Electrical Tutorial

Routing a Cableway

Version 2014

PART OF HEXAGON

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SESSION 3

Routing a Cableway

Objective

By the end of this session, you will be able to:

- Route a cableway in Smart 3D

Prerequisite Sessions

- Smart 3D Overview
- Smart 3D Common Sessions
- Electrical Overview

Overview

Cableway is a channel for enclosing and holding wires, cables, or busbars in a plant. Cableway is a reserved space for cable tray. Cableway does not have physical parts whereas cable tray does have parts.

The **Route Cableway** command on the vertical toolbar allows you to route a cableway or a cable tray network and define its geometry and properties. Using this command, you can create, modify, or extend an existing cableway in a model. You can then add features and components to the cableway or the cable tray network, which are driven by predefined specifications and the catalog.

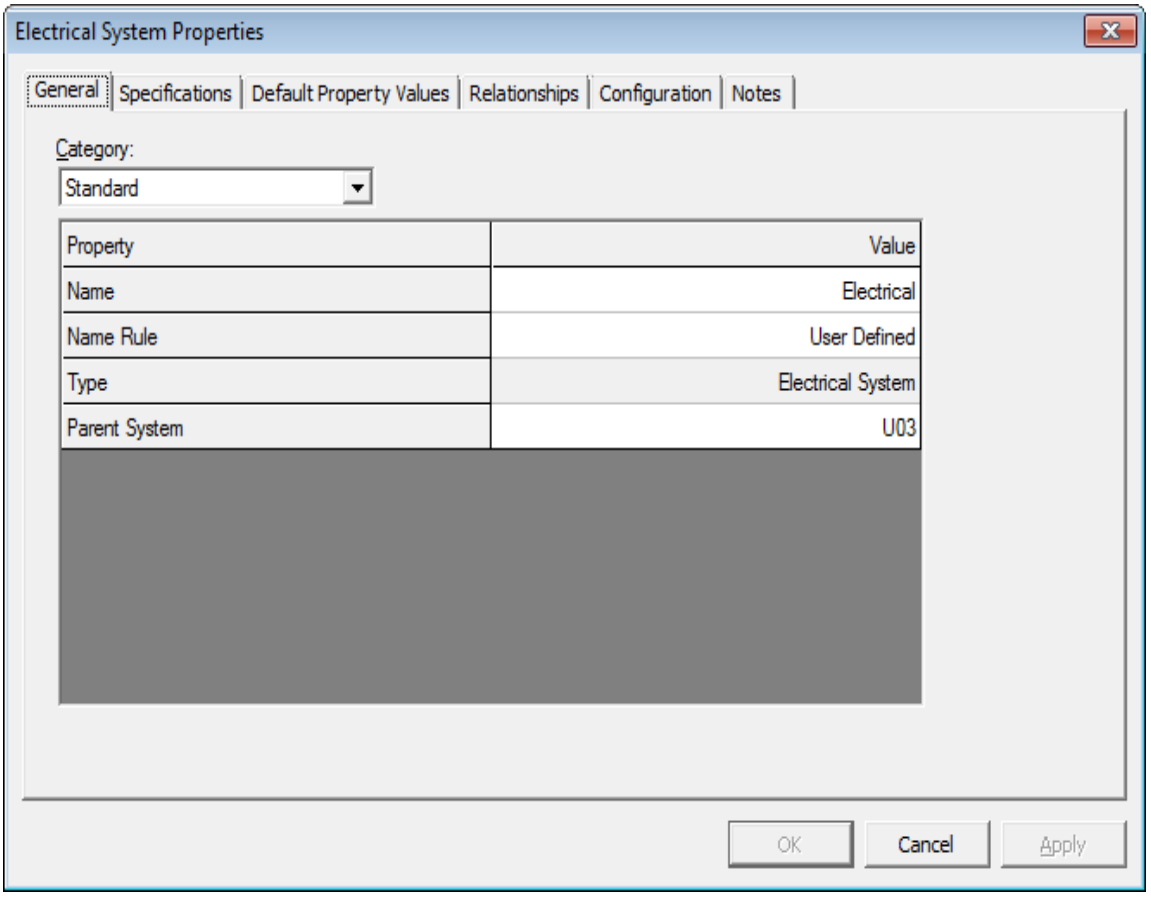
NOTE Specifications are defined in the reference data. You can create and customize the specifications to suit your requirements.

When you route an existing cableway or create a new cableway in a model, you have the option to set the default/common properties of the cableway at system level.

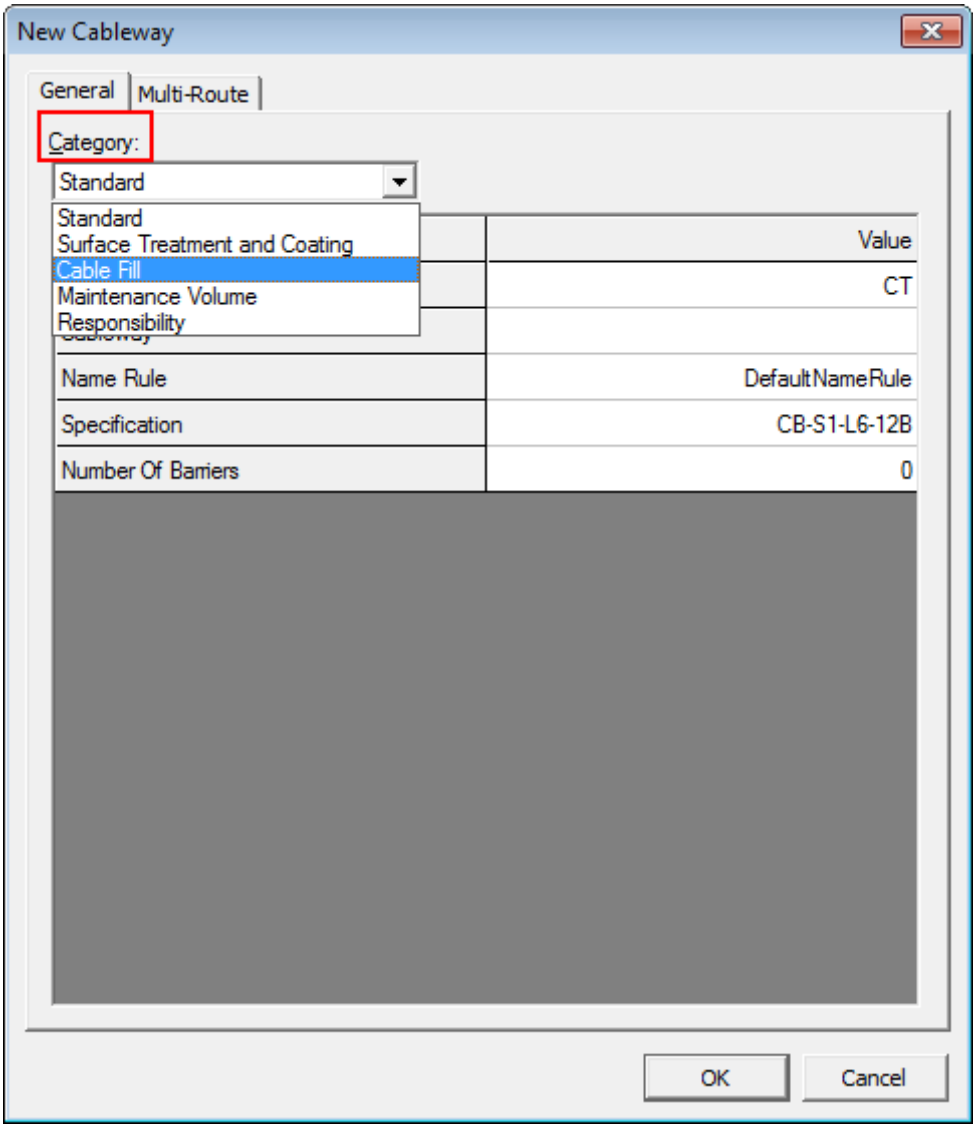
Default properties for the new cableway can come from any one of the following:

