVE</strong>, but can also be negative or zero.</td>
</tr>
<tr>
<td></td>
<td>If the <em>Backbone Thickness</em> value is <strong>POSITIVE</strong>, the Backbone Datum will be offset in the direction <strong>BELOW</strong> the Profile Grade Point.</td>
</tr>
<tr>
<td></td>
<td>If the <em>Backbone Thickness</em> value is <strong>NEGATIVE</strong>, the Backbone Datum will be offset in the direction <strong>ABOVE</strong> the Profile Grade Point.</td>
</tr>
<tr>
<td></td>
<td>If the <em>Backbone Thickness</em> value is <strong>ZERO</strong>, the Backbone Datum will be directly atop the Profile Grade Point.</td>
</tr>
<tr>
<td><strong>Backbone Parametric Label</strong></td>
<td>If a Backbone Parametric Label is used, then the <em>Parametric Constraint</em> tool can be used to change the Backbone Thickness value for a station range.</td>
</tr>
<tr>
<td></td>
<td><strong>WARNING:</strong> This functionality is broken in the current version of the ORD Software.</td>
</tr>
<tr>
<td><strong>Minimum Mode</strong></td>
<td>The <em>highest</em> Existing Ground point in each processed cross-section is selected as the <strong>Controlling Point location</strong>. The Backbone Datum is offset from the Controlling Point according to the Minimum Overlay Thickness value.</td>
</tr>
<tr>
<td><strong>Minimum Overlay</strong></td>
<td>The <em>lowest</em> Existing Ground point in each processed cross-section is selected as the <strong>Controlling Point location</strong>. The Backbone Datum is placed directly atop of the Controlling Point. All Points along the Backbone Datum will be placed below or directly atop of the existing ground. This Mode is intended to produce the least amount of milling across the full width the Backbone Datum.</td>
</tr>
<tr>
<td><strong>Minimum Milling</strong></td>
<td>Sets the distance between the <strong>Controlling Point location</strong> (placed at the highest Existing Ground point in each processed cross section) and the Backbone Datum.</td>
</tr>
<tr>
<td></td>
<td><strong>NOTE:</strong> This value should be <strong>POSITIVE</strong>, but can also be negative or zero.</td>
</tr>
<tr>
<td></td>
<td>If the <em>Minimum Overlay Thickness</em> value is <strong>POSITIVE</strong>, the Backbone Datum will be placed in the direction <strong>ABOVE</strong> the Controlling Point Location.</td>
</tr>
<tr>
<td></td>
<td>If the <em>Minimum Overlay Thickness</em> value is <strong>NEGATIVE</strong>, the Backbone Datum will be placed in the direction <strong>BELOW</strong> the Controlling Point Location.</td>
</tr>
<tr>
<td></td>
<td>If the <em>Minimum Overlay Thickness</em> value is <strong>ZERO</strong>, the Backbone Datum will be placed directly atop the Controlling Point Location.</td>
</tr>
</tbody>
</table>
### Vertical Overlay Adjustment Dialogue Options

