Chapter 16
CROSS SECTIONS
# Chapter 16  Cross Sections

This chapter covers the creation of Cross Sections and the procedure for the assembly Cross Section sheets for FLH Plan Set deliverables.

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Many concepts presented in the Plan and Profile sheets (Chapter 14 – Plan Sheet Production) are applicable to the creation of Road Cross Sections sheets. Each cross-section station will require the creation of a Named Boundary element with the Place Named Boundary tool. Next a corresponding CROSS SECTION Drawing Model is created for each Named Boundary element.

Cross Section Named Boundary elements are actually created in the 3D Design Model. However, they are shown in the 2D Design Model View through Referencing.
16A.1 Components and 3D Linear Elements (Points) in the Drawing Model

In the CROSS SECTION Drawing Models, there are two types of elements that comprise Road Cross Section graphics: 3D Linear Elements (Points) and Components. All 3D elements that intersect with the Named Boundary elements will be shown in the CROSS SECTION Drawing Models.

**NOTE:** Both Components and 3D Linear Elements (Points) are directly related to Road and Site Modeling Templates used to create Corridors, Linear Templates, and Surface Templates. Template Points and Components are created in the 3D Design Model when a Corridor, Linear Template, or Surface Template is processed.

3D Linear Elements (Points): 3D Linear Elements (Points) directly correspond to Template Points. A Template produces a 3D Linear Element when a Corridor is processed. When placing labels and annotations, the 3D Linear Elements (Points) are sought out by the Annotation Group. For more information on the labeling of 3D Linear Elements (Points), see 16D – Configuring Cross Section Annotations.

**NOTE:** In CROSS SECTION Drawing Models, Points are often imperceptible to the human eye (even when zoomed in). Use a Selection Window to identify a Point in the Properties Box.

Components: Components directly correspond with Template Components. Within the CROSS SECTION Drawing Models, Components are for graphical display purposes only. Components are NOT used for labeling/annotation purposes.

**NOTE:** Terrain Model (i.e., Existing Ground, Finished Ground) graphics are also found in Cross Section graphics. However, the User will generally NOT interact with these Terrain Model elements for annotation purposes.
16A.2 Cross Section Production Flow Chart

The flow chart below is intended to provide an overview for processes required to produce Cross Section sheets.

1. Create Cross Section Sheets
   - 16B- Create Cross Section - Workflow
     - Create the Cross Section ORD File
       - 16B.1 Create and Setup the Cross Section ORD File
       - Create CROSS SECTION Named Boundaries
         - 16B.2. Create the CROSS SECTION Named Boundary Elements
     - Setup Project Information and the Sheet Index for Sheet Numbering
       - 16B.3 Setup Project Information and Sheet Numbering (Index)
     - Create Drawing Models and Sheet Models
       - 16B.4 Create the Drawing Models and Sheet Models from the Named Boundary Manager

2. Manipulating Cross Section Labels (Annotations)
   - 16D - Cross Section Annotation Basics
   - 16E - Configuration Cross Section Annotation
     - Setup and Access the Annotation Group
       - 16D.3 Access and Setup of the Annotation Group Manager
     - Manipulate Annotations
       - 16F - Manipulating Offset/Elevation Labels
     - Miscellaneous Cross Section Annotation Workflows
       - 16G.1 Create Right-of-Way Annotation

3. Troubleshoot Cross Sections
   - 16H - Troubleshoot Cross Sections

4. Printing Cross Sections
   - 16I - Printing Cross Sections
16A.3 Warnings and Considerations for Cross Section Sheet Creation

**IMPORTANT:** The creation of Cross Sections is a straightforward procedure. However, if CROSS SECTION Named Boundary elements are created incorrectly, they are difficult or impossible to rectify. In other words, if Cross Sections are created incorrectly, the User will have to re-create them.

**WARNING:** Do NOT create CROSS SECTION Drawing Models and Sheet Models until ALL CROSS SECTION Named Boundary elements have been created and their placement reviewed.

**DESIGN ITERATIONS WARNING:** As a design evolves and the Alignment is adjusted, it is very likely that Cross Sections will have to be re-created for each design milestone (30%, 70%, 95%, Final). CROSS SECTION Named Boundary elements will NOT reposition if the Alignment is edited (shifted or moved).

**WARNING:** It is crucial that the User understands that CROSS SECTION Named Boundary elements are NOT dynamic after creation. The dimensions (width and height) and position (in respect to the Alignment) of CROSS SECTION Named Boundary elements CANNOT be changed after creation.

**Edits to the Alignment:** If the Alignment is altered (even slightly), the CROSS SECTION Named Boundary elements will NOT reposition to accommodate the horizontal change. In other words, CROSS SECTION Named Boundary elements will NOT be centered or perpendicular to the Alignment after edits to the Alignment. Similarly, all Named Boundary elements down-station of an Alignment edit will be at an uneven station location (i.e., 10+26.43).

**Edits to the Profile:** CROSS SECTION Named Boundary elements will NOT reposition vertically if the Profile were to change. Minor edits to the Profile may be acceptable, assuming the Cross Section graphics do NOT shift outside of the height limits of the CROSS SECTION Named Boundary elements.

**Edits to the Corridor Template:** Edits to Corridor Template may be acceptable. However, the User will have to re-create Cross Section Annotation Labels to reflect the new Corridor Template Point configurations. **NOTE:** If the Corridor Template is to significantly widen, then the cross-section graphics may shift outside of the width limits of the CROSS SECTION Named Boundary elements – in which case, the Cross Section will have to be created with wider Named Boundary elements.

**WARNING:** After CROSS SECTION Named Boundary elements have been created, the User CANNOT change the dimensions of the Cross Section Grid or Vertical Exaggeration. The dimensions of the Profile Grid directly correlate with the dimensions of the Named Boundary elements. If the dimensions of the Named Boundary elements are unacceptable, then the User will have to re-create them.

**MORE INFORMATION ABOUT THE CROSS SECTION GRID:** The HEIGHT of the Cross Section Grid is slightly different for each Cross Section. The height of the Grid is dependent on the Top and Bottom Clearances and the critical high/low point in the Cross Section graphics. See 16B.2.a.ii Top and Bottom Clearances and the Cross Section Grid Height.
This section covers the overall workflow for creating Cross Sections and the associated FLH Cross Section sheets.

Before creation of Cross Section, see 16A.3 Warnings and Considerations for Cross Sections for Cross Section Sheet Creation.

### 16B.1 Create and Setup the Cross Section ORD File

Cross Sections should be placed in a new ORD File.

**WARNING:** Do NOT create Cross Sections in the Corridor (prefix_cor.dgn) or other design files.

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
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<tbody>
<tr>
<td>1</td>
<td>Create a new ORD File. For the overall procedure for new ORD Files, see 3B – Create a New ORD File. Refer to 3C – ORD File Naming Conventions for naming of the Cross Section File.</td>
</tr>
<tr>
<td>2</td>
<td>Set the Coordinate System for the new ORD File. See 3D.1 Set the Coordinate System.</td>
</tr>
</tbody>
</table>
| 3    | In the new ORD File, Reference in the following ORD File types:  
  * Existing Survey File and/or Existing Terran Model File (_sur.dgn and/or _ter.dgn)*  
  * Mainline Alignment File (_ali.dgn)  
  * Corridor Modeling File (_cor.dgn)  
  * Any other ORD Files that contain 3D Modeling elements that should appear in the cross sections (i.e., Approach, Driveway, and Intersection modeling files [_cor_appr.dgn]).  
  * Existing and Proposed Right-of-Way Files (e_row.dgn and p_row.dgn)**  
  * **NOTE**: For Cross Section creation, it is necessary to activate the Existing Ground Terrain Model. Existing Survey linework is NOT strictly necessary for the Cross Section creation or labeling purposes. If the Existing Ground Terrain Model is contained in a dedicated ORD File (i.e., _ter.dgn), then it is NOT necessary to reference in the Existing Survey File (_sur.dgn).  
  * **NOTE**: Existing and Proposed Linework can be copied into the active Cross Section ORD File and projected into the cross sections. This procedure is shown in 16G.1 Create Right-of-Way Annotation. If the ROW linework does NOT need to be projected into the Cross Sections, then there is no need to reference the ROW ORD Files into the Cross Section ORD File.  
  |  
| 4    | Set the Existing Ground Surface as Active. For more information on Activating the Existing Ground Terrain Model, see 3D.3 Activate the Existing Ground Terrain Model.  
  * **NOTE:** After the Existing Ground Surface is activated in the 2D Design Model, a corresponding 3D Design Model will automatically be created in the ORD File. See 3D.3.a Creation of the 3D Design Model after Terrain Model Activation.  
  |  
| 5    | Open up a second View and set the second View to show the 3D Design Model. The User will perform all procedures in the 2D Design Model, but the 3D Design Model should be open for processing purposes.  
  * **WARNING:** If CROSS SECTION Named Boundaries are attempted to be created without the 3D Design Model, then an error message will be displayed.  

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**TIP:** Opening multiple View windows and controlling the Model shown in a View is discussed in Chapter 1.

**NOTE:** During the creation of CROSS SECTION Named Boundary elements, the User should have two View open at all times.

**View 1:** Showing the 2D Design Model  
**View 2:** Showing the 3D Design Model

**TIP:** Highlight (left-Click) on a second View toggle to open a second View.
16B.2 Create the CROSS SECTION Named Boundary Elements

**IMPORTANT:** If Cross Sections *Named Boundary* elements are created incorrectly, they are difficult or impossible to rectify after *Drawing Models* and *Sheet Models* have been created. For this reason, the User should take care to review the placement of each CROSS Section *Named Boundary* element before creating *Drawing Models* and *Sheet Models*. For example, if a CROSS SECTION *Named Boundary* element is too narrow, then the Proposed Road might sprawl past the horizontal limits of the Grid.

In the example shown above, it is possible to fit the entire Proposed Road fill slope into the Cross Section Grid by staggering the *Left Offset* and *Right Offset* for a specified station range. By doing so, the Cross Section Grid won't be exactly centered on the Alignment. Instead, the Grid will be shifted to capture the Proposed Road fill slope – within in the specified station range. This procedure is shown in **16B.2.b.ii Place Shifted Named Boundaries**.
16B.2.a Initial Setup of the *Named Boundary* Dialogue Box

In this step, the *Named Boundary* dialogue box is setup.

From within the 2D Design Model, select the Place Named Boundary tool from the Ribbon: [OpenRoads Modeling → Drawing Production → Named Boundaries].

In the Place Named Boundary Dialogue Box, select the Civil Cross Section mode by clicking on the icon.

Prompt: Place Named Boundary Civil Cross Section > Identify Path Element – Left-Click on the Alignment.
**Drawing Seed:** The *Drawing Seeds* corresponds to the design scale that Cross Section will be shown at on the *Sheet Models*.

Most roadway projects utilize the **10 Scale Portrait** or **20 Scale Portrait** *Drawing Seeds*. The *Drawing Seed* directly corresponds with the *Total Cross Section Length* that can be shown in the sheets. For example, the **10 Scale Portrait Drawing Seed** can show a total of 90 feet of a roadway cross section (45 feet on each side of the Alignment). See [16B.2.a.i Cross Section](#) *Drawing Seed Table and Total Lengths* for Total Cross Section Length available for each *Drawing Seed*.

**TIP:** The User should have a rough idea of how much cross-sectional length is needed when choosing a *Drawing Seed*. For example, if the average existing right-of-way width is 100 feet, then the **10 Scale Portrait Drawing Seed** would be insufficient, because it only shows a total cross-sectional width of 90 feet.

**IMPORTANT:** The Drawing Seed will automatically set the Left Offset and Right Offset.

**Detail Scale:** The *Detail Scale* is automatically set by the *Drawing Seed*.

**WARNING:** Do NOT manually change the *Detail Scale*.

**Group:** When creating the first set of *Named Boundaries*, the *Group* will be set to *(New)*. After the first set is finally placed, a *Group* (with the *Name* shown just below) is created and is selectable in this drop-down.

**TIP:** When creating additional *Named Boundary* elements, ALWAYS select the previously-created *Group* from the drop-down.

**BEST PRACTICE:** All *Named Boundary* elements in the Cross Section ORD File should be assigned to the same *Group*. In later steps, all *Named Boundaries* must be contained in the same *Group* to be displayed continuously in the *Sheet Models*.