- The cableway to which you are connecting.
- The parent electrical system default properties defined in the **Systems and Specifications** task of Smart 3D.

If default properties are defined on an electrical system, Smart 3D uses them when you open the **New Cableway** dialog box. The Smart 3D administrator can setup the default properties based on the project specification set. To access the properties, you right-click **Electrical** system in the **Workspace Explorer** and select the **Properties** option.



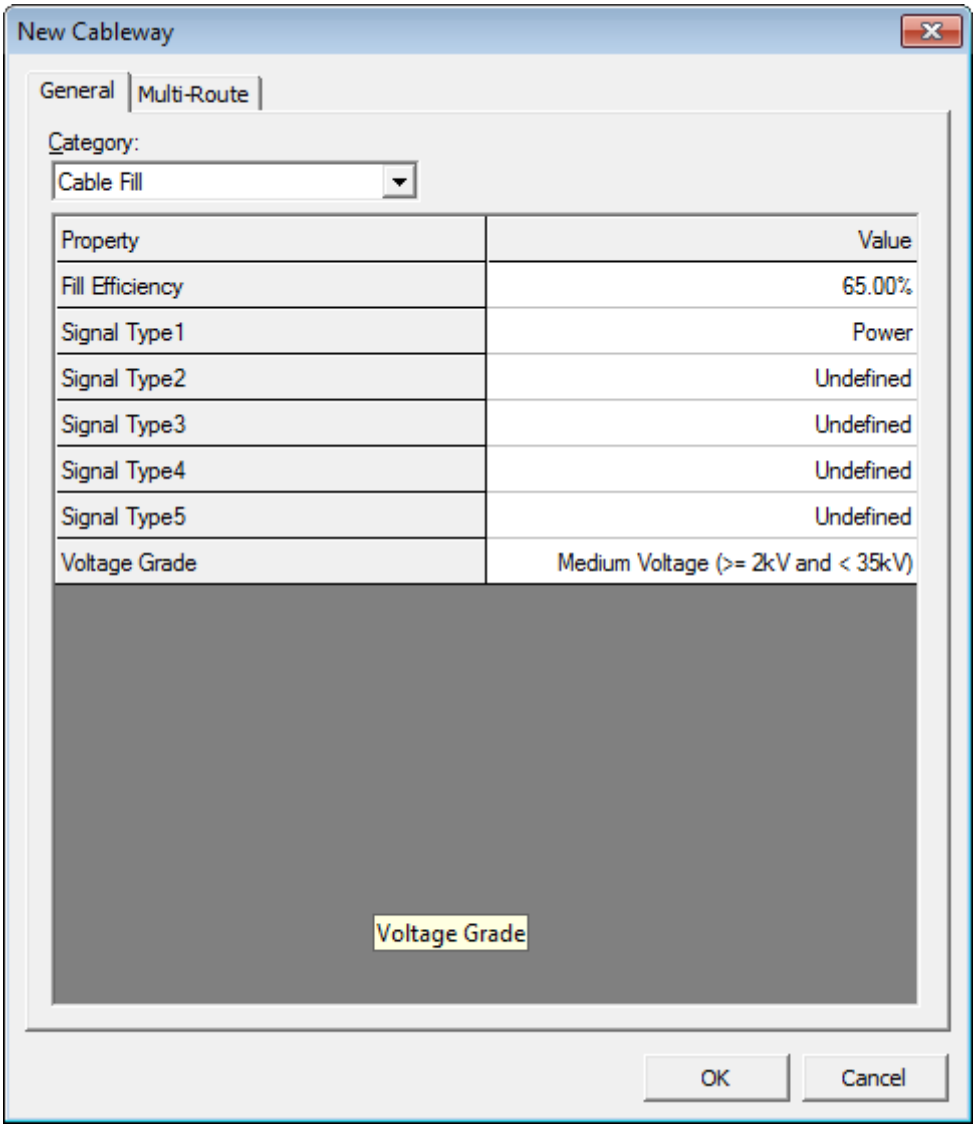
The **New Cableway** dialog box appears when the user creates a new cableway. You can view and make changes to the default properties of a cableway by using the **New Cableway** dialog box. You can select the category for which you want to define values by using the **Category** option.



Default cableway properties are divided into different categories:

- Standard category: Displays or defines the specification for the cableway. Only those specifications that are allowed in the system that you selected will appear. You define name of a cableway or cable tray under this category.
- Responsibility category: Specifies the parties responsible for the cleaning, designing, fabrication, installation, painting, requisition, supply, and testing of cableways.
- Surface Treatment and Coating category: Specifies the interior and exterior coating requirements, type, area, and color of a cableway.
- Cable Fill category:

- Fill Efficiency: Specifies the efficiency of stacking cables in the cableway.
- Signal Type: Specifies the cable usage, which is used in the cable tray fill calculations. Also, the signal type will be required at a later time for automated cable routing. There are five signal type attributes that can be used on the cableway. The signal type of the cable being placed into a cableway must match one of these values. Otherwise, it cannot be automatically routed through that cableway.
- Voltage Grade: Specifies the voltage grade, which is used in determining the range of voltage that the cableway can transmit. It is the value against which the cable tray fill calculations should be executed and also the value that should be used to match the voltage of the cable against the voltage grade assigned to the cableways. The voltage grade can also be useful for naming conventions utilized by cableway systems.