<table>
<thead>
<tr>
<th>Options:</th>
<th>Description:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Use Maximum Milling</strong></td>
<td>This box can be enabled for both <em>Minimum Modes</em>. If this box is enabled, the <em>Maximum Milling Thickness</em> parameter can be enabled.</td>
</tr>
<tr>
<td><strong>Maximum Milling Thickness</strong></td>
<td>This parameter sets a maximum distance between any point along the Backbone Datum and the Existing Ground.</td>
</tr>
<tr>
<td></td>
<td>First, the software attempts to set the vertically adjusted Profile according to the <em>Backbone Thickness, Minimum Mode, and Minimum Overlay Thickness</em> values used.</td>
</tr>
<tr>
<td></td>
<td>Then, the software analyzes if the distance between any point along the Backbone Datum and Existing Ground exceeds the <em>Maximum Milling Thickness</em> value.</td>
</tr>
<tr>
<td></td>
<td>If no points exceed the <em>Maximum Milling Thickness</em>, then no adjustments are made to the Profile. If there is any point that exceed the <em>Maximum Milling Thickness</em>, then the Profile is again adjusted (typically upwards) such that <em>Maximum Milling Thickness</em> is NOT exceeded.</td>
</tr>
<tr>
<td></td>
<td><strong>NOTE:</strong> This value needs to be <strong>POSITIVE</strong>.</td>
</tr>
<tr>
<td><strong>Maximum Milling Parametric Label</strong></td>
<td>If a Maximum Milling Label is used, then the <em>Parametric Constraint</em> tool can be used to change the Maximum Milling value for a station range.</td>
</tr>
<tr>
<td></td>
<td><strong>WARNING:</strong> This functionality is broken in the current version of the ORD Software.</td>
</tr>
<tr>
<td><strong>Left/Right Template Range Point</strong></td>
<td>The Left and Right Template Range Points are used to set the width of the Backbone for each processed cross section. Existing Ground points outside of the Left and Right Template Range will NOT be analyzed. The Left and Right Template Range is typically set to the left and right proposed edge of pavement.</td>
</tr>
<tr>
<td><strong>Existing Ground Range</strong></td>
<td><strong>Match Template Range</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Match Existing Linear Geometry</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Fixed Offsets</strong></td>
</tr>
<tr>
<td><strong>Solution Option</strong></td>
<td><strong>Examine All Cross Section Points</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Examine Template Points Only</strong></td>
</tr>
<tr>
<td><strong>Maximum Vertical Difference</strong></td>
<td>The resulting vertically adjusted Profile will be created such that the difference in elevation for each consecutive Profile Grade Point does NOT exceed the specified <em>Maximum Vertical Difference</em> value. In other words, the elevation between each processed cross-section will not exceed the <em>Maximum Vertical Difference</em>. This may help to prevent sharp deflection angles in the resulting profile.</td>
</tr>
<tr>
<td></td>
<td>If this value is set to the default value of zero, then consecutive Profile Grade Points for each processed cross-section will NOT be analyzed and adjusted for.</td>
</tr>
</tbody>
</table>
Using the **Minimum Milling** mode, the **lowest** Existing Ground point is selected as the **Controlling Point** location. The **Backbone Datum** is placed directly atop of the **Controlling Point**.

In the graphic shown above, the two outside points on the Backbone Datum are placed below the Existing Ground and the center point is placed directly on the Existing Ground (Controlling Point).

**NOTE:** In this example, the **Solution Option** is set to **Examine Template Points Only**.

If the **Examine All Cross Section Points** option is used, then the location marked ✽ would be the **Controlling Point**.
9H.3.a Overlay Vertical Adjustment Tool - Workflow

In this workflow, the Overlay Vertical Adjustment tool is used to automatically create a Profile for an asphalt overlay design.

The project requires a pavement section consisting of 1.5” Asphalt Wearing Course - placed on top of an Asphalt Binder Course. The Binder Course is placed directly on the Existing Ground – which means it will have variable depth. For structural integrity, the Binder Course is required to be at least 2” in depth at all locations.

This type of workflow is accomplished with the Minimum Overlay mode. The Minimum Overlay mode will ensure that the Backbone Datum is always a fixed distance above the Existing Ground. The fixed distance is set by Minimum Overlay Parameter value – which will be set to 2”. The vertical space between the Existing Ground and Backbone Datum will be automatically filled with the Binder Course Overlay Component.

The Corridor Template is created with a Conventional Template Component to represent the 1.5” Wearing Course. The Binder Course is created with an Overlay Component – which allows for variable depth. See 8D - Template Components. See page 122, for the end results of this workflow.

**PREREQUISITE:** Before this tool can be used, a Corridor must be created by the User. The Corridor must be created in the same ORD File as the Alignment and Profile for this tool to work.

A temporary Profile is created in order to create a Corridor. The temporary Profile can be deleted after the Overlay Vertical Adjustment tool is used and the resulting Profile is Activated.
Select the **Overlay Vertical Adjustment** tool from the Ribbon:

**Ribbon Location:** [OpenRoads Modeling → Corridor → Miscellaneous].

**WARNING:** Do NOT access this tool through the **Pop-Up Icon Menu** of the Corridor – because the software will abort the tool operation midway through. Instead, access this tool through the Ribbon.

**Prompt:** Locate Corridor – Left-Click on the Corridor.

**Prompt:** Vertical Name – Assign a Name to the Profile to be automatically created.

**Prompt:** Start – Select the Starting location for the Profile to be automatically created.

**Prompt:** Stop – Select the Ending location for the Profile to be automatically created.

**Prompt:** Backbone Thickness – Key-in the Backbone Thickness and left-click to advance to the next prompt.

In this case, the Backbone Thickness is set +0.125’ (1.5”) to match to the **1.5” Surfacing Course**. The Backbone Thickness is measured from the top of the **Surfacing Course** to the **Top of the Binder Course** (Leveling Component).