**WARNING:** The *Group Name* is also important in sheet production because it will be prominently shown in the Title Block of the resulting *Sheet Models*. For information about the *Fields* contained within the Title Block, see [16B.3 Setup Project Information and the Sheet Index for Sheet Production](#). When the Alignment (path element) is selected, the *Group Name* will take the same Name as the Alignment – which should be named in accordance to the FLH Naming Convention. See [3f - Naming Convention for Alignments, Profiles, Corridors, And Terrain Models](#).

**Start Location** and **End Location:** These Locations can be determined by clicking on the intended location along the Alignment.

**WARNING:** Do NOT set *Start/End Location* at this point. *Start/End Location* are set in the next process – [16B.2.b.i: Place the First Set of CROSS SECTION Named Boundary elements](#).
Left Offset and Right Offset: The Left/Right Offsets determine the width of the CROSS SECTION Named Boundary element. Left/Right Offsets widths are relative to the Alignment (which was selected in the step ). The combined sum (absolute value) of the Left/Right Values will determine the TOTAL width of the Cross Section. For example, Left Offset = -45.000 and Right Offset = 45.000 will create a Cross Section that is 90 feet wide and is centered on the Alignment.

TIP: The Left/Right Offsets can be varied to show more cross section width on one side of the Alignment, and less width on the other. However, the combined sum (absolute value) of the Left/Right Values should always equal to the Total Cross Section Length need for the selected Drawing Seed. Total Cross Section Length values are shown in 16B.2.a.i Cross Section Drawing Seed Table and Total Lengths.

Interval: The Interval sets the cross section spacing. Typically, roadway design projects will require an Interval of every 50 feet or 100 feet.

NOTE: To place a Cross Section element on the PC/PT of Horizontal Curves (along with other important horizontal geometry points), the Include Control Points box must be CHECKED.

NOTE: Regardless of the start station of the Alignment, CROSS SECTION Named Boundaries will always be placed at round, even stations. For example, with an Interval of 50 feet, if the Alignment starts at station 9+76.58, then the first Named Boundary will be placed at this 9+76.58 starting location. The subsequent Named Boundaries will be placed at 10+00, 10+50, 11+00, etc...

Vertical Exaggeration: If desired, enter in a Vertical Exaggeration value. For typical FLH Projects, road cross sections are NOT vertically exagerated (i.e., Vertical Exaggeration = 1).

Top Clearance and Bottom Clearance: Top/Bottom Clearance is automatically set by the Drawing Seed.

IMPORTANT: The Top and Bottom Clearance are the only control the User has on the Cross Section Grid height. If Top/Bottom Clearance are NOT used (boxes are UNCHECKED), then the Grid height directly corresponds with the Critical High Point and the Critical Low Point.

For a graphical depiction of Top/Bottom Clearance and the Critical High/Low Point, see 16B.2.a.ii Top and Bottom Clearances and the Cross Section Grid Height.

Bottom Clearance: The amount of Grid that will be created below the LOWEST POINT in the cross section (Critical Low Point). The LOWEST POINT critical point can correspond to either the Existing Ground or Proposed Road.

NOTE: The actual Bottom Clearance value (as measured by the User from the bottom axis of the Grid to the LOWEST POINT critical point), will be slightly larger than specified because the bottom of the grid must honor the Elevation Datum Spacing value. The Elevation Datum Spacing value is used to place the bottom of the grid at a nice, round elevation value.

Top Clearance: The amount of Grid that will be created above the HIGHEST POINT in the cross section (Critical High Point).
### Elevation Datum Spacing:

The Cross Section Grid will always begin on a multiple of the value entered into this box. For example, for a value of 2.000, the bottom axis will begin at elevations that are multiples of 2 (i.e., 2842, 8546, 9550, etc.).

**TIP:** When a value of 0.000 is entered, then the elevation of the bottom axis is unrounded and placed with respect to the Bottom Clearance and Critical Low Point.

**BEST PRACTICE:** For road cross sections, use the default value, which is automatically set by the Drawing Seed. Typically, the default value is 2.0000. However, it may be desirable to coordinate this value with the Vertical major axis labels – which are typically shown every at elevation values of 10 (i.e., 1790, 1800, 1810). For example, an Elevation Datum Spacing of 10.0000 would assure that a Vertical major axis label is always placed at the bottom of the grid.

### Event Point List:

If Event Point Lists (not covered in this manual) are used, then a Cross Section is created at each station that corresponds with an Event Point.

### Include Control Points:

If this box is CHECKED, then a Cross Section is created at each horizontal Alignment geometry point (i.e., PC/PT of curves). For typical FLH Projects, it is conventional to place Cross Sections at Control Points (ensure box is CHECKED).

**NOTE:** When this box is CHECKED, CROSS SECTION Named Boundaries are NOT placed at Vertical profile geometry points (i.e., VPI, VPC, VPT of vertical curves).

### Backward Facing:

If CHECKED, the Cross Sections will be mirrored (backwards). Typically, this box remains UNCHECKED.

### Create Drawing:

If this box is CHECKED, then CROSS SECTION Drawing Models and Sheet Models are created immediately after use of this tool.

If this box is UNCHECKED, the Drawing/Sheet Models must be created from the Named Boundary Manager.

**BEST PRACTICE:** Keep this box **UNCHECKED** to create Drawing Models and Sheet Models from the Named Boundary Manager – as shown in 16B.4 Create the Drawing Models and Sheet Models from the Named Boundary Manager.

### Show Dialog:

This option is only available if the Create Drawing box is CHECKED. When this box is CHECKED, then the User will be presented with the Named Boundary Dialogue Box before creation of the CROSS SECTION Drawing Models and Sheet Models. If this box is UNCHECKED, then the Dialogue Box is NOT shown.
16B.2.a.i Cross Section Drawing Seed Table and Total Lengths

The table below is useful for determining the Total Length that a Cross Section Drawing Seed is capable of displaying.

**NOTE:** The Total Length is the absolute value sum of the default Right Offset and Left Offsets.

The table below is also useful for placing uncentered (shifted) CROSS SECTION Named Boundary elements relative to the Alignment. This is performed by varying the Right Offset and Left Offsets. Although the Right Offset and Left Offsets may be varied, their combined (absolute value) sum should still equal to the Total Length – as shown in the table below.

For example, when using the 20 Scale XS Portrait Drawing Seed, the User might use the following configuration to shift the Named Boundary elements 30 feet to the right:

**Drawing Seed:** 20 Scale XS Portrait (Total Length = 180 ft)

**Shifted Left Offset** = -60 ft (Default Left Offset = -90 ft)

**Shifted Right Offset** = +120 ft (Default Right Offset = +90 ft)

| -60 ft | + | +120 ft | = 180 ft (Total Length) |

### Cross Section Drawing Seeds

<table>
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<tr>
<th>Drawing Seed</th>
<th>Sheet Size</th>
<th>Sheet Orientation</th>
<th>Default Left Offset</th>
<th>Default Right Offset</th>
<th>Total Length</th>
<th>Top / Bottom Clearances</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 Scale XS Landscape</td>
<td>11”x17”</td>
<td>Landscape</td>
<td>-75 ft</td>
<td>+75 ft</td>
<td>150 ft</td>
<td>8 ft / 12 ft</td>
</tr>
<tr>
<td>10 Scale XS Landscape Letter</td>
<td>8.5”x11”</td>
<td>Landscape</td>
<td>-45 ft</td>
<td>+45 ft</td>
<td>90 ft</td>
<td>8 ft / 12 ft</td>
</tr>
<tr>
<td>10 Scale XS Portrait</td>
<td>11”x17”</td>
<td>Portrait</td>
<td>-45 ft</td>
<td>+45 ft</td>
<td>90 ft</td>
<td>8 ft / 12 ft</td>
</tr>
<tr>
<td>20 Scale XS Landscape</td>
<td>11”x17”</td>
<td>Landscape</td>
<td>-150 ft</td>
<td>+150 ft</td>
<td>300 ft</td>
<td>16 ft / 30 ft</td>
</tr>
<tr>
<td>20 Scale XS Landscape Letter</td>
<td>8.5”x11”</td>
<td>Landscape</td>
<td>-90 ft</td>
<td>+90 ft</td>
<td>180 ft</td>
<td>16 ft / 30 ft</td>
</tr>
<tr>
<td>20 Scale XS Portrait</td>
<td>11”x17”</td>
<td>Portrait</td>
<td>-90 ft</td>
<td>+90 ft</td>
<td>180 ft</td>
<td>16 ft / 30 ft</td>
</tr>
<tr>
<td>30 Scale XS Landscape</td>
<td>11”x17”</td>
<td>Landscape</td>
<td>-225 ft</td>
<td>+225 ft</td>
<td>450 ft</td>
<td>24 ft / 44 ft</td>
</tr>
<tr>
<td>30 Scale XS Portrait</td>
<td>11”x17”</td>
<td>Portrait</td>
<td>-135 ft</td>
<td>+135 ft</td>
<td>270 ft</td>
<td>24 ft / 44 ft</td>
</tr>
<tr>
<td>40 Scale XS Landscape</td>
<td>11”x17”</td>
<td>Landscape</td>
<td>-300 ft</td>
<td>+300 ft</td>
<td>600 ft</td>
<td>32 ft / 62 ft</td>
</tr>
<tr>
<td>40 Scale XS Portrait</td>
<td>11”x17”</td>
<td>Portrait</td>
<td>-180 ft</td>
<td>+180 ft</td>
<td>360 ft</td>
<td>32 ft / 62 ft</td>
</tr>
</tbody>
</table>
16B.2.a.ii Top and Bottom Clearances and the Cross Section Grid Height

The graphic below shows how the Top and Bottom Clearances will interact with the resulting height of the CROSS SECTION Named Boundary elements. For the configuration below, the “10 Scale XS Portrait” Drawing Seed is used and the Top and Bottom Clearance boxes are CHECKED.

If the Top and Bottom Clearance boxes are UNCHECKED, then height of the Named Boundary element is reduced. The height of the Grid is exactly the height needed to vertically fit the Existing Ground and Proposed Road within the Cross Section Grid – as shown below.

16B.2.b Place the CROSS SECTION Named Boundary Elements

After the initial setup of the Named Boundary Dialogue Box, the User can begin to layout the Named Boundary elements for eventual creation of the Drawing Models and Sheet Models.
16B.2.b.i Place the First Set of CROSS SECTION Named Boundary Elements

In this step, the User will need to pay attention to both the Prompts and the Place Named Boundary dialogue box. It is very IMPORTANT for the User to know which Prompt is currently displayed in the lower left-hand corner of the ORD Software window.

**IMPORTANT:** To avoid placing CROSS SECTION Named Boundary elements that do NOT capture the entire road section, the User should examine each Named Boundary element before accepting placement. By scrolling the Mouse Cursor along the Alignment, a preview of each Named Boundary element will be shown. The User should ensure that the Named Boundary extends past the Slope Stake Limits, Right-of-Way, and other important features to be shown in the cross sections.

At this point in the workflow, the Alignment should have already been selected as the Path Element.

See 3 of 16B.2.a Initial Setup of the Named Boundary Dialogue Box.

**Prompt:** Accept/Reject. Identify Path start point to place boundary - In the Place Named Boundary dialogue box, type in the Start Location (this is the Start Station of the project) and press the ENTER key to lock it (when the box is CHECKED, then the Start Location is locked).

Ensure that the box next to Start Location is checked. Left-Click in the View to accept the Start Location and advance to the next Prompt.

**NOTE:** The User may have to Left-Click in the View twice to advance to the next Prompt.

**IMPORTANT:** In the next step, carefully examine the placement of all Named Boundary elements.
Prompt: Place Named Boundary Civil Plan > Identify Path end point to place boundary - 

By moving the mouse cursor along the length of the Alignment, the User will see a preview of where each Named Boundary element will be placed. Examine each Named Boundary element for sufficiency.

If the Named Boundary element does NOT extend past all Slope Stake Limits, Right-of-Way, and other important features, then hover the mouse up to the LAST station that is sufficient.

**NOTE:** If the placement of ALL Named Boundary elements were examined and found to be sufficient, then proceed to 16B.3 Setup Project Information and Sheet Numbering (Index).

In the Named Boundary Dialogue Box, the approximate station of the LAST sufficient Named Boundary is shown in the Stop Location box.