To learn about these properties, refer to the New Cableway Dialog Box topic of the ElectricalUsersGuide.pdf.

In the **Electrical** task, you can route cableways with a non-part specification. Such routed cableways are referred to as cableway zero-specs. Cableway with a non-part specification is a spec without parts where as the corresponding cable tray spec is one which has parts. By using cableway with a non-part specification to model tight turns and vertical drop outs, you can route cables across the gaps in the cable tray and enable the cable routing to form a contiguous network through which to route the cable.

NOTE One of the extended uses of a cableway with non-part specification is that you route a cableway to reserve the space in the model, then you change specification by using the property page to a cable tray spec. This allows you to size the tray at a later time, and SP3D will solve for the parts when you flip the spec from a cableway with non-part spec to a cable tray spec. You can also go back to cableways with non-part spec later if you want. It is a reversible process.

This space reservation is intended to reserve space and can report as clashes when the Interference Detection processes the data. You see a hybrid of this effect when you are dealing with a cable tray part spec that has no turn parts. In this case we can route straight sections of tray and the turns will just be space reservations that represent where we think the cable will hang as it passes from one tray straight section to another.

Using cableway with non-part specification, you can route a cable path across the following gap conditions:

- A tight radius turn for which no elbow has been placed
- A longer radius turn
- A gap between two trays in the same plane
- A gap between a horizontal and vertical tray

This session will cover the procedures to:

- Create a new cableway with non-part specification
- Basic cableway routing
- Route and extend multi trays after routing the cableway

Routing a Cableway

Create a cable tray network by routing one cableway from the coordinate points **E: 5 ft, N: 30 ft, EL: 26 ft** and another cableway from the coordinate points **E: 37 ft, N: 50 ft, EL: 34 ft** in Unit **U04**. Extend the first cableway by using its end feature and then connect both the cableways. Extend the free end of the second cableway by changing the size of the cable tray. The routed cableway should resemble below.

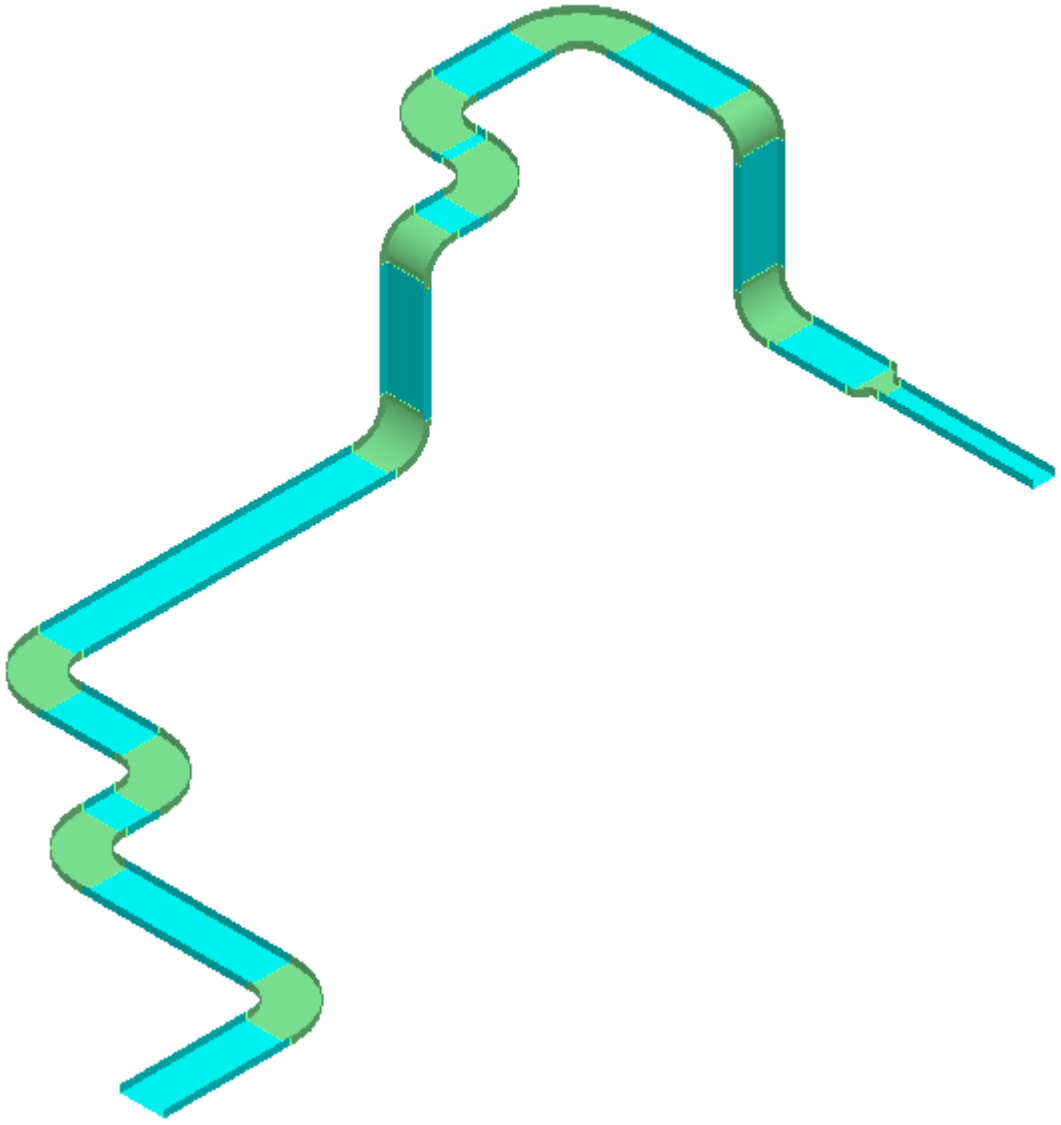
Set the following default properties of cableways before routing them:

Standard category:

System: CT
Name Rule: DefaultNameRule

Cable Fill category:

Fill Efficiency: 60%
Signal Type 1: Control

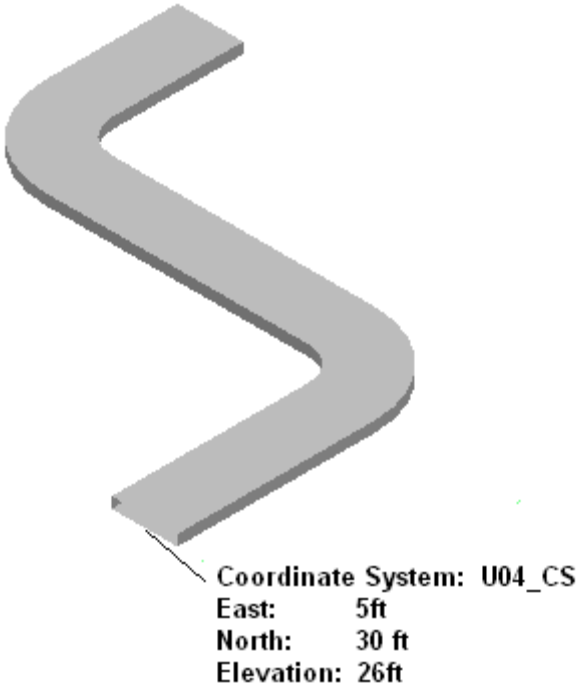


Cableway Routing with Non-Part Specifications

Place a preliminary reserved space by routing a cableway using SmartSketch and length control tools in Unit U04. Define the origin of the cableway using the following coordinate points on the PinPoint ribbon:

E: 5 ft
N: 30 ft
EL: 26 ft

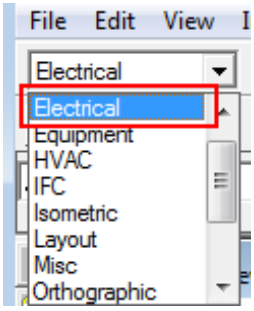
The routed cableway should resemble this.



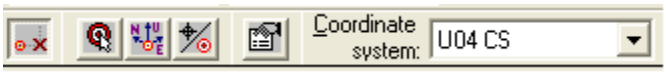
Before beginning the procedure:

Define your workspace to display Unit U04 and coordinate system U04 CS. In your training plant, select U04 from Plant Filters > Training Filters in the Select Filter dialog box.

1. Go to the Electrical task by clicking **Tasks > Electrical**.
2. Make sure the **Active Permission Group** is set to **Electrical**.



3. Activate the **PinPoint** ribbon and set the active coordinate system to **U04 CS** on the PinPoint ribbon.



4. Click **Set Target to Origin** on the PinPoint ribbon, to move the target to the origin of the current coordinate system.

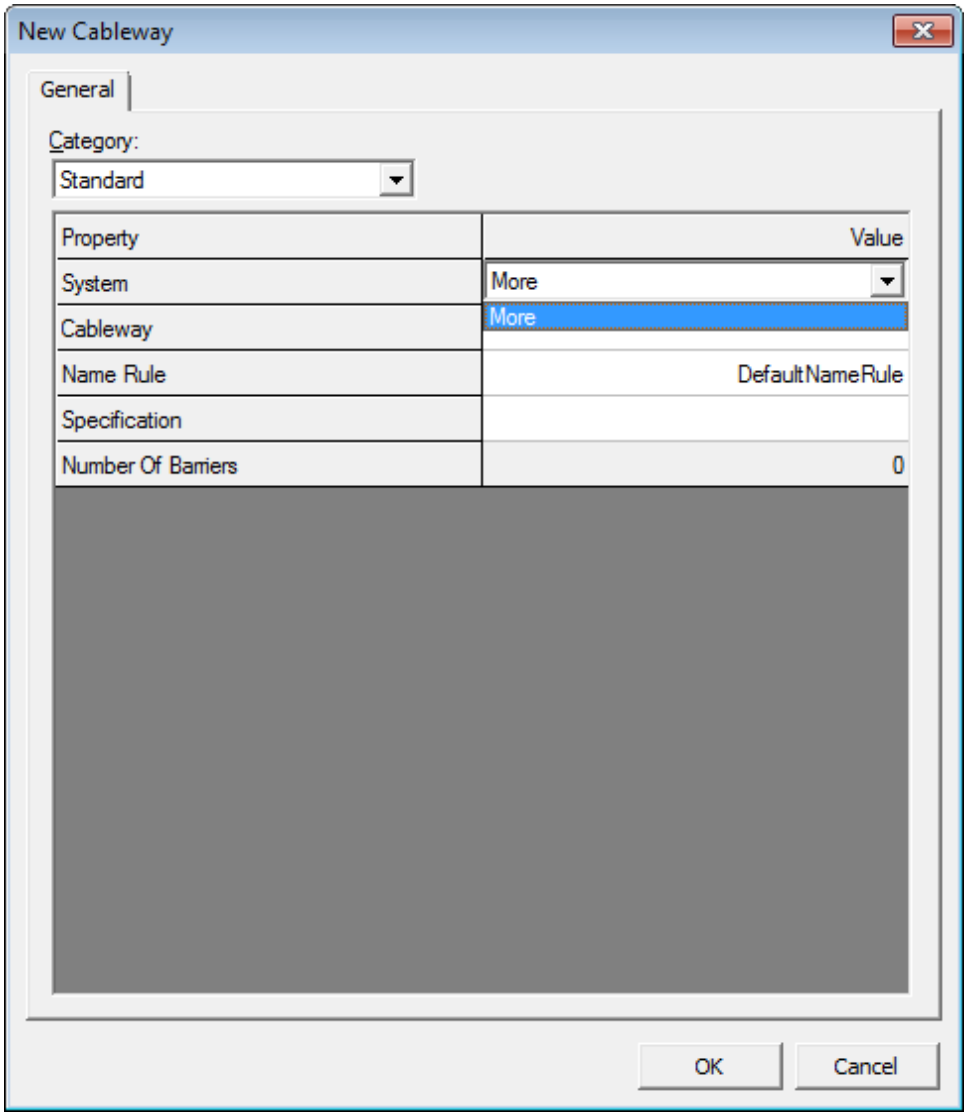
5. Click **Route Cableway** on the vertical toolbar.