**Prompt:** Backbone Parametric Label – From the drop-down in the Dialogue Box, select the desired Parametric Label to be assigned to the Backbone Thickness.

In this case, the Labels is left blank.
Prompt: **Overlay Or Milling** – Using the Up and Down Arrow Keys to select.

In this case, the *Minimum Overlay* mode is selected.

Prompt: **Minimum Overlay Thickness** - Key-in the Minimum Overlay Thickness and left-click to advance to the next prompt.

In this case, the Minimum Overlay Thickness is set to +0.1667’ (2”)

Prompt: **Overlay Parametric Label** - From the drop-down in the Dialogue Box, select the desired Parametric Label to be assigned to the *Minimum Overlay Thickness*.

In this case, the Labels is left blank.

Prompt: **Using Maximum Milling** – Use the Up and Down Arrow Keys to select Yes or No.

In this case, the No is selected because there is not Maximum Milling depth requirement.

Prompt: **Left Template Point Range** – In the 2D Design Model, left-click on the Template Point line to define the left edge of the Backbone Datum. In this case, the left proposed edge of pavement line is selected.

Prompt: **Right Template Point Range** - Left-click on the Template Point line to define the right edge of the Backbone Datum. In this case, the right proposed edge of pavement line is selected.

Prompt: **Existing Ground Range** - Use the Up and Down Arrow Keys to select the desired type.

In this case, **Match Template Range** is selected because the desire is to only analyze Existing Ground Points within the Left/Right Template Point Range.
Prompt: Solution Option – Use the Up and Down Arrow Keys to select the desired type.

In this case, Examine All Cross Section Points is selected to analyze all Existing Ground vertices in the Left/Right Template Point Range. This type ensures that minimum 2” overlay is achieved at all locations in the Left/Right Template Point Range.

If Examine Template Points Only was selected, then only the Existing Ground elevation directly above/below Template Points are analyzed. If between Template Points, there was a high point in the existing ground, then it is possible that the minimum 2” overlay would not be achieved at the high point.

Prompt: Maximum Vertical Distance – In this case, it is not anticipated that there will be sudden changes in the Profile Grade between each processed cross section. Therefore, this value is set to 0.

After Step 15, the Vertical Adjusted Overlay Profile should have been automatically created in the Profile Model of the Corridor Alignment. The Vertical Adjusted Overlay Profile must be Activated to be applied to the Corridor

Enter the Profile Model for the Corridor Alignment and Activate the resulting Profile.
## 9H.4 Corridor Reports

All Corridor Reports are accessed through the Ribbon:

Ribbon Location: **OpenRoads Modeling** workflow → Corridor tab → Review panel.

<table>
<thead>
<tr>
<th>Corridor Report Tool</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Component Quantities</td>
<td>Generates material (Component) and earthwork quantities for a single Corridor. This tool is useful for quickly calculating component quantities - such as pavement or aggregate volumes - for an individual corridor. See 9H.4.a.</td>
</tr>
<tr>
<td></td>
<td><strong>WARNING:</strong> This report will NOT generate accurate quantities if the Corridor has been clipped. See 9G.10 Corridor Clipping References.</td>
</tr>
<tr>
<td></td>
<td>The Quantities By Named Boundaries tool should be used to calculate quantities for complex models that include Corridors, Linear Template, and Surface Templates. See Chapter 20 - Quantities By Named Boundaries.</td>
</tr>
<tr>
<td>Design Input Report</td>
<td>Generates a list of all Corridor Objects used to manipulate a Corridor. In essence, this report itemizes all contents in the Corridor Objects Menu and Submenus into a single report. See 9G - Corridor Objects.</td>
</tr>
<tr>
<td>Results Report</td>
<td>Generates a report that lists the specific Template at every Template Drop station in the Corridor. This Results Report is NOT very inciteful and may take a very long period of time to generate.</td>
</tr>
<tr>
<td>Milling Report</td>
<td>This Report is only relevant for Corridors and Templates that utilize Milling Components. See 8D.8 Overlay/Stripping Components. For pavement milling, this Report will calculate the left/right offset and elevation for at every Template Drop station. The pavement milling area between each Template Drop Station is also calculated.</td>
</tr>
<tr>
<td>Superelevation Report</td>
<td>Differing from other Corridor Report tools which is used in conjunction with the Corridor Handle, this tool is used with a Superelevation Section to generate a report. See Chapter 10 - Superelevation.</td>
</tr>
<tr>
<td></td>
<td>The Report will list all input parameters used to calculate superelevation - such as design speed, maximum E value, runoff length tables used. This Report also lists the station locations and corresponding E values of each instance of where superelevation is applied.</td>
</tr>
</tbody>
</table>
9H.4.a Component Quantities for a Single Corridor – Workflow

In this workflow, the Component Quantities tool is used to generate quantities for a Corridor.