**WARNING:** Do NOT place the STOP Location at an unrounded value (i.e., 25+68.81). This is usually mistakenly done by accepting the Stop Location by graphically left-clicking in the View.

Instead, in the Place Named Boundary dialogue box, type in the ROUNDED Stop Location station. (i.e., 25+50.00). Press the ENTER key to lock in the ROUNDED Stop Location station.

**WARNING:** Before accepting placement of the Stop Location, ensure that the Create Drawing box is UNCHECKED. If this box is CHECKED, then the resulting Sheet Models will NOT contain the correct Sheet Numbers. Additionally, subsequent Named Boundaries to be placed will NOT be continuous with the first set when scrolling through the resulting Cross Section sheets. Drawing Models and Sheet Models will eventually be created in the Named Boundary Manager – as shown in 16B.4 Create the Drawing Models and Sheet Models.

Ensure that the box next to Stop Location is checked. Left-Click in the View to place the first set of CROSS SECTION Named Boundary elements.
16B.2.b.ii Place Shifted Named Boundaries

If the placement of ALL Named Boundary elements were found to be sufficient in the previous step, then proceed to 16B.3 Setup Project Information and Sheet Numbering (Index).

In this procedure, the Named Boundary elements will be shifted to the left to accommodate a large fill slope on the left side. The Named Boundary Dialogue Box will be set up with the same configuration shown in 16B.2 Initial Setup of the Named Boundary Dialogue Box. However, the Right Offset and Left Offset parameters will be altered so that the Named Boundaries are uncentered (shifted) relative to the Alignment.

**BEST PRACTICE:** Place shifted Named Boundary elements only in the station range in which it is necessary to show the entire cross-sectional design. It is **BEST PRACTICE** to place Named Boundary elements centered on the Alignment when practical.

**WARNING:** Create the shifted set of CROSS SECTION Named Boundary elements using the same Group as was used in the initial set. If a different Group is used, then initial and subsequent sets of cross section sheets may contain discontinuous Sheet Numbers and introduce further problems.

---

**WARNING:** Ensure that the Group is **NOT** set to (New).

**Use the same Group that was created in the First Set of CROSS SECTION Named Boundary elements.**

---

<table>
<thead>
<tr>
<th>1</th>
<th>From within the 2D Design Model, select the Place Named Boundary tool from the Ribbon: [OpenRoads Modeling → Drawing Production → Named Boundaries].</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Prompt: Place Named Boundary Civil Cross Section &gt; Identify Path Element – Left-Click on the Alignment.</td>
</tr>
<tr>
<td>3</td>
<td>Setup the Place Named Boundary Dialogue Box as shown in 16B.2 Initial Setup of the Named Boundary Dialogue Box. However, setup of the Group and Left/Right Offsets will be shown in the next steps.</td>
</tr>
</tbody>
</table>
**Group:** From the *Group* drop-down, select the *Group* that was created previously.

**NOTE:** At this point, only the previously-created *Group* should be available.

**WARNING:** Ensure that the *Group* drop-down is NOT set to *(New)* for subsequent sets of *Named Boundary* elements.

**Left Offset** and **Right Offset:** In order to shift the CROSS SECTION *Named Boundary* elements – such that they are uncentered on the Alignment – the **Left** and **Right Offsets** need to be unequal.

However, when the **Left** and **Right Offsets** are adjusted, they should still equal to the **Total Length** that corresponds with the selected **Drawing Seed**. For more information see [16B.2.a.i Cross Section Drawing Seed Table and Total Lengths](#).

In this case, in order to show the large fill, the CROSS SECTION *Named Boundary* elements will be shifted 15 feet to the left. This is performed by varying the offsets as shown:

**Drawing Seed:** 20 Scale XS Portrait *(Total Length = 180 ft)*

- **Shifted Left Offset** = -75 ft  (Default Left Offset = -90 ft)
- **Shifted Right Offset** = +105 ft  (Default Right Offset = +90 ft)
Start Location: The desired Interval spacing and Start Location should be coordinated and with the station of the last Named Boundary element placed in 16B.2.i Place the First Set of CROSS SECTION Named Boundaries.

In this case, the last Cross Section (for the first set) was placed at 25+50. Since the Interval being used is every 50 ft, the Start Station for this subsequent set should be set to 26+00.

Type in the Start Location and press the ENTER key to CHECK and lock the Start Location box.

Left-Click in the View to accept the Start Location and advance to the next Prompt.

Prompt: Place Named Boundary Civil Plan > Identify Path end point to place boundary - Using the Mouse Cursor, determine the Stop Location for this set of shifted, uncentered Named Boundary elements.

In the Named Boundary Dialogue Box, type in the ROUNDED Stop Location station. (i.e., 26+50). Press the ENTER key to lock in the ROUNDED Stop Location station.

Ensure that the box next to Stop Location is checked. Left-Click in the View to complete placement of the shifted, uncentered Named Boundary elements.

Create the remaining Named Boundary elements as shown in 16B.2.b.i Place the First Set of CROSS SECTION Named Boundary Elements. However, return the Left and Right Offset values to the default values.
16B.3 Setup Project Information and Sheet Numbering (Index)

The WorkSet and Sheet Index must be properly setup to ensure that Cross Section Sheets are correctly numbered and contain the correct project information in the FLH Cross Section Sheet Border.

**BEST PRACTICE:** Ideally, the WorkSet and Sheet Index should be set up before the creation of Drawing Models and Sheet Models. However, the WorkSet and Sheet Index Fields can be updated (refreshed) by printing the Cross Section Sheets. See 16I.1 WARNINGS for the Printing of Cross Sections.

The graphics below show the FLH Cross Section Border after the creation of Sheet Models.

**UPPER-RIGHT CORNER of FLH Cross Section Sheet Border**

- **PROJECT INFORMATION** is populated from proper setup of WorkSet Properties.

  - These blank Fields are used for the PMIS Number and the NPS Drawing Number (NPS projects ONLY).

- **SHEET NUMBER** is only populated if the Sheet Index is properly setup.

**LOWER-MIDDLE TITLE BLOCK of FLH Cross Section Sheet Border**

- **Group name** assigned in the creation of CROSS SECTION Named Boundary elements.

- **ORD File Title**

  - This Field is linked to the "Title" of the Active Cross Section ORD File.

  - This Field is set at File > Properties > Extended > Title

- **Name of the current Sheet Model**

  - This Field is linked to the WorkSet Properties. The "Proj Name" property is linked to this Field.

  - **NOTE:** The Sheet Model name will automatically include the suffix: "...[SHEET]" when created. To exclude the suffix, the Sheet Model would have to be manually renamed - which is infeasible on longer projects with an abundance of sheets.
16B.3.a Setup the WorkSet Properties for the Project Information

There are two requirements for showing the appropriate project information (WorkSet Properties) in the FLH Cross Section Sheet Border:

- The Cross Section ORD File (\_xs.dgn) must be assigned to the appropriate project WorkSet. For more information on WorkSet and assigning ORD Files to the appropriate WorkSet, see Chapter 1 and 2B - Introduction To The WorkSpace And WorkSet.
- For the project WorkSet, the User must create the WorkSet Properties—which correspond with Fields contained in the FLH Cross Section Sheet Border.

**WARNING:** The name of custom WorkSet Properties must be typed in exactly—including correct capitalization (i.e., “Proj Name”, “Proj Number”, “State”, etc.).

The creation of custom WorkSet Properties is shown in 2D.1 Create WorkSet Properties for Sheet Borders - Workflow.
16B.3.b Setup the Sheet Index in the Project Explorer

For newer projects – created with the Version 10.08.01 WorkSpace or later – the Sheet Index should be automatically setup when the WorkSet is initially created. However, for on-going projects created with legacy WorkSpaces, it may be required to manually setup the Sheet Index.

The Sheet Index is found in the Project Explorer.

**IMPORTANT:** Ensure that the Cross Section ORD File (_xs.dgn) opened and is assigned to the appropriate project WorkSet.

6. Close the Sheet Index by clicking the Make Sheet Index Read Only icon.

1. Open the Project Explorer.

2. Expand the Sheet Index drop-down.

3. Open Sheet Index for Edit by clicking the icon.

4. Right-Click on the X-Sections folder and select Properties.

5. Ensure that the Sheet Number Prefix is set to "XS".

**IMPORTANT:** If the X-Sections folder is NOT found, then follow the procedure on the next page.
If the **X-Section** folder is NOT found in the *Sheet Index*, then the User will have to manually create an **X-Section** folder to house the CROSS SECTION *Sheet Models*. Follow steps 1-3 as shown on the previous page to open the *Sheet Index* for edits.

4. **Create a new Folder by clicking Create Folder.**
   
   Name the folder "**X-Sections**".

6. **Right-Click** on the **X-Sections** folder and select **Properties**.

7. **Close the Sheet Index by clicking the Make Sheet Index Read Only icon**.

   In the **Sheet Number Prefix** box, manually type in "**XS**".
16B.4 Create the Drawing Models and Sheet Models from the Named Boundary Manager

After Project Information, the Sheet Index, and CROSS SECTION Named Boundary elements have been placed, the CROSS SECTION Drawing Models and Sheet Models can be created from the Named Boundary Manager. For a more detailed overview of the Named Boundary Manager, see 14A.3 Place Named Boundary tool and the Named Boundary Manager and 14B.6 STEP 8: Create Drawing Models and Sheet Models.

IMPORTANT WARNING: Before attempting to open the Named Boundary Manager, ensure that a View showing the 3D Design Model is opened. If these two Views are NOT opened, then an error message will be displayed and Cross Section sheets will NOT be created.
In this procedure, the *Create Drawing Dialogue Box* is setup. By using the *Add To Sheet Index* function, the resulting *Sheet Models* will be correctly numbered – assuming that the *Sheet Index* folder has been setup with the appropriate *Sheet Number Prefix* (i.e., “XS.").

**IMPORTANT:** Ensure that the *Annotation Group* is set. If the “XS Grid w/ Annotation” group is NOT used in the *Active ORD File*, then customization of Cross Section Annotations will NOT be available. Customization of Cross Section Annotation Groups is shown in *16E – Configuring Cross Section Annotations*.

1. Ensure that the **Annotation Group** is set to "XS Grid w/ Annotation".
2. **CHECK** the *Add To Sheet*.
3. Push the *Select a folder from Sheet Index* icon.
   - Select (highlight) the "X-Sections" Folder.
4. Push **OK** to create the *Drawing Models* and *Sheet Models*. 
Using the *Civil Cross Section By 2 Points* mode, Cross Sections that are skewed relative to the Alignment can be created. In this example, a CROSS SECTION *Named Boundary* will be placed inline with a skewed culvert for presentation in a Plan Set.
16C.1 Create and Setup the Cross Section ORD File

**WARNING:** Do NOT place skewed Cross Sections in Modeling ORD Files (i.e., Corridor File or Culvert Modeling File) or other design files.

Skewed Cross Sections for culverts should be placed in a dedicated Plan Sheet File. Skewed Cross Sections for plan set production will contain Sheet Models, which means they should be placed in a Plan Sheet File. See 3C – ORD File Naming Conventions.

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Create a new Plan Sheet ORD File. For the overall procedure for new ORD Files, see 3B – Create a New ORD File. Refer to 3C – ORD File Naming Conventions for naming of Plan Sheet Files.</td>
</tr>
<tr>
<td>2</td>
<td>Set the Coordinate System for the new ORD File. See 3D.1 Set the Coordinate System.</td>
</tr>
</tbody>
</table>
| 3    | In the new ORD File, Reference in the following ORD File types:  
  - Existing Survey File and/or Existing Terran Model File (_sur.dgn and/or _ter.dgn)*  
  - Mainline Alignment File (_ali.dgn)  
  - Corridor Modeling File (_cor.dgn)  
  - Culvert Modeling File (_hyd_cor.dgn) or any Modeling File that contains desired Culvert modeling elements.  
  **NOTE:** For Cross Section creation, it is necessary to activate the Existing Ground Terrain Model. If the Existing Ground Terrain Model is contained in a dedicated ORD File (i.e., _ter.dgn), then it is NOT necessary to reference in the Existing Survey File (_sur.dgn). |
| 4    | Set the Existing Ground Surface as Active. For more information on Activating the Existing Ground Terrain Model, see 3D.3 Activate the Existing Ground Terrain Model.  
  **NOTE:** After the Existing Ground Surface is activated in the 2D Design Model, then a corresponding 3D Design Model will automatically be created in the ORD File. See 3D.3.a Creation of the 3D Design Model after Terrain Model Activation. |
| 5    | Open up a second View and set the second View to show the 3D Design Model. The User will perform all procedures in the 2D Design Model, but the 3D Design Model should be open for processing purposes.  
  **WARNING:** If CROSS SECTION Named Boundaries are attempted to be created without the 3D Design Model, then an error message will be displayed. |
16C.2 Create a Dummy Alignment that Matches with the Drawing Seed

With the Civil Cross Section 2 Points mode, the resulting CROSS SECTION Named Boundary (and Cross Section grid) is the exact length between the User-specified 2 Points. This is problematic because the resulting Cross Section grid may be too wide or too narrow when placed in the Sheet Model. If the User does NOT choose the 2 Points carefully, then the resulting Cross Section Grid may extend beyond the Sheet Border in the Sheet Model - as shown below.