6. Key in the following coordinate specifications on the **PinPoint** ribbon and click in the graphic view:

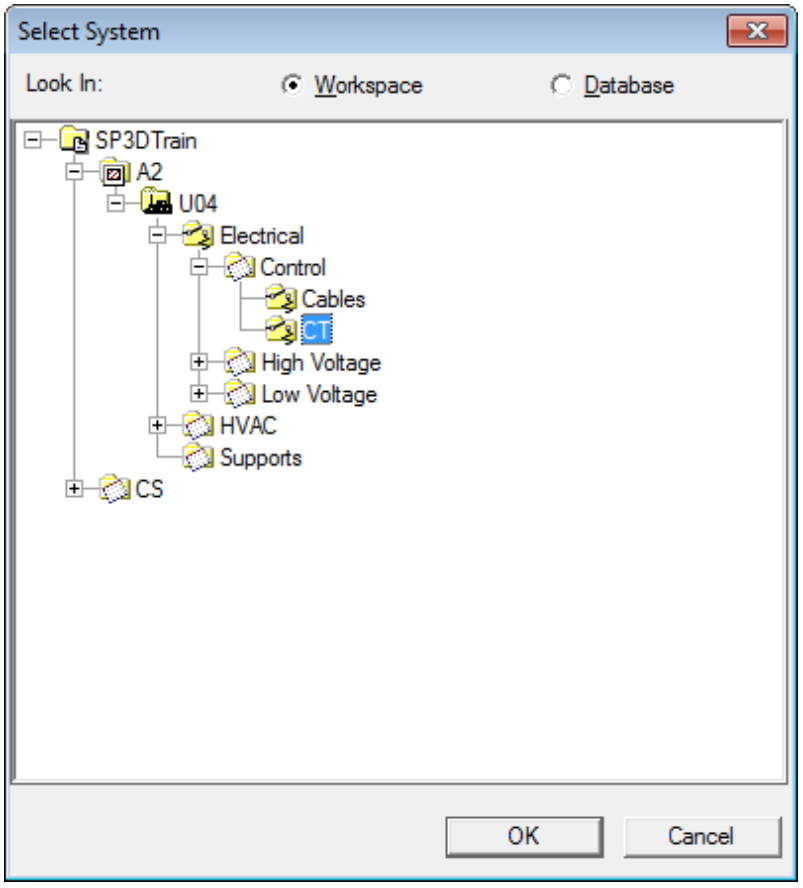
   E: 5 ft
   N: 30 ft
   EL: 26 ft

   The New Cableway dialog box appears.

7. Select the **More** option in the **System** drop-down list to specify the system where you want to place the cableway.