In the Ribbon, Left-Click on the Component Quantities tool. 
Ribbon Location: OpenRoads Modeling workflow → Corridor tab → Review panel.

Alternatively

Select the Corridor Handle and summon the Pop-Up Icon Menu. Select the Component Quantities tool.
An example **Component Quantities Report** is shown below. There are two types of quantities that are calculated:

1. **Earthwork Quantities** – include *Cut* and *Fill Volumes*. Earthwork Quantities are calculated as the volumetric difference between the Bottom Mesh and Existing Ground. See 9I.1 Top and Bottom Meshes.
2. **Component Quantities** – are calculated from Template Components found in the Templates used to create the Corridor. Component Quantities can be planar (Surface Area) or Volumetric.

**NOTE:** *Cut Volume* and *Fill Volume* (Earthwork Quantities) are NOT interchangeable with *XS_TC_Cut* and *XS_TC_Fill* (Component Quantities). The *XS_TC_Cut/Fill* quantities correspond with the End Condition Components – which are *Planar Components* (See 8A.2.a Template Points and Components). The *XS_TC_Cut/Fill* quantity values shown below represents the End Condition Component *Surface Area*.
Component Quantities are calculated for each Template Drop Station

Grand Totals for Component Quantities are shown at the end of the Report

1. To convert the Report to Excel or XML:
   - Go to File > Save As

2. Change the Save as type: to Excel or XML

ALTERNATIVELY
- Right-Click in the Report Screen and select Export to Microsoft Excel
9I – CREATING TERRAIN MODELS FROM THE CORRIDOR

9I.1 Top and Bottom Meshes

By default, a Corridor will create a Top Mesh and Bottom Mesh when processing the Template.

**Top Mesh** – creates a single *Mesh* element by tracing the ‘Top’ of a Corridor Model. All Template Points at the top of a Template are automatically connected to create the Top Mesh. The Top Mesh is Finished Grade for a Corridor Model.

**Bottom Mesh** – creates a single *Mesh* element by tracing the ‘Bottom’ of a Corridor Model. The Bottom Mesh is typically considered Subgrade for a Corridor Model. **IMPORTANT:** Cut and Fill Earthwork is calculated by the volumetric difference between the Bottom Mesh and Existing Ground Terrain Model.

**NOTE:** Mesh Elements are found in the 3D Design Model and can be used to create Finished Grade and Subgrade Terrain Models. By default, Top and Bottom Meshes are not displayed. Top and Bottom Mesh display settings are found in the Feature Definition properties for Corridors – within the Project Explorer.
9I.1.a Display Top and Bottom Meshes

By default, the FLH Workspace is set up with Top and Bottom Mesh Display DISABLED. To display the Top and Bottom Mesh in the 3D Design Models, the Corridor Feature Definition settings must be edited in the Project Explorer. Corridor Mesh settings are located in the Project Explorer under:

*OpenRoads Standards > Current DGN Name (Default) > Feature Definitions > Corridor > Current Corridor Feature Definition.*

The *Top Mesh Display* and *Bottom Mesh Display* must be changed from *False* to *True*.

![Image of Project Explorer settings](image)

After Corridor Feature Definition display settings are edited, the Corridor must be reprocessed for the Top and Bottom Mesh to finally be displayed.


9I.2 Create Finished Grade and Subgrade Terrain Models from Corridor

Using the Create Terrain Model from Design Meshes tool, Terrain Models can be created from the Top and Bottom Meshes of a Corridor. The Top Mesh of a Corridor represents the Finished Grade. The Bottom Mesh of a corridor represents Subgrade. See 9I.1 Top and Bottom Meshes.

**WARNING:** Corridor Models and Terrain Models are processed by the software differently. Corridors are created by Dropping Templates along an Alignment. Terrain Models are triangulated with an exterior Boundary and interior break lines. A common problem that occurs with this workflow is that the Terrain Model deviates from the Corridor – especially around the exterior boundary. This commonly occurs when the Corridor contains curves with small radii. Some manipulation may be required to calibrate the triangulation of the Terrain Model to match the Corridor. See Chapter 11: Calibrate Terrain Model Triangulation.