To ensure the resulting Cross Section Grid that exactly lines up with the Sheet Border, a Dummy Alignment can be created atop the Culvert Alignment to assist in specifying the 2 Point locations. The Dummy Alignment length should be coordinated with the desired CROSS SECTION Drawing Seed. As discussed in 16B.2.a.i Cross Section Drawing Seed Table and Total Lengths, each Drawing Seed corresponds with a total maximum Cross Section Grid length.

**NOTE:** The User will click on the Dummy Alignment end points to specify the Length and Orientation of the resulting CROSS SECTION Named Boundary element.

<table>
<thead>
<tr>
<th><strong>Based on the Culvert length, select an appropriate Drawing Seed from the table shown in</strong> 16B.2.a.i Cross Section Drawing Seed Table and Total Lengths.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>The Total Length of the Drawing Seed should be larger than the culvert length to fit the entire culvert design into the Cross Section Grid.</strong></td>
</tr>
<tr>
<td><strong>In this case, the culvert length is 80 feet. The “10 Scale XS Landscape” is selected because it has a Total Length of 150 feet and produces an 11” x 17” sheet in a Landscape orientation.</strong></td>
</tr>
<tr>
<td><strong>TIP:</strong> For plan sets, it is conventional to use 11” x 17” sheet size in a Landscape orientation. Do NOT use “Landscape Letter” or “Portrait” Drawing Seeds for Culvert Plan Sheets to be included in the plan set.</td>
</tr>
<tr>
<td><strong>In the 2D Design Model, draw a SmartLine (Dummy Alignment) with length that equals to the Drawing Seed Total Length.</strong> In this case, a SmartLine that is 150 feet is created.</td>
</tr>
</tbody>
</table>
Use the *Move* tool to place the SmartLine (Dummy Alignment) atop the Culvert Alignment.

**TIP:** To ensure the culvert graphics are centered on the Road Alignment within the Profile Grid, choose the SmartLine midpoint as the move basepoint. Place the SmartLine midpoint directly onto the intersection of Culvert Alignment and Road Alignment.

**IMPORTANT:** By placing the midpoint of the Dummy Alignment exactly onto the intersection with the Road Alignment, the horizontal axis label will be 0 at the Road Alignment – which is conventional in FLH Plans. For a graphical depiction of this concept, see [16C.4 Resulting Skewed Cross Section Sheet](#).

Use the *Rotate* tool to rotate the SmartLine (Dummy Alignment) in line with Culvert Alignment.

**NOTE:** The Place SmartLine, Move, and Rotate tools are discussed in *Chapter 6 – Drawing Tools*.
16C.3  Create the Skewed CROSS SECTION Named Boundary

**WARNING:** If CROSS SECTION Named Boundaries are attempted to be created without the 3D Design Model, then an error message will be displayed. Ensure that a second View is opened and displaying the 3D Design Model.

16C.3.a  Setup the Place Named Boundary Dialogue Box

In this procedure, the Place Named Boundary Dialogue Box is setup. All settings found in this dialogue box are discussed in detail in 16B.2.a Initial Setup of the Named Boundary Dialogue Box.

---

**NOTE:** Select the Road Alignment for the Path Element

---

10. From within the 2D Design Model, select the Place Named Boundary tool from the Ribbon: [OpenRoads Modeling → Drawing Production → Named Boundaries].

11. In the Place Named Boundary Dialogue Box, select the Civil Cross Section 2 Points mode by clicking on the icon.

**Prompt:** Place Named Boundary Civil Cross Section 2 Points > Identify Path Element – In the 2D Design Model, Left-Click on the Road Alignment.

**IMPORTANT:** To automatically show the Road Alignment Stationing in the title of the resulting Sheet Border, use the Road Alignment as the Path Element.
**Drawing Seed:** In the *Place Named Boundary* dialogue box, set the **Drawing Seed** from the drop-down. Use the **Drawing Seed** selected in step 6 - which should be coordinated with the Dummy Alignment length. In this case, the “10 Scale XS Landscape” **Drawing Seed** is used.

**Group and (Group) Name:** When creating the first CROSS SECTION Named Boundary in the ORD File, the **Group** will be set to “(New)”.

Assign the **Group** to be created a logical name. In this case, “Culvert Group” is typed into the **Group Name** box. When creating subsequent CROSS SECTION Named Boundaries, select the **Group** created in this step from the drop-down.

**Vertical Exaggeration:** If desired, enter in a **Vertical Exaggeration** value. Typically, Culvert Cross Sections are NOT exaggerated (i.e., Vertical Exaggeration = 1).

**Top Clearance and Bottom Clearance:** **Top/Bottom Clearance** is automatically set by the **Drawing Seed**. In this case, the default values are used.

Top/Bottom Clearance and the Critical High/Low Point are discussed in 16B.2.a.ii Top and Bottom Clearances and the Cross Section Grid Height.

**IMPORTANT:** The **Top** and **Bottom Clearance** are the only control the User has on the Cross Section Grid height. If **Top/Bottom Clearance** are NOT used (boxes are UNCHECKED), then the Grid height directly corresponds with the **Critical High Point** and the **Critical Low Point**.

**Elevation Datum Spacing:** The Cross Section **Grid** will always begin on a multiple of the value entered into this box. For example, for a value of 2.000, the bottom axis will begin at elevations that are multiples of 2 (i.e., 2842, 8546, 9550, etc.).

**TIP:** It may be desirable to coordinate this value with the Vertical major axis labels – which are typically shown every at elevation values of 10 (i.e., 1790, 1800, 1810). For example, an **Elevation Datum Spacing** of 10.0000 would assure that a Vertical major axis label is always placed at the bottom of the grid.

**Backward Facing:** If CHECKED, the Culvert Cross Section will be mirrored (backwards). Typically, this box remains UNCHECKED.

**Create Drawing:** In this case, this box is CHECKED in order to create a **Drawing Model** and **Sheet Model** immediately after placement of the **Named Boundary**.

**Show Dialog:** To ensure the correct **Annotation Group** is used, this box should be CHECKED.
16C.3.b Place the Skewed Named Boundary

In this procedure, the 2 Points that define the resulting Named Boundary length and rotation are specified.

**IMPORTANT:** Use the Dummy Alignment end points as the 2 Point locations. Use the Key Point Snap to Dummy Alignment end points.

**TIP:** The clicking order of the 2 Points will define the direction of the Cross Section Grid. The first point corresponds with the left-side of the Grid. The second point corresponds with the right-side of the Grid. In this example, the inlet side of the culvert is used as the first point to show the culvert sloping downward from left to right in the Cross Section Grid.

**WARNING:** If CROSS SECTION Named Boundaries are attempted to be created without the 3D Design Model, then an error message will be displayed. Ensure that a second View is opened and displaying the 3D Design Model.

---

**Prompt:** Place Named Boundary Civil Cross Section 2 Points > **Enter First Point** – Left-Click on the Dummy Alignment end point located near the **inlet** of the culvert.

**Prompt:** Place Named Boundary Civil Cross Section 2 Points > **Enter Second Point** – Left-Click on the Dummy Alignment end point located near the **outlet** of the culvert.

**Prompt:** Place Named Boundary Civil Cross Section 2 Points > Accept/Reject. Data Point in Plan View to place boundary – Left-Click anywhere in the 2D Design Model to accept and create the CROSS SECTION Named Boundary elements.

---

**WARNING:** Do NOT use the Culvert Alignment end points for the 2 Point locations. Use the Dummy Alignment end points.
If the Show Dialog box was CHECKED in step 20, then the Create Drawing dialogue box will be shown. Typically, there is no configuration required for this dialogue box. However, ensure that an appropriate Annotation Group is selected.

The Annotation Group controls the appearance of the Cross Section Grid and annotation labels that will be used. See 16D – Cross Section Annotation Basics and 16E – Configuring Cross Section Annotations.

After the OK button is pushed, the CROSS SECTION Drawing Model and Sheet Model will be created.
16C.4 Resulting Skewed Cross Section Sheet

If the Dummy Alignment midpoint was placed directly on to the intersection with the Road Alignment, then the Cross Section Grid station 0 will be in line with the Road Alignment.

See Step 8.
In highway design, the roadway cross-sectional geometry often varies from project to project. For this reason, the default Annotation Group ("XS Grid w/ Annotations") - found within the FLH WorkSpace – will likely require customization to accommodate project-specific cross-sectional geometry.

In general, Cross Section Annotations operate under many of the same concepts present in **15D – Civil Annotations (Stationing & Profile)**.

Cross Section Annotation labels are found and created within CROSS SECTION Drawing Models.
16D.1 Guide to the Default Cross Section Annotation Groups found in the FLH WorkSpace

Cross Section Grid and Annotation elements belong to Cross Section Annotation Groups. There are only two default Cross Section Annotation Groups configurations found in the FLH WorkSpace:

**XS Grid w/ Annotation:** This is the base Annotation Group. This Annotation Group works by labeling 3D Linear Elements (Points) based on their specific Template Point Name – which means only points that were generated with a Template will be labeled by default. For more information labeling, see [16E – Configuring Cross Section Annotations](#). The “XS Grid w/ Annotation” group contains all Cross Section Grid elements and annotates other features, including:
- Cross Section Station Label
- Design Grade, Subgrade, and Existing Grade Labels
- Offset/Elevation Labels
- Slope Segment Labels
- Centerline Symbol and Line Label

**XS R/W GRail and Cbl Bar Annotation:** This Annotation Group is intended to be placed atop the base “XS Grid w/ Annotation” group. The “XS R/W Grail and Cbl Annotation” group creates graphics to denote Right of Way, Guardrail, Jersey Barrier, and Chain Link Fence locations. This Annotation Group works by labeling 3D Linear Elements (Points) based on their specific Feature Definition – which is useful labeling points that were NOT generated by a Corridor (i.e., Right-of-Way, Guardrail).

**WARNING:** Unfortunately, the dimensions of the Cross Section Grid CANNOT be changed after creation of the CROSS SECTION Named Boundary element.

**Cross Section Grid** Annotations are directly applied to the CROSS SECTION Drawing Model border. The outer boundary and overall grid dimensions are directly dependent on the dimensions of the CROSS SECTION Named Boundary element.
16D.2  Create, Remove, and Reapply Cross Section Annotations

16D.2.a  Create Cross Section Annotations

The procedure below shows how to create Cross Section Annotations. Cross Section annotations are typically created in the Drawing Model and Sheet Model creation process. However, when experimenting and configuring Annotation Groups, it is necessary to remove and recreate annotations.

**TIP:** When experimenting with configuration of Annotation Groups, remove and re-create Annotations for a single cross section model. This will help to avoid long processing times that occur when All Drawing Models are annotated.

---

1. From the Ribbon, select the Annotate Drawing Model tool: [OpenRoads Modeling → Drawing Production → Annotations].

2. **Prompt:** All Drawing Models – If **Yes** is selected, then ALL CROSS SECTION Drawing Models in the active ORD File will be annotated.

   If **No** is selected, ONLY the active (current) CROSS SECTION Drawing Model will be annotated.

3. **Prompt:** Select Annotation Group - <ALT> Down to Browse Annotation Drawing Groups – Open the Annotation Group selection box by simultaneously pressing the ALT and DOWN arrow key.