8. In the **Select System** dialog box, select **A2 > U04 > Electrical > Control > CT** and click **OK**.

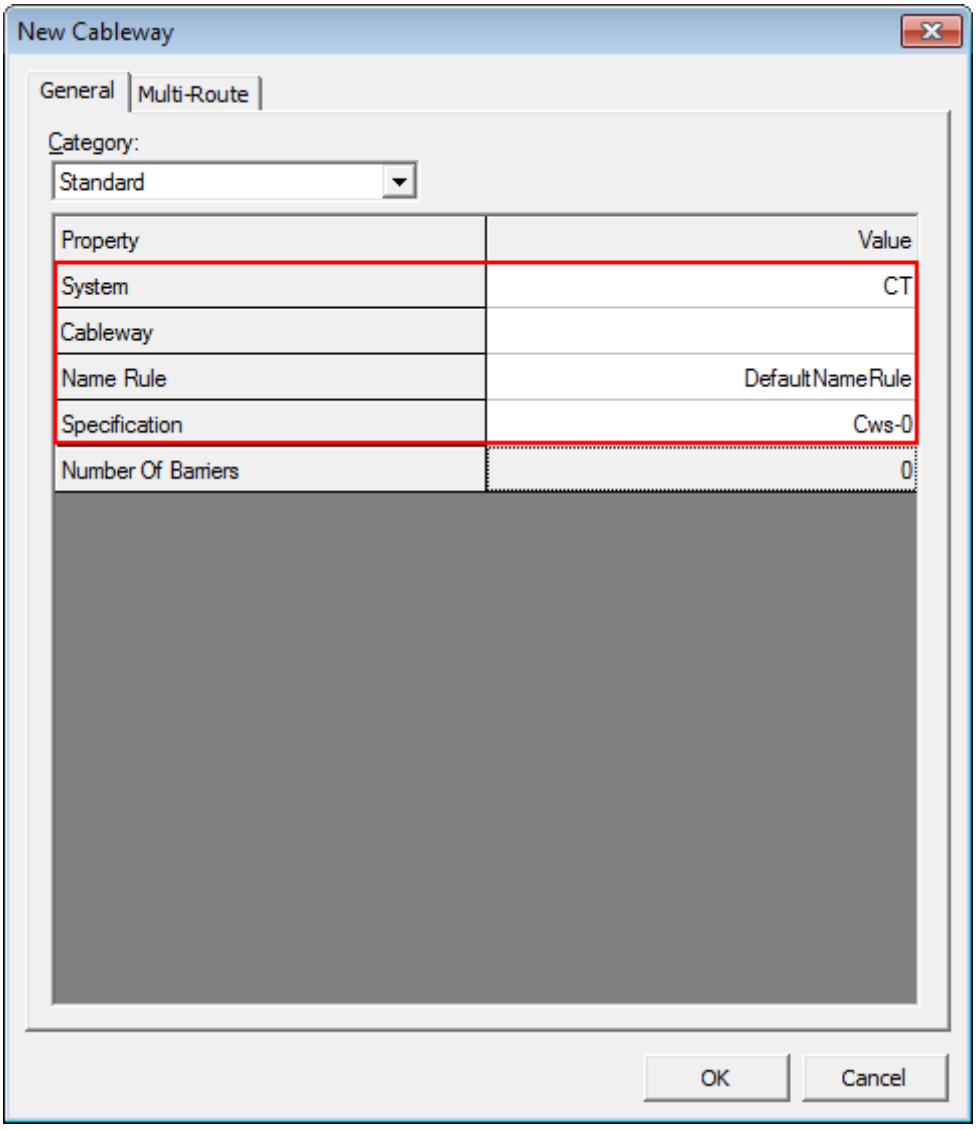


9. In the New Cableway dialog box, verify the following cableway specifications:

   System: CT
   Name Rule: DefaultNameRule
   Specification: Cws-0

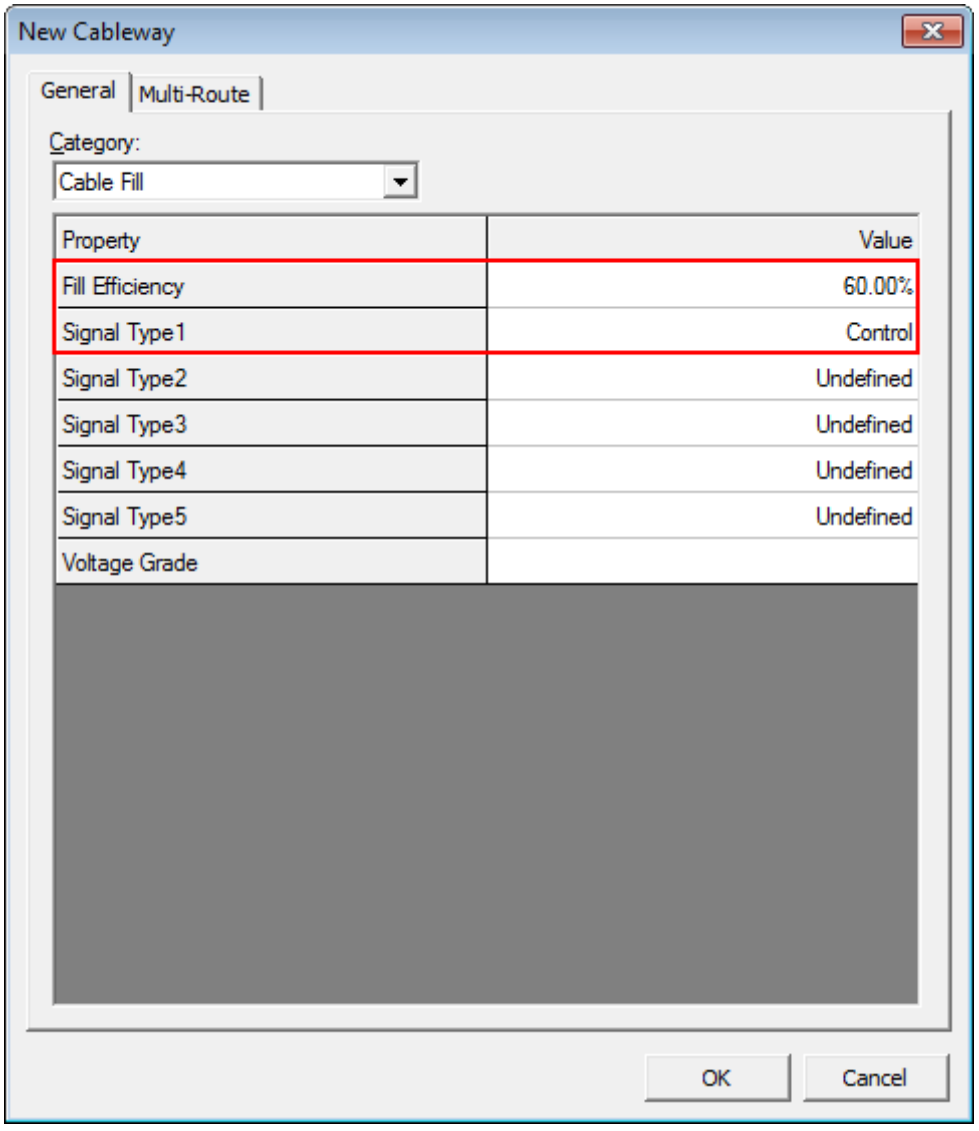
   NOTES

   - Name Rule specifies the naming rule that you want to use to name the cableway that you are routing. You can select one of the listed rules or select User Defined to specify the run name.
   - Cableway specification Cws-0 is a non-part specification and is used to route cableways (reserved space) for tray parts and cables.

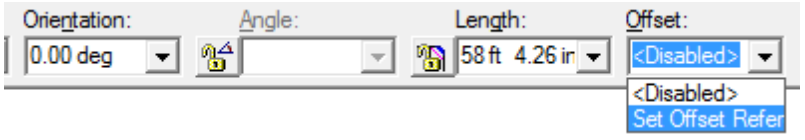


10. Select **Cable Fill** in the **Category** drop-down list. Verify the following specifications and click **OK**:

Fill Efficiency: 60%
Signal Type 1: Control



11. Select **Set Offset Reference…** from the **Offset** drop-down list on the **Route Cableway** ribbon, to set options for reference offsets while routing a cableway.



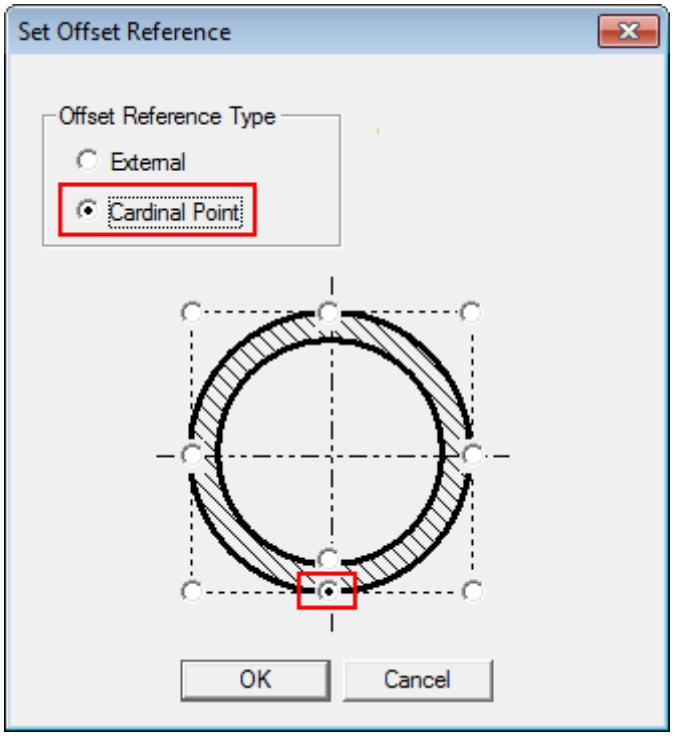
The **Offset** drop-down list on the **Route Cableway** ribbon displays an offset of the cableway surface from the working plane.

The **Set Offset Reference** dialog box appears. There are two types of offset references available in the **Set Offset Reference** dialog box while routing a cableway:

- **External** - Routes a cableway at a specified distance from another object, such as a cableway running parallel to the cableway you are placing.
- **Cardinal Point** - Routes a cableway by the top, sides, bottom, or invert elevation of the cableway instead of the cableway centerline.

12. Select the following options in the **Set Offset Reference** dialog box, and click **OK**:

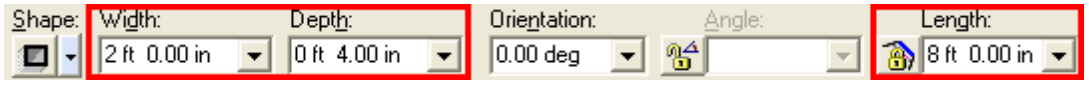
    Cardinal Point option
    Bottom center option



The **Shapes** drop-down list on the **Route Cableway** ribbon sets the offset cross section shape. When you change the cross section shape, the dimensions that you need to specify on the **Route Cableway** ribbon also change. For example, if you select the **Rectangle** or **Flat Oval** shape, all dimensions, such as **Width** or **Depth**, are displayed. If you select the **Round** shape, a box for the diameter appears on the **Route Cableway** ribbon.