**TIP:** If the exterior boundary of the Terrain Model does NOT match the outer limits of the Corridor, then the Terrain Model should be deleted. Recreate the Terrain Model and ensure that Rule Exterior (Step 4) is set to Yes. By doing so an enclosed element - that traces the outer limits of the Corridor is created - along with the Terrain Model. Using the Add Boundary tool, the enclosed Corridor boundary element is incorporated into the Terrain Model – which will clip out the areas where the Terrain Model deviates from the Corridor.

**NOTE:** If multiple Corridors/Linear Templates or Referenced Corridors/Linear Templates are contained in the DGN, then a separate and distinct Terrain Model will be created for each Corridor or Linear Template.

**TIP:** Use the Create Complex Terrain Model tool to combine multiple Terrain Models into a single Complex Terrain Model.
1. Left-Click the *Create Terrain Model from Design Meshes* tool from the *Additional Methods* dropdown.

   The *Create Terrain Model* tool is found in the Ribbon at the following location: **OpenRoads Modeling → Terrain → Create**

2. **Prompt: Design Surface Side** – Select the desired Mesh from which to create a Terrain Model from. *Top* corresponds to Finished Grade. *Bottom* corresponds to Subgrade. Left-Click in the *View* to advance to the next prompt.

3. **Prompt: Design Surface Feature Definition** – Select an appropriate Feature Definition for the Terrain Model to be created. Left-Click in the *View* to advance to the next prompt.

4. **Prompt: Rule Exterior** – Select Yes or No and Left-Click in the *View* to complete the command.

   If Yes is selected, then a *3D Linear Element* is also created with the Terrain Model. The *3D Linear Element* is enclosed and will exactly trace the outer extents of the Corridor.

   The *3D Linear Element* can be used to calibrate the resulting Terrain Model. See **WARNING** and **TIP** on the previous page.

5. **Prompt: Rule Void** – Select Yes or No and Left-Click in the *View* to complete the command.

   If Yes is selected, then a *3D Linear Element* is created for each *void* or holes present in the Corridor.

   The *3D Linear Element* can be used to calibrate the resulting Terrain Model. See **WARNING** and **TIP** on the previous page.
9I.3 Create Alternate Surfaces - Workflow

Top and Bottom Meshes can be used to create Terrain Models for Finished Grade and Subgrade respectively. See 9I.1 Top and Bottom Meshes and 9I.2 Create Finished and Subgrade Terrain Models From a Corridor. However, it may be necessary to create a Terrain Model representing an intermediate layer in the Template. Intermediate layers are called Alternate Surfaces in the ORD software. See 8C.4 Alternate Surfaces.

In this workflow, an Alternate Surface Terrain Model is created to represent the top of aggregate layer in a road Template. In this workflow, the top of aggregate layer is referred to as the Red Tops layer. A Terrain Model representing the Red Tops could be used to provide staking information.
Double-Click on the first Alternate Surface point to bring up the Point Properties menu.  

In the *Alternate Surface* text box – manually type in the desired name for the Alternate Surface. In this demonstration, “Red Tops” is manually typed in.  

Left-Click on the *Apply* button and exit out of the Point Properties.  

Double-Click on the next point to be included in the “Red Tops” alternate surface – to bring up Point Properties menu.  

In the *Alternate Surface* text box – the “Red Tops” surface is now shown in the dropdown. Select the “Red Tops” Alternate Surface.  

Left-Click on the *Apply* button and exit out of the Point Properties.  

Repeat steps 4-6 for all Template Points necessary to delineate the “Red Tops” alternate surface. When completed, save the Template to the Template Library.
Reapply the Template to the Corridor with the *Synchronize With Library* tool.

Left-Click on the *Create Corridor Alternate Surfaces* tool from the *Additional Methods* dropdown. This tool is located under the *OpenRoads Modeling* workflow > *Terrain* ribbon > *Create* panel.

*Prompt: Locate Corridor* – Left Click on the Corridor to complete the command.

The “Red Tops” Terrain Model is now shown in the Project Explorer – but has not been given an appropriate Feature Definition. Open up the Properties of the “Red Tops” Terrain Model to set an *Alternate Surface* specific Feature Definition.