4. Select the desired annotation group. In this case, the “XS Grid w/ Annotation” group is used.

5. Left-Click anywhere in the View to complete the command and annotate the Drawing Model.
16D.2.b Remove Cross Section Annotations

In order to reapply or refresh the Cross Section Grid or Annotations, the User must remove then re-create the Annotations. This process demonstrates how to remove Annotations.

The process on the previous page shows how to re-create Annotations.

From the Ribbon, select the Remove Annotate Drawing Model tool: [OpenRoads Modeling → Drawing Production → Annotations].

Prompt: All Drawing Models – If Yes is selected, then annotations will be removed from ALL CROSS SECTION Drawing Models in the active ORD File.

If No is selected, ONLY the annotations in the active (current) CROSS SECTION Drawing Model will be removed.

Left-Click anywhere in the View to complete the command and remove annotations from the Drawing Model.
16D.3  Access and Setup of the Annotation Group Manager - Workflow

The *Annotation Group Manager* for Cross Sections functions in the same manner as Stationing and Profile Annotations – which is discussed in [15f - Civil Annotations (Stationing & Profile)].

However, there are a few processes that should be performed prior to accessing the Cross Section *Annotation Group Manager*. Similarly, after accessing the *Annotation Group Manager*, a Template used in Corridor creation needs to be loaded.

The overall process for accessing and setting up the *Annotation Group Manager* is as follows:

1. **Access the Template Editor and Load the Template Library used for Corridor creation.**
   
   16D.3.a *Load the Template Library used for Corridor Modeling*

2. **In the 2D Design Model , set the Annotation Scale to match the Drawing Seed.**
   
   16D.3.b *Set the Annotation Scale before Accessing the Annotation Manager*

3. **Access the Annotation Group Manager through the Project Explorer**
   
   16D.3.c *Access the Annotation Group Manager*

4. **In the Annotation Group Manager, select a Template that was used in Corridor Modeling**
   
   16D.3.d *Select the Corridor Template*
16D.3.a Load the Template Library used for Corridor Modeling

Before accessing the Annotation Group Manager, load the Template Library (.itl file) used in creation of the mainline Corridor. When creating and manipulating labels in the Annotation Group Manager, the User will directly interact with Corridor Templates. The Points to be labeled can be directly selected from Templates. See 8B.1 Accessing the Template Editor and Template Libraries.

16D.3.b Set the Annotation Scale before Accessing the Annotation Manager

The Annotation Group Manager contains a preview window that is sensitive to the Annotation Scale set in the 2D Design Model. By default, for a new ORD File, the Annotation Scale is set to 1” = 100’ (for WFL new files) or 1”=50’ (for EFL and CFL new files). Both default Annotation Scale values are inappropriate for display in the Annotation Group Manager. If the Annotation Scale is set to a large value (i.e., 1” = 100’), then the Labels shown in the Annotation Group Manager preview window will be too large and overlap. Set the Annotation Scale to match the Drawing Seed so the Annotation Group Mangers provides an accurate preview of the resulting Cross Section annotation labels in the Drawing Models.

IMPORTANT: Before accessing the Annotation Group Manager, set the Annotation Scale to the Drawing Seed scale set in the creation of CROSS SECTION Named Boundary elements. For example, if the “20 – Scale XS Portrait” Drawing Seed was used, then set the Annotation Scale to 1”=20’. To change the Annotation Scale in the 2D Design Model, see 15A.8 Set the Annotation Scale in the 2D Design Model.

NOTE: By default, the Annotation Scale for the 2D Design Model of a newly-created ORD File is set to 1”=100’.
16D.3.c Access the Annotation Group Manager

The Annotation Group Manager is accessed in the same manner shown in 15F.4 Editing Alignment (Plan) Annotation Groups. The Cross Section Annotation Groups are accessed through the Explorer in the following location:

OpenRoads Standards → Standards → Active ORD File (2D Design SurvFT)*** → Annotation Groups → Cross Section → Drawing

**WARNING:** The Cross Section Annotation Groups are only accessible when the 2D Design Model is active. In other words, Left-click anywhere in a View that is showing the 2D Design Model before attempting to access the Annotation Group.

**WARNING:** Annotation Groups will NOT be shown in the Explorer until used in the Drawing Models of the active ORD File.
16D.3.d Select the Corridor Template

Before manipulation of a Cross Section Annotation Group, use the Select Template icon to load a Template that was used in the creation of the Corridor Model.

**WARNING:** If project Corridor Templates are not available, it means that Template Library (itl. file) has NOT been loaded in the Template Editor. See 16D.3.a Load the Template Library used for Corridor Modeling.
The Annotation Group Manager is arranged into six dropdowns that control which Points are labeled and how the label is placed.

**WARNING** for manipulating Numerical Values: All Numerical Values (i.e., Offset End, Vertical Offset, and Square Size) are unadjusted for the Annotation Scale. These values will be multiplied by the Annotation Scale factor in the Drawing Models. This concept is discussed in 15F.4.b Understanding the Annotation Scale within the Manage Annotation Menu.

**IMPORTANT:**

When **Annotate** is set to **Text**, then parameters in the **Cell** drop-down have NO AFFECT on the label.

When **Annotate** is set to **Cell**, then the **Text** drop-down is inconsequential.
16E.1 **Location: Specify which 3D Linear Elements (Points) are Labeled**

Most Cross Section Annotations work by labeling the position of 3D Linear Elements (Points) within the Drawing Model. For labeling purposes, a Point can be Located by either it’s Template Point Name or the assigned Feature Definition. The method used for Point Location is specified in the Location sub-menu – which is discussed in on the next page.

The **Template Point Name** method is typically used to label Points that were generated by the Road Corridor Template.

With the **Feature Definition** method, any Point assigned to a specified Feature Definition will be labeled. This method can be used to label custom-created 3D Linear Elements – such as Right-of-Way and Guardrail.
16E.1.a Location Sub-Menu

In the Annotation Group Manager, the Location sub-menu is used to specify which Points will be labeled. This sub-menu operates differently depending on the method selected in the Points to Be Filtered drop-down.

Create List of Points corresponds with the Template Point Name method discussed on the previous page. This method works by loading project Templates and graphically selecting which Point to label. A detailed overview of this method is discussed in 16F.1 Manipulating Offset/Elevation Labels.

Use All Points is used to label a Point by the Feature Definition or other Filter Properties. Filters are discussed in depth in 16E.1.b Filters.
16E.1.a.i Template Point Name (Create List of Points) overview

When the Create List of Points method is used, the currently loaded Template is used to select which Points will be labeled.

When CROSS SECTION Drawing Models are annotated, the label will seek out ANY 3D Linear Element (Point) which contains a listed Template Point Name. This means it is NOT necessary to load every Template used to create the Corridor, if consistent Pointing naming was used among the multiple Templates.

**TIP:** The Template Point Name for a 3D Linear Element can be found in the Properties Box. Select the Template Point in the CROSS SECTION Drawing Model with a Selection Window.
Below are a listed of disadvantages for Create List of Method:

- ONLY points generated by a Corridor, Linear Template, or Surface Template model are eligible for labeling. 3D Linear Elements (Point) created manually by the User (i.e., Right-of-Way, Guardrail, Fences) CANNOT be labeled with this method.

- For longer Corridors, the Template Point Naming schemes between Template Sections should ideally be consistent between multiple Template Drop Sections. This is something to watch out for because generally Templates are created in an earlier phase of the overall design process. Inconsistent and sloppy Template Point Naming among multiple Templates requires the User to manually select each Template Point that contains a unique name – which can be very inefficient. Similarly, the User may have trouble locating Template Point Names that were created in the override of Template Drop Sections (as discussed in 9E.6 Edit (Override) Template Drop tool).
16E.1.a.ii Feature Definition and Filter (Use All Points) Overview

When the Use All Points option is used, the User will typically identify Points to be labeled based on Feature Definition or other Filter Properties. This method is strictly necessary to label User-created points (i.e., Right-of-Way, Guardrail, Fences), but will also function with Corridor, Linear Template, and Surface Template points that are assigned to the specified Feature Definition. Within the Location sub-menu, the Feature Definition to be labeled is specified with a Filter. Filters are discussed in 16E.1.b Filters.

**IMPORTANT:** The “XS R/W GRail and Cbl Bar Annotation” group solely uses the Use All Points method to label points.

The graphic below shows the configuration of Filter that is seeking out Points for specific two specific Feature Definitions: “Right of Way_LT” OR “Right of Way_RT”.

Click the icon to access the Location sub-menu

Use All Points option

The "point_feature_definition" shown in the Current Filter box will determine which Points are labeled.

In this example, Points that are assigned to the following Feature Definitions will be labeled:

"Linear\Right of Way\Right of Way_LT"
"Linear\Right of Way\Right of Way_RT"
16E.1.b Filters

Filter Expressions are created in the Location sub-menu. Typically, Filters Expressions are only applied with use of the Use All Points (Feature Definition) method. The Use All Points method needs at least ONE Filter Expression to specify which 3D Linear Elements (Points) are labeled. If NO Filter Expressions are applied, then literally every Point in the CROSS SECTION Drawing Model will be labeled (which explains why the method is called Use All Points).

When creating Filter Expressions, the User will work from bottom to top of the menu. Most tasks are performed by Double-Clicking on Properties (always selected first), Math Operators, and Logical Operators – which are located in the bottom portion of the Location sub-menu.

**IMPORTANT:** All Filter Expressions must begin by selecting a Property (i.e., offset, elevation, on_top, on_bottom, point_name, or point_feature_definition).
16E.1.b.i Basic Filter Creation Workflow

The steps below show the basic procedure and techniques for building a Filter Expression. A Property should always be the first part of an Expression Line. For an explanation and examples of each Property, see 16E.1.b.ii Property Types.

The text for the Current Filter implies the following criteria. All criteria must be satisfied for a Point to receive a Label:

Expression 1: The Point must be assigned to the “XS_TL_Subgrade” Feature Definition.

OR

Expression 2: The Point must be assigned to the “XS_TL_Edge of Shdr 4” Feature Definition.

AND

Expression 3: The Point must be located 5 feet to the right of the Alignment OR 5 feet to the left of the Alignment

AND

Expression 4: The Point must NOT be located on the top-string of Points that comprise the Cross Section.
**16E.1.b.ii Property Types**

In this section, the available Property types are explained with example Filter Expressions.

In the graphics below, the symbol represents a double-click location.

**Offset**: Any Point that satisfies the Offset expression will be labeled. This Property type must be used in conjunction with a Math Operator (typically, a greater than [>] or less than [<] operator).

**Example Expression**: “(offset > 2) OR (offset < -2)”

Any Point that is horizontal located more than (greater than) than 2 feet to the right (positive direction) of the Alignment OR located more than (less than) than 2 feet to the left (negative direction) will be labeled. In this configuration, Points within 2 feet of the Alignment will NOT be labeled.

**IMPORTANT**: The Points to be Filtered option should be set to Use All Points.

**WARNING**: Ensure that the first expression is set to OR in the AND/OR column drop-down. By default, this parameter is set to AND – so it must be changed before the second expression is added. If the entire expression (in the Current Filter box) were to read: “(offset > 2) AND (offset <-2)”, then no Points would be labeled. This is because the two expressions are conflicting. A single Point CANNOT be simultaneously placed 2 feet to the right AND 2 feet to the left of the Alignment. However, with the OR operator selected, only a single sub-expression needs to be satisfied to produces a label.
**Elevation:** Any Point that satisfies the Elevation expression will be labeled. This Property type must be used in conjunction with a Math Operator (typically, a greater than [>] or less than [<] operator).

**Example Expression:** “elevation > 1972”
Any Point that is greater than 1972 in elevation will be labeled.
**On_Top:** For a Corridor Template, any Point that is located on the top string of points will be labeled.

*Example Expression:* “on_top”  
Any Point on the top of the Cross Section will be labeled.

*IMPORTANT:* This Property does NOT require any Mathematical Operators or numerical values. It simply works as a stand-alone Expression.

---

**On_Bottom:** For a Corridor Template, any Point that is located on the bottom string of points will be labeled.

*Example Expression:* “on_bottom”  
Any Point on the bottom of the Cross Section will be labeled.

*IMPORTANT:* This Property does NOT require any Mathematical Operators or numerical values. It simply works as a stand-alone Expression. See the “on_top” graphic for formulation of this expression. Choose the “on_bottom” for step 2.