13. Select the **Rectangle** shape in the **Shapes** drop-down list and key in the following specifications on the **Route Cableway** ribbon to specify the width and depth of the cross section of the cableway:

    Width: 2 ft
    Depth: 0 ft 4 in
    Length: 8 ft

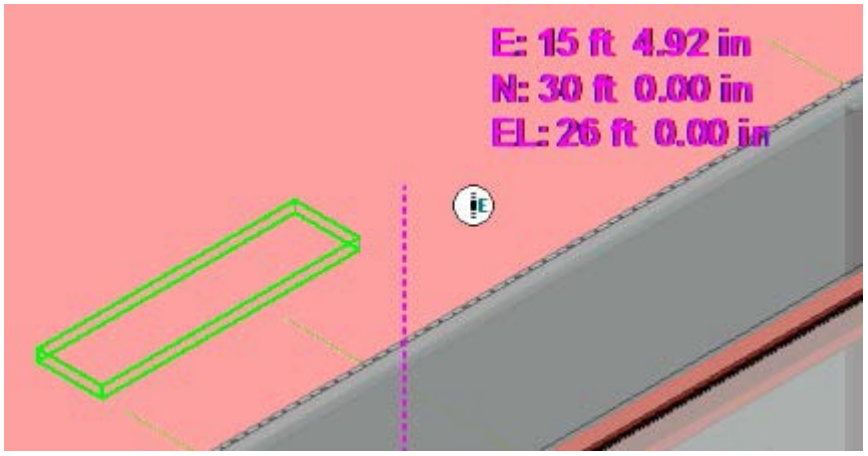


The Plane drop-down list on the Route Cableway ribbon activates options for selecting a working plane for the route path.

NOTE **Width** value must be greater than the depth value. Smart 3D displays an error message if **Depth** is greater than **Width**.

14. Select the **Plan Plane** option in the **Plane** drop-down list on the **Route Cableway** ribbon.

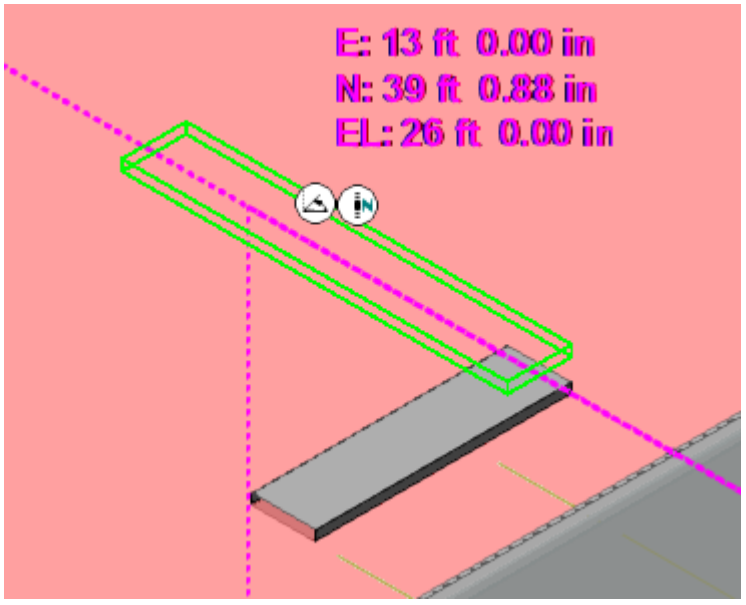
15. Position the cursor in the east **E** direction and click to define the end point to place 8 ft cableway, as shown below.



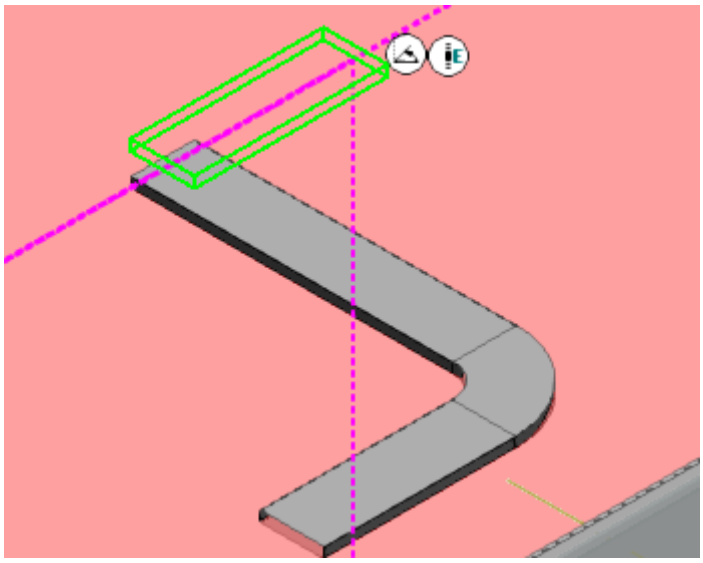
NOTE You can use SmartSketch to constraint the cursor movement along the Easting direction. Click the middle mouse button to set this constraint.

16. On the Route Cableway ribbon, key in 12 ft in the Length box.

17. Position the cursor in the north N direction and click to define the end point to place 12 ft cableway, as shown below.



18. On the Route Cableway ribbon key in 6 ft in the Length box.
19. Position the cursor in the east E direction and click to define the end point to place a 6 ft cableway, as shown below.



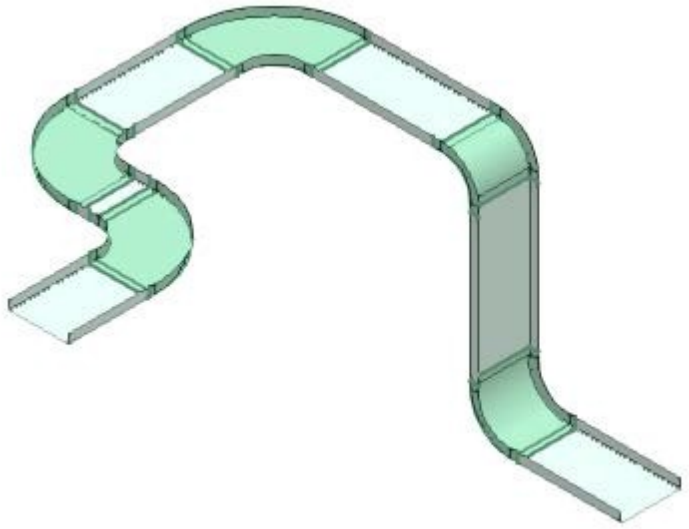
20. Right-click the graphic view to terminate the **Route Cableway** command.

Cableway Routing using PinPoint, Offset, and Cardinal Point

Route a cableway with part specification using PinPoint, SmartSketch and length control tools in Unit 04. Define the origin of the cableway using the following coordinate points on the PinPoint ribbon:

E: 37 ft
N: 50 ft
EL: 34 ft

The routed cableway should resemble below.

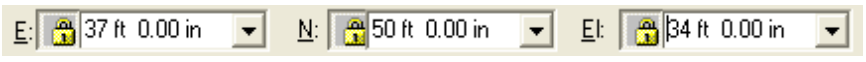


Before you start routing the cableways, set the following in your workspace:

- Define your workspace to show Unit U04 and coordinate system U04 CS.