*TIP:* The on_bottom property is generally NOT useful because the bottom of intermediate Components are also labeled, NOT just “sub-grade” of the bottom of the Template.
**Point_Name:** Any 3D Linear Element (Point) with the specified Name will be labeled. Must be used with the equals (=) Math Operator.

**Example Expression:**
“(point_name = Pavt_ETW_Layer4_L) OR (point_name = Pavt_ETW_Layer4_R)”

Any 3D Linear Element (Point) that is named “Pavt_ETW_Layer4_L” OR “Pavt_ETW_Layer4_R” will be labeled.

**WARNING**: Ensure that the first sub-expression is set to OR in the AND/OR column drop-down. By default, this parameter is set to AND – so it must be changed before the second expression is added. If the entire expression (in the Current Filter box) was to read:

“(point_name = Pavt_ETW_Layer4_L) AND (point_name = Pavt_ETW_Layer4_R)”

then no Points would be labeled because the expression would be because both sub-expressions would have to be satisfied (by a single point) – which is impossible. A single 3D Linear Element Point CANNOT contain two Point Names. However, with the OR operator selected, only a single sub-expression needs to be satisfied to produce a label.
**PointFeatureDefinition:** Any 3D Linear Element (Point) that is assigned to the specified Feature Definition will be labeled. When this option is used, the User will be prompted to select a Feature Definition from the FLH Library. The User does NOT need to manually type in the Feature Definition name.

**Example Expression:**

"point_feature_definition = "Linear\Modeling\Template Points\Subgrade\XS_TL_Subgrade""

Any 3D Linear Element (Point) that is assigned to the “XS_TL_Subgrade” will be labeled.
16E.2 Annotate: Specify the Label Type (Cell or Text element)

The **Annotate** drop-down only has two parameters: **With** and **Template**.

**With:** Specifies whether a **Cell** or **Text** element is used to label the Point.

- When a **Cell** element is used, then the **Cell drop-down** is mainly used to specify which Cell is used from the FLH Cell Library.
- When a **Text** element is used, then the **Text drop-down** is mainly used to specify the **Text Favorite** and other text related parameters that are used.

**Template:** Specifies the **Element Template** which is applied to the resulting label. **Element Templates** control the Symbology (i.e., Level, Color, Weight, etc...) of the resulting element. **Element Templates** are discussed in more detail in [15F.4.a Manage Annotation Menu Overview](#).
16E.2.a Text drop-down

The Text drop-down is only used when Text is selected for the Annotate With option.

The most important parameter is (Text) Favorite. For Cross Section labeling, the Text Favorite controls which Field types are used (i.e., elevation value, offset value, slope value). Fields and Text Favorites are discussed in 15E – Fields, Text Favorites, and Labels.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prefix/Suffix</td>
<td>A prefix or suffix can be added in conjunction with the Text Favorite text string.</td>
</tr>
<tr>
<td>(Text) Style</td>
<td>A Text Style can be used to set the Size, Font, and Justification of the Text Element. Text Styles are discussed in detail in 15B.2 FLH Text Styles Descriptions and Usages.</td>
</tr>
<tr>
<td>(Text) Favorite</td>
<td>Controls which Text Favorite is used from the FLH Text Favorite Library.</td>
</tr>
<tr>
<td>View Independent</td>
<td>If set to TRUE, the Text Element is automatically rotated to align with the Drawing Model.</td>
</tr>
<tr>
<td>View Readable</td>
<td>If set to TRUE, the Text Element is ALWAYS rotated with the Sheet Models orientation.</td>
</tr>
</tbody>
</table>

NOTE: It is typically NOT necessary to set the View Independent or View Readable parameters.
16E.2.b  Cell drop-down

The Cell drop-down is only relevant when **Cell** is selected for the Annotate With option. The Name parameter is used to choose a Cell from the FLH Cell Library.

**NOTE:** When placed in Drawing Models, the dimensions of Cell elements are multiplied by the Annotation Scale.

### Text drop-down

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Used to choose a Cell element from the FLH Cell Library</td>
</tr>
<tr>
<td>X, Y, and Z Scale</td>
<td>Multiplies (scale) the size of the Cell element. The X, Y, and Z Scale should have the same value to look proportionally correct. Typically, the X, Y, and Z Scale is set to 1 and shouldn’t be unaltered by the User.</td>
</tr>
<tr>
<td>Apply Active Cell Scale</td>
<td>If the Cell was originally created in the presence of an Annotation Scale, then that specific Annotation Scale multiplier will be used.</td>
</tr>
</tbody>
</table>
16E.3 Leaders

A Leader is simply a Line drawn between the Text or Cell element and the Location being labeled. The leader can be configured with a Terminator (i.e. Arrow, Circle, Square, or Triangle) that is pointing towards the Template Point being labeled.

If the Place Leader parameter is set to FALSE, then no Leader is used. Leaders are rarely used in labeling in the “XS Grid w/ Annotation” group. Only the Centerline Marker Label uses a Leader.

**NOTE:** Leaders do NOT have the capability to create a Landing near the text.
<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offset Begin</td>
<td>Controls the distance between the Point being labeled and the beginning of the Leader/Terminator</td>
</tr>
<tr>
<td>Offset End</td>
<td>Controls the distance between the Text/Cell element and the end of the Leader. <em>NOTE:</em> As shown in the graphic on the previous page, this value may need to be NEGATIVE to be placed in close proximity to the Text/Cell element.</td>
</tr>
<tr>
<td>Arrow Size/Width</td>
<td>If these options are zeroed out, then no Arrow is created. Determines the length (Arrow Size) and width (Arrow Width) of the Arrow Terminator.</td>
</tr>
<tr>
<td>Circle Size</td>
<td>If these options are zeroed out, then no Circle is created. If this option is populated, then a Circle is drawn around the Template Point.</td>
</tr>
<tr>
<td>Square Size</td>
<td>If these options are zeroed out, then no Square is created. If this option is populated, then a Square is drawn around the Template Point.</td>
</tr>
<tr>
<td>Triangle Size</td>
<td>If these options are zeroed out, then no Triangle is created. If this option is populated, then a Triangle is drawn around the Template Point.</td>
</tr>
<tr>
<td>Extension Size</td>
<td>If these options are zeroed out, then no Extension is created. If this option is populated, then a Line or Tick is drawn atop the Template Point. The resulting Extension Line is drawn perpendicular to the Leader. <em>NOTE:</em> Leaders do NOT have the capability to create a Landing near the text.</td>
</tr>
<tr>
<td>Template</td>
<td>Controls the Symbology Properties (Level, Line Style, Line Weight, Color) that is assigned to the Leader when created in the Drawing Model. <em>NOTE:</em> If this is blank, then the Template specified in the Annotate With drop-down is used.</td>
</tr>
</tbody>
</table>
16E.4 Placement: Specify the Position of Labels

The Placement drop-down is used to control how the Cell or Text element is positioned in the Drawing Model. The Placement parameters are relative to 3D Linear Element (Point) location. The Placement of labels is primarily affected by the Vertical/Horizontal Offset Options and Rotation Option.

**Rotation Option:** Controls the rotation of the Cell or Text element. In the example below, the Rotation value is set to 90° to tilt the Text element vertically. If the Rotation value is set to 0°, then the Text element will be placed horizontally.

*TIP:* Always keep the Rotation Option set to Angle Value.
**Vertical Offset Option:** Controls where the label is anchored vertically. In the example below, the Text element is anchored to the **Bottom Border** of the CROSS SECTION *Named Boundary* element.

### Vertical Offset Options

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offset Value</td>
<td>The label is placed DIRECTLY anchored directly atop the Point. The Vertical Offset parameter is used to move the label up or down – away from the Point. If a positive value is used, then the Label will be moved upwards. If a negative value is used, the Label will be placed downward.</td>
</tr>
<tr>
<td>Top Side</td>
<td>The label is anchored just above the Point. The bottom edge of the label is placed just above the Point.</td>
</tr>
<tr>
<td>Bottom Side</td>
<td>The label is anchored just below the Point. The top edge of the label is placed just below the Point.</td>
</tr>
<tr>
<td>Top Border</td>
<td>The label is placed vertically in line with the Point. However, the Point is anchored to the top border of the CROSS SECTION Named Boundary.</td>
</tr>
<tr>
<td>Bottom Border</td>
<td>The label is placed vertically in line with the Point. However, the Point is anchored to the bottom border of the CROSS SECTION Named Boundary. There are many default Annotations which use this option – including Offset/Elevation Labels and &quot;PGL Subgrade Annotations&quot;.</td>
</tr>
</tbody>
</table>
**IMPORTANT:** When placed in Drawing Models, the Numerical Values relating to Placement parameters are multiplied by the Annotation Scale (as set by the Drawing Seed). See [15F.4.b Understanding the Annotation Scale within the Manage Annotation Menu](#). For example, as shown below the numerical value for the Vertical Offset is set to 0.005. When placed in a Drawing Models set to a 1”=20’ Annotation Scale, the actual Vertical Offset will be 1.2 feet = (0.005 x 240). **NOTE:** The Design to Paper multiplier for a 1”=20’ Annotation Scale is 240.

**Horizontal Offset Option:** Controls where the label is anchored horizontally. These options operate similarly to Vertical Offset Options.

There are very few default Annotations that utilize Horizontal Offset Options. Typically, labels are kept in exact horizontal alignment with the Point (being labeled) by setting the Horizontal Option to Offset Value. If the Horizontal Offset Value is then set to 0, then NO horizontal offset is used.
**16E.5 Slope Segment Labeling**

Slope Segments operate by labeling the Slope between two adjacent Points. Within the “XS Grid w/ Annotations” group, the “XS Right Slope Annotation” and “XS Left Slope Annotation” are responsible for Slope Segment labeling.

**NOTE:** Slope Segments are considered *Linear Annotations* - which are specifically meant to label a slope or dimension between two Points. The vast majority of other labels used in Cross Section labeling are considered *Point Annotations*. *Point Annotations* do NOT have the ability to label slopes.

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**NOTE:** The Text Favorite conditionally controls whether the label is shown in a *Percentage* or *Ratio*. Slopes that are steeper than **10%** are shown as *Ratios*. **1:2** **1.4** **-2.0%**
16E.5.a Location: Specify which Segments are Labeled

Segments for slope labeling are identified in the Location sub-menu. Similar to the discussion in 16E.1.a Location sub-menu, there are two methods for identifying segments to be labeled: Use all segments (Filters) and Create list of segments (Template).

In the default configuration, the “XS Left/Right Slope Annotation” label is set to the Use All Segments method. By default, Filter Expressions are used to identify which segments are labeled. Filters are discussed in 16E.1.b Filters.

Typically, the User shouldn’t need to modify the default Slope Segment labels.

**TIP:** The Create list of segments (Template) method is almost identical to the process described in 16E.1.a.i Template Point Name (Create List of Points) overview. If this method is used to identify Slope Segments, then REMOVE all Filter Expressions from the Location sub-menu.
16E.5.b Understanding the Filter Expressions used for Slope Labels

In this section, the Filters Expressions used by the default Slope Segment labels are analyzed for better understanding of how segments are labeled.

Expression 1: $\text{point1\_offset} \leq 0.1 \text{ AND } \text{point2\_offset} \leq 0.1$

This expression is used to ONLY label Slope Segments on the Left-side of the Alignment. This expression is specific to the “XS Left Slope Annotation” label. $\text{Point1\_offset}$ and $\text{Point2\_offset}$ are relative to the Alignment. This expression will NOT label any segments that are horizontally located (offset) more than 0.1 feet to the Right (Positive) of the Alignment.

Expression 2: $\text{NOT point1\_elevation} - \text{point2\_elevation} = 0$

If the difference in elevation between two adjacent Points equals to 0, then the segment will NOT be labeled. In other words, flat segments (slope = 0.00%) will NOT be labeled. **TIP:** Remove this Expression to label flat segments.

Expression 3: $\text{width} \geq 1.6 \text{ OR } \text{width} \leq -1.6$

In simplest terms, this expression requires the horizontal distance between two Points to be greater than 1.6 feet in order to receive a Slope Segment label. **TIP:** Change the 1.6 value to a larger value to forgo labels on smaller segments and reduce clutter in the overall Cross Section. **WARNING:** For End Conditions that require a horizontal distance of less than 1.6 feet to be solved, no Slope Segment Label will be created – as implied by this Expression.
Excluding delineation of Right-Of-Way, Guardrail, and Jersey Barriers – the majority of edits are performed to the “XS Grid W/ Annotations” group.

Most commonly, the “XS Grid W/ Annotations” group needs to be edited to place Subgrade Offset/Elevation Labels at the correct locations for the project-specific Cross Section points.

Subgrade Offset/Elevation Labels are controlled by the “XS Subgrade Annotation” component. The exception is Offset/Elevation Labels for Slope Stake Limits – which is controlled by the “XS Ex Lim Annotation” component.

The “XS Subgrade Annotation” and “XS Ex Lim Annotation” components are configured identically and produce identical labels. However, the “XS Ex Lim Annotation” component is specifically intended for Slope Stake Limits – which are technically NOT at subgrade elevation and explains why these components are separated out.

**WARNING:** These Labels do NOT display in the Preview Window.
16F.1 Default Offset/Elevation Labels

Subgrade and Slope Stake Limits Offset/Elevation Labels are setup to seek out 3D Linear Elements (Points) that correspond with specific Template Point Names.

**TIP:** The default Template Point Names that are found in the “XS Grid w/ Annotations” are intended to correspond with FLH Standard Templates.

The subgrade Template Point Names that will be labeled with the default “XS Grid w/ Annotations” group configuration are as follows:

- “Pavt_ETW_Layer4_L” and “..._R”
- “Pavt_EOP_Layer4_L” and “..._R”
- “Pavt_ETW_Layer4_Out_L” and “..._R”
- “Pavt_ETW_Layer4_In_L” and “..._R”
- “Shdr_EOP_Layer4_L” and “..._R”
- “Shdr_Outside_Layer4_L” and “..._R”
- “Ditch_Bot_L” and “..._R”
- “Ditch Bottom Backslope_L” and “..._R”
- “Slope_Stake_L” and “..._R”
- “Slope_Stake_Fill_L” and “..._R”
- “Slope_Stake_Cut_L” and “..._R”

The graphic on the next page demonstrates how a Template Point and its corresponding Name (referred to in the Properties box as a Feature Name) interact with the resulting 3D Linear Element (Point). The Road Template shown on the next page is the “Two-Lane Pavement” from the FLH Standard Template Library:

(Templates → FLH Standard Templates → New Pavement → Undivided → “Two-Lane Pavement”)

The Template Point examined here is Named “Shdr_Outside_Layer4_L” – which is found in the default “XS Grid w/ Annotation” group.

The Location where Template Points to be labeled is shown below. The process for adding additional Template Points to be labeled is covered in more detail in 16F.2 Add Custom Offset/Elevation Labels - Workflow.
TIP: To view in the Properties Box use a Selection Window (created from Left to Right) to select a single 3D Linear Element (Point) without selecting other Component or Points.
16F.2 Add Custom Offset/Elevation Labels - Workflow

For custom labeling to occur, the User will have to add Template Points to the “XS Subgrade Annotation” component – which is located in the “XS Grid w/ Annotations” group.

**WARNING:** Before Template Points can be added, load and select a custom Template that was specifically created for the project. See 16D.3.d Select the Corridor Template.

**IMPORTANT:** As discussed in 16E – Configuring Cross Section Annotations, when 3D Linear Elements (Points) are labeled within CROSS SECTION Drawing Models, the Template Point Name is sought out. If multiple Templates were used in the creation of the mainline Corridor, it is NOT necessary to repeat this process for each Template – assuming that the exact same Template Point Names were consistently used for all Templates. If Template Point Names are inconstant across the multiple Templates, then each Template will have to be loaded and this process repeated for each unique Template Point Name.

In this workflow, the Template contains two custom Points that are NOT found by default in the “XS Grid w/ Annotations” group. Points that are labeled by default are discussed in 16F.1 Default Offset/Elevation Labels.

In this workflow, the following Template Points will be labeled:

“Ditch_Bot_Front_R” and “..._L”
“Ditch_Bot_Back_R” and “..._L”

**NOTICE:** These Points are NOT labeled by default.
Before beginning this workflow, perform the tasks discussed in **16D.3 Access and Setup of the Annotation Group Manager**.

1. Load the Template Library which the points to be labeled belongs to: **16D.3.a Load the Template Library used for Corridor Modeling**.

2. Set the Annotation Scale which corresponds with the Drawing Seed used to create the CROSS SECTION Named Boundary elements: **16D.3.b Set the Annotation Scale before Accessing the Annotation Manager**.

3. Open the Annotation Group Manager for the “XS Grid w/ Annotations” group: **16D.3.c Access the Annotation Group Manager**. **TIP:** Ensure that the 2D Design Model is showing in the active View when accessing the Annotation Group Manager through the Project Explorer.

4. In the Annotation Group Manager, load the Template that contains the Template Points to be labeled: **16D.3.d Select the Corridor Template**.

![Image of Annotation Group Manager](image)

5. Select (highlight) the “XS Subgrade Annotation” component.

6. In the **Location** box, click the ![icon](image) icon to access the **Annotation Filter** menu.

7. In the **Annotation Filter** menu, push the **Select points from Template** button.
In the Select Points menu, graphical select (left-click on) the Points to be labeled.

**ALTERNATIVELY:** Select (highlight) Points by their name and push the Arrow button to move them to the List to be labeled.

Exit out of the Select Points menu.

In the Annotation Filter menu, push the Apply Expression Changes button to save changes made in this workflow.

Exit out of the Annotation Filter menu and the Annotation Group Manager.

To apply the changes that were made to the Annotation Group, Cross Section Annotations have to be removed and then re-created in a Drawing Model.

See 16D.2.b Remove Cross Section Annotations and 16D.2.a Create Cross Section Annotations.
16G – MISCELLANEOUS CROSS SECTION ANNOTATION WORKFLOWS

16G.1 Create Right-of-Way Annotations

In this workflow, annotations are created to denotate Right-of-Way locations in the Cross Sections.

This process involves converting 2D Right-of-Way linework into 3D Linear Elements that are draped onto the Existing Ground Terrain Model. **IMPORTANT:** Typically, Right-of-Way linework is created by the survey department as 2D linework. 2D linework CANNOT be labeled. Only 3D Linear Elements that intersect with the CROSS SECTION Named Boundary elements can be labeled.

16G.1.a Convert ROW Linework into 3D Linear Elements (Points)

This workflow is performed from the Cross Section ORD File (_XS.dgn). The ORD File which contains Right-Of-Way linework (which is typically the _e_row.dgn, _p_row.dgn, or _sur.dgn) must be referenced into the Cross Section ORD File.

1. For the Reference File that contains the Right-of-Way Linework, turn off all Levels except those containing ROW Linework.
2. In the References Manager, bring the Right-of-Way Linework into the active File by using the **Merge Into Master** tool. Right-Click on the Reference File and select **Merge Into Master**.
For Cross Section labeling, the Right-Of-Way Linework needs to be assigned to a Feature Definition. In this case, the ROW Linework is assigned to the "XS_TL_ExistRight of Way" Feature Definition by using the Set Feature Definition tool.

3 Select all ROW Linework. This can be easily accomplished by expanding the Element Selection menu and highlighting the ROW Linework Level.

4 With all the ROW Linework elements selected, use the Set Feature Definition tool: [OpenRoads Modeling → Geometry → General Tools].

5 In the Dialogue Box, select the appropriate Feature Definition. In this example, the "XS_TL_ExistRight of Way" Feature Definition is used.

6 Left-Click in the View to assign the Feature Definition to all ROW Linework.

**NOTE:** For the current FLH WorkSpace and default Annotation Groups, Right-of-Way labeling has NOT been setup properly. In an ideal default configuration, there would be a Feature Definition that corresponds with a Label found in the “XS RW GRail Cbl Bar Annotation” group. Due to this fact, the User can choose any Feature Definition that seems appropriate. At this time, the User will have to manually configure the “XS RW GRail Cbl Bar Annotation” group – as shown in 16G.1.b Configure the "XS RW GRail Cbl Bar Annotation" Group. The Feature Definition assigned in step 3 will be manually inputted in this Annotation Group for labeling.
At this point of the workflow, the ROW Linework is 2-Dimensional (which means its found in the 2D Design Model ONLY). For Cross Section labeling, the ROW Linework needs to be converted to a 3D Linear Element (which are found in the 3D Design Model). The 3D Linear Elements need to intersect with CROSS SECTION Named Boundary elements for display in the Drawing Models. To assure the resulting ROW Linework 3D Linear Elements are placed at the Existing Ground elevation, the Profile From Surface tool is used to drape the ROW Linework onto the Existing Ground Terrain Model.

Select all ROW Linework. This can be easily accomplished by expanding the Element Selection menu and highlighting the ROW Linework Level.

**WARNING:** From the previous page, after all ROW Linework has been assigned to a Feature Definition, the Level may be different. Verify the Level by hovering over the ROW Linework with the mouse-cursor.

With all the ROW Linework elements selected, use the Profile From Surface tool: [OpenRoads Modeling → Geometry → Vertical].

**Prompt:** Data Point to Apply DTM Profile to x selected elements – Left-Click in the View to advance to the next prompt.

**Prompt:** Locate Reference Surface – Reset for Active Terrain Model – The Existing Ground Terrain Model should have been activated in the creation of the Cross Section ORD File. Right-Click in the View to accept the Existing Ground Terrain Model as the Reference Surface.

Follow and advance through the remaining Prompts with the Profile From Surface tool. This tool and its parameters are discussed in detail in 7E.4.a Profile From Surface.
16G.1.b Configure the “XS RW GRail and Cbl Bar Annotation” Group

In this process, the “XS RW GRail and Cbl Bar Annotation” group is configured to place labels on the ROW 3D Linear Elements (Points). The Annotation Group will be configured to seek out 3D Linear Elements (Points) that are assigned to the Feature Definition specified in step 5. In this example, the “XS_TL_ExistRight of Way” Feature Definition was specified.

**WARNING:** For the “XS RW GRail and Cbl Bar Annotation” group to be displayed in the Project Explorer and edited, then first, the User will have to apply this Annotation Group in at least one CROSS SECTION Drawing Model.

Enter a CROSS SECTION Drawing Model and Annotated the Drawing Model with the “XS RW GRail and Cbl Bar Annotation” group. See 16D.2.a Create Cross Section Annotations.
Access the “XS RW GRail and Cbl Bar Annotation” group as shown in 16D.3.c Access the Annotation Group Manager. **NOTE:** For this workflow, it is NOT necessary to load the Corridor Template because the ROW 3D Linear Elements are NOT generated from a Template.

13 Set the Annotation Scale which corresponds with the Drawing Seed used in creation of the CROSS SECTION Named Boundary elements: 16D.3.b Set the Annotation Scale before Accessing the Annotation Manager.

14 Open the Annotation Group Manager for the “XS Grid w/ Annotations” group: 16D.3.c Access the Annotation Group Manager. **TIP:** Ensure that the 2D Design Model is showing in the active View when accessing the Annotation Group Manager through the Project Explorer.

Select (highlight) the “E_ROW” component.

In the **Location** box, click the ... icon to access the **Annotation Filter** menu.

In the **Annotation Filter** menu, push the **Select points from Template** button.

Remove the default Feature Definition from the **Current Filter** box by pushing the **Remove** button next to the Expression Line.

**NOTE:** This default Feature Definition (“Linear\Modeling\Right of Way\E_ROW”) is NOT available in the FLH Feature Definition Library list.

This Feature Definition may be included in later editions of the FLH WorkSpace - which will make the configuration of this Annotation Group...
In the processes shown below, the “XS_TL_ExistRight of Way” Feature Definition (specified in step 5) is added to the E_ROW component.
After exiting out of the Annotation Filter Menu and ManagerAnnotations Menu (step 24), then proceed to apply the “XS RW GRail and Cbl Bar Annotation” group to all CROSS SECTION Drawing Models. See 16D.2.a Create Cross Section Annotations.

**TIP:** The “XS RW GRail and Cbl Bar Annotation” group is placed atop the “XS Grid W/ Annotations” group.
To rectify the placement of the Text Component, re-enter the Annotation Group Manager for the “XS RW GRail and Cbl Bar Annotation” group. Select (highlight) the “E_ROW” component and make the following changes. Additional information about the placement of labels is discussed in 16E.4 Placement: Specify the Position of Labels.

**NOTE:** The Text label and Leader will appear crowded. This is due to the Justification used in the Style.

- Change the Offset End to -0.0620.
- Change the Vertical Offset to 0.0050.

The following figure shows an alternative configuration of the Existing ROW Label.
**IMPORTANT:** The X Scale and Y Scale depends on the Drawing Seed used in creation of the Named Boundary elements. The X Scale and Y Scale should be set to ~40% of the Design to Paper Multiplier.

In this case, the 10 Scale Portrait seed was used. This seed corresponds a 1" = 10' (1: 120) Design to Paper Multiplier. In this example, the proper X Scale and Y Scale is obtained by taking 40% of 120 - which equals to about 50.

**NOTE:** The Z Scale is inconsequential.
16H.1  Slope Stake Limit Points NOT Labeling

The graphic below shows an instance where a CUT Slope Stake Limit label will NOT be labeled.

As shown below, in the graphic below, a single Cut End Condition is created between two stations that are solved as a Fill End Condition. This configuration will NOT produce a label for the lone Cut End Condition.

**EXPLANATION:** Because the Cut End Condition is processed at a singular location, a 3D Linear Element is NOT produced. As discussed in **16E.1 Location: Specify which 3D Linear Elements (Points) are Labeled**, labels seek out 3D Linear Elements that intersect the CROSS SECTION Named Boundary element. See the next page for a solution to remedy this situation.
The situation on the previous page can be rectified by editing the Corridor. Place a Key Station on either side of the singular Cut End Condition station. Creation of Key Stations is shown in 9G.3 Key Station.

**NOTE:** For this workaround to work, the custom Key Station must solve in Cut End Condition. If two Cut End Conditions are solved consecutively, then a 3D Linear Element is created between the two stations. Therefore, if a Cut 3D Linear element is found at the station coinciding with the CROSS SECTION Named Boundary, then a label can be created.
16H.2 Design Grade and Subgrade Elevation Labels are Absent

For Road Cross Sections, it is FLH Convention to show the Design Grade (“Des Grade”) and Subgrade elevation below the Cross Section grid for each station. If this label is NOT displaying, it is likely due to incorrect Template Point Names used in the road Corridor Templates.

Design Grade and Subgrade Elevation labels are placed by the “XS PGL Annotation” and “XS PGL Subgrade Annotation” respectively. These labels are pre-configured to seek out certain Template Point Names. If the Road Template does NOT utilize these exact Point Names, then labels will not be created.

**NOTE:** The acronym "PGL" stands for Profile Grade Line.
Design Grade ("XS PGL Annotation") – By Default, the Design Grade label is seeking out road Template Points that are named:

- "Pavt_CL_LayerTop"
- "Pavt_ETW_Layertop_In_L"

The Template Points that are sought out for labeling are specified with the Location option.

In the road Template shown below, the top, Center Line Point is named "CL_Top" – which means the default Design Grade label will NOT be created because it is NOT found by the label.
To rectify this mismatch and produce the desired labels, there are two options available:

**OPTION 1: Edit the Corridor Template:** This option involves editing each Template used in the Corridor and changing the Template Point Names to match the Names sought after by the Annotation label.

**OPTION 2: Edit the Annotation Label Location:** Using information described in *16E.1 Location: Specify which 3D Linear Elements (Points) are Labeled*, edit the Annotation Label to seek out the Template Point Name used in Corridor Modeling.

After performing one of the options listed above, remove and reapply Cross Section annotations. See *16D.2 Create, Remove and Reapply Cross Section Annotations*. 


16H.3 Subgrade and Existing Ground Label Positioned to the Left

As shown below, the Subgrade and Existing Ground ("Original Grnd") label are non-centered and positioned to the left.

The misposition of the Subgrade and Existing Ground label is due to an incorrect Placement setting. The Horizontal Offset Option needs to be changed from “Left Side” to “Offset Value”.

After changing the Horizontal Offset Option for both the Subgrade and Existing Ground label, remove and reapply the Annotation Group in the CROSS SECTION Drawing Model. See 16D.2 Create, Remove and Reapply Cross Section Annotations.
16H.4 Existing Ground Elevation Label ("Original Grnd") is Absent

For Road Cross Sections, it is FLH Convention to show the Existing Ground Grade ("Original Grnd") elevation below the Cross Section grid for each station. If this label is NOT displaying, it is probably because the Existing Ground Null Point is NOT present in the road Corridor Template.

The Existing Ground Null Point must be Named: "ExGrd"

Use the Project To Surface constraint to ensure the Null Point is placed on the Existing Ground Surface.
To ensure the Existing Ground Grade ("Original Grnd") elevation is labeled in Cross Section sheets, each Template used in the Corridor must be edited to include the Existing Ground Null Point. After creating the Existing Ground Null Point, remove and reapply Cross Section annotations. See 16D.2 Create, Remove and Reapply Cross Section Annotations.

The Existing Ground Null Point must be exactly named “ExGrd”. Use the Project To Surface constraint type (set to <Active>). Also, the Existing Ground Null Point must use the Horizontal constraint type (Value = 0) with a Center Line point as the Parent Point. Template Point creation is discussed in Chapter 8 – Template Library.
16H.5 Update Project Information and Sheet Number Fields for all Sheet Models

**WARNING:** For the current version of the software, this workflow is unreliable. The Key-In described in this section works occasionally. This software bug is currently being rectified. This workflow section is intended as a place holder until the software bug is rectified. Instead of this workflow, use the procedure described in 16I.1 **WARNINGS for the Printing of Cross Sections** to update Sheet Border Fields.

A deficiency of the software is that Project Information and Sheet Number *Fields* are NOT automatically assigned when *Sheet Models* are created.

**IMPORTANT:** The Project Information and Sheet Number *Fields* are ONLY updated when an individual *Sheet Model* is opened. This means that if *Sheet Models* are printed as is, then *Sheet Models* that have NOT been opened will NOT contain the correct Project Information and Sheet Number *Fields*. In other words, if the following procedure is NOT performed, the User would have to open every individual *Sheet Model* in the ORD File to show the correct *Fields* – which is NOT feasible on longer projects.

**WARNING:** In the *Key-in* box, the User must exactly type in “field update all file”. All letters should be lower-case. If necessary, copy and paste the *Key-in* expression from this page (do NOT include the quotation marks “ ”). Push the ENTER key to run the *Key-in*.

This procedure uses the *Key-in* tool to populate every *Field* in the active ORD File.
16H.6 Cross Sections and Station Titles are Overlapping in the Sheet Model

As shown below, Cross Sections may overlap if a Configuration Variable is set incorrectly.

For appropriate vertical spacing between Cross Sections, the configuration variable called "CIVIL_CROSSSECTION_TOP_TO_BOT_SPACING" should be set to a value of 0.095. See the next page.
**IMPORTANT:** After the procedure shown below is performed, CROSS SECTION Drawing Models and Sheet Models need to be re-created to reflect the spacing changes.

1. In the Search Bar, type in "Configuration Variables".

2. Scroll down to and highlight "Civil_CROSSSECTION_TOP_TO_BOT_SPACING".

3. Push the Edit button.

4. Ensure that the Edit Mode is set to **Overwrite**.
   - Set the **New Value** to 0.095.
   - Push OK.

5. Push OK to save the Configuration Variable.
16H.7 Cross Sections Placed Beyond the Top of the Sheet Border

As shown below, top Cross Sections may extend beyond the top of the Sheet Border if a Configuration Variable is set incorrectly.

For appropriate vertical spacing between Cross Sections, the configuration variable called “CIVIL_CROSSSECTION_TOP_MARGIN” should be set to a value of 0.070. See the next page.
IMPORTANT: After the procedure shown below is performed, CROSS SECTION Drawing Models and Sheet Models need to be re-created to reflect the spacing changes.

1. In the Search Bar, type in "Configuration Variables".

2. Scroll down to and highlight "Civil_CROSSSECTION_TOP_MARGIN".

3. Push the Edit button.

4. Ensure that the Edit Mode is set to Overwrite. Set the New Value to 0.070.

5. Push OK to save the Configuration Variable.
This section covers the printing of Cross Section sheets. The printing must NOT be performed from the Cross Section ORD File (_XS.dgn). In other words, enter a different ORD File (other than the _XS.dgn) before printing.

16I.1 WARNINGS for the Printing of Cross Sections

**IMPORTANT WARNING:** The printed Cross Section Sheets will contain incorrect Sheet Number and Project Information if printed from the Cross Section ORD File (_XS.dgn). For printing of Cross Section Sheets, access ANY ORD File that does NOT contain the Cross Section Sheet Models.

**WARNING:** Also, for correct Field information, the Configuration Variable called “MS_PRINTORGANIZER_OPEN_DGN_READWRITE” must be set to 1. See your CADD Administrator for proper configuration of this Variable. See the next page for configuration of this variable.

**BACKGROUND INFORMATION:** A deficiency of the software is that Fields contained in Sheet Models - such as Project Information and Sheet Numbering - are NOT automatically updated in the creation of the Cross Section Sheet Models. In other words, Fields will be incorrect until the Fields are updated. It is possible to update Fields by manually opening each Sheet Model. However, for longer projects with hundreds of pages of Cross Sections, it is infeasibly time-consuming to open each Sheet Model.

As a workaround the “MS_PRINTORGANIZER_OPEN_DGN_READWRITE” can be set to 1. When this variable is set to 1, then each Sheet Model will be directly opened during the printing process – which allows for Fields to be automatically updated. By default, this variable is set to 0, which means the Sheet Models are always opened Read-Only during printing (which means Fields are NOT automatically updated).

In order for this variable to operate correctly, the User CANNOT print from the ORD File that contains the Sheet Models. In the background of the printing process, the Print Organizer opens each ORD File that is being printed. If an ORD File to be printed is currently opened by the User, then the Print Organizer has NO choice but to open the Sheet Models as Read-Only.
The configuration of the MS_PRINTORGANIZER_OPEN_DGN_READWRITE variable is shown below:

Ensure this variable is set to 1.

MS_PRINTORGANIZER_OPEN_DGN_READWRITE

Manually type in "1".
16I.2 Printing Cross Section - Workflow

Cross Sections Sheets are printed through the Sheet Index – which is found in the Project Explorer.

**WARNING:** This procedure assumes that the procedures specified in 16B.3 Setup Project Information and the Sheet Index were followed exactly. Specifically, the Sheet Index needs to be setup properly.

**WARNING:** To ensure that the Fields located in the Cross Section Sheet Borders are updated and correct, do NOT print Cross Section Sheets from Cross Section ORD File (…_xs.dgn). For the first time printing cross sections, print from a different ORD File to update Fields. If printing Cross Section Sheets for a second time, and Fields do NOT need to be updated, then printing can occur from any ORD File. See 16I.1 WARNINGS for the Printing of Cross Sections.

Open any ORD File – besides the file that contains the Cross Section Sheet Models. In this example, the Corridor ORD File (.cor.dgn) is opened.

**NOTE:** To access the project Sheet Index, the User must open an ORD File that belongs to the project WorkSet.

2 Open the Project Explorer.

3 In the Project Explorer, navigate to the Sheet Index tab.
Expand the project *Sheet Index* and select (highlight) the “X-Sections” Folder.

**WARNING:** The User that originally configured *Sheet Index* may need to print Cross Section sheets. Depending on the Agency’s or Consulting company’s IT infrastructure relating to WorkSpace and WorkSet, the *Sheet Index* may only be available to the User that initially set it up. For example, some remote workers may have the WorkSpace and WorkSet installed directly on their computer’s C: Drive. Since the *Sheet Index* is stored in the *WorkSet*, other User may NOT have access to it if located on the C: Drive.

5. Left-Click on the *Open Print Organizer* icon.

6. The User will be prompted to select a *Print Style*. Select (highlight) the “FLH_Standard_PDF” options and push OK.

7. In the *Print Organizer*, select (highlight) the “X-Sections” Folder.

8. Push the *Print* icon.

9. In the *Print* dialogue box, select the desired folder for the resulting PDF, by clicking the ... icon next to the *Destination* box.

10. In the *Print* Dialogue box, consider checking the *Open print file after creation* box. If this box is CHECKED, then the PDF will be automatically opened after completion of printing.

11. Select OK to proceed with printing.

**WARNING:** Printing operations may take an extended period of time.