1. If you are not in the **Electrical** task, select the **Tasks > Electrical** command.
2. Make sure the **Active Permission Group** is set to **Electrical**.
3. Activate the **PinPoint** ribbon and set the active coordinate system to **U04 CS** on the PinPoint ribbon.
4. Click **Set Target to Origin** on the **PinPoint** ribbon, to move the target to the origin of the current coordinate system.
5. Click **Route Cableway** on the vertical toolbar.
6. Key in the following coordinate specifications on the PinPoint ribbon and click in the graphic view:

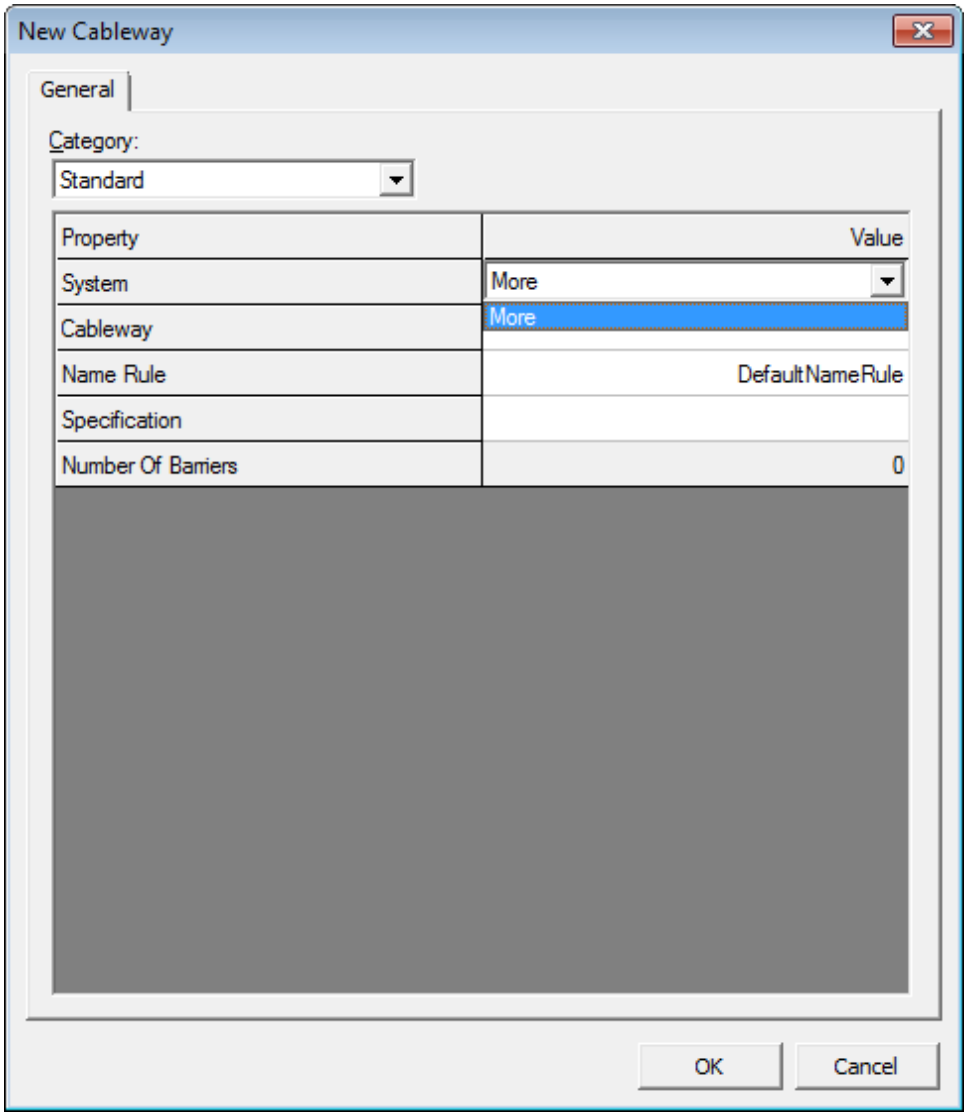
   E: 37 ft
   N: 50 ft
   El: 34 ft



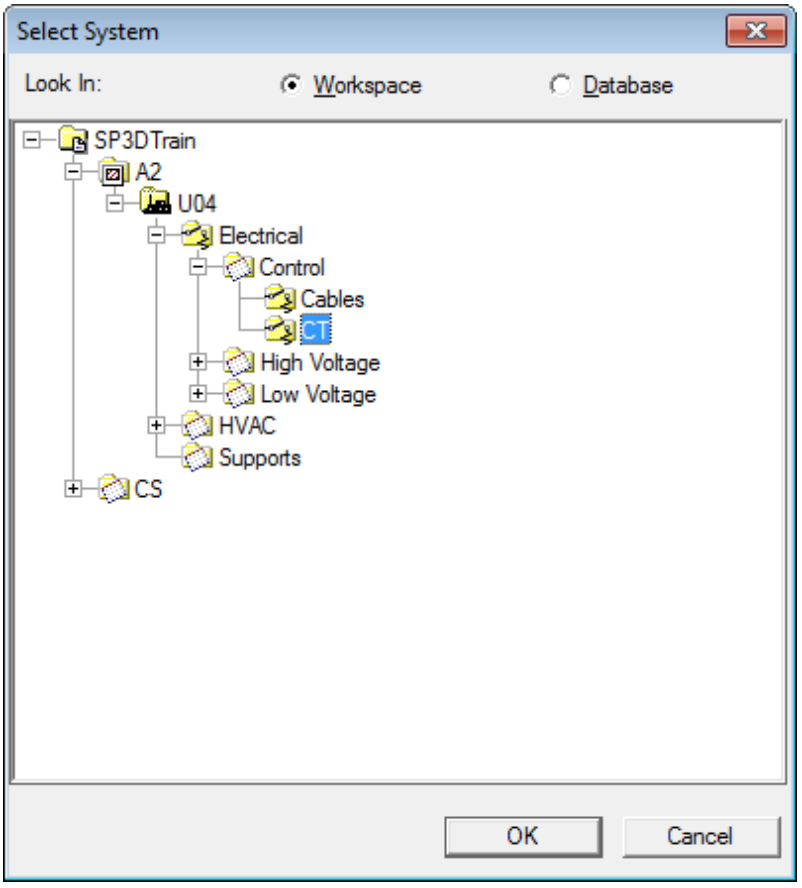
7. Click in the graphic view to accept the starting point.

   The New Cableway dialog box appears.

8. Select **More…** in the **System** drop-down list of the dialog box to specify the system where you want to place the cableway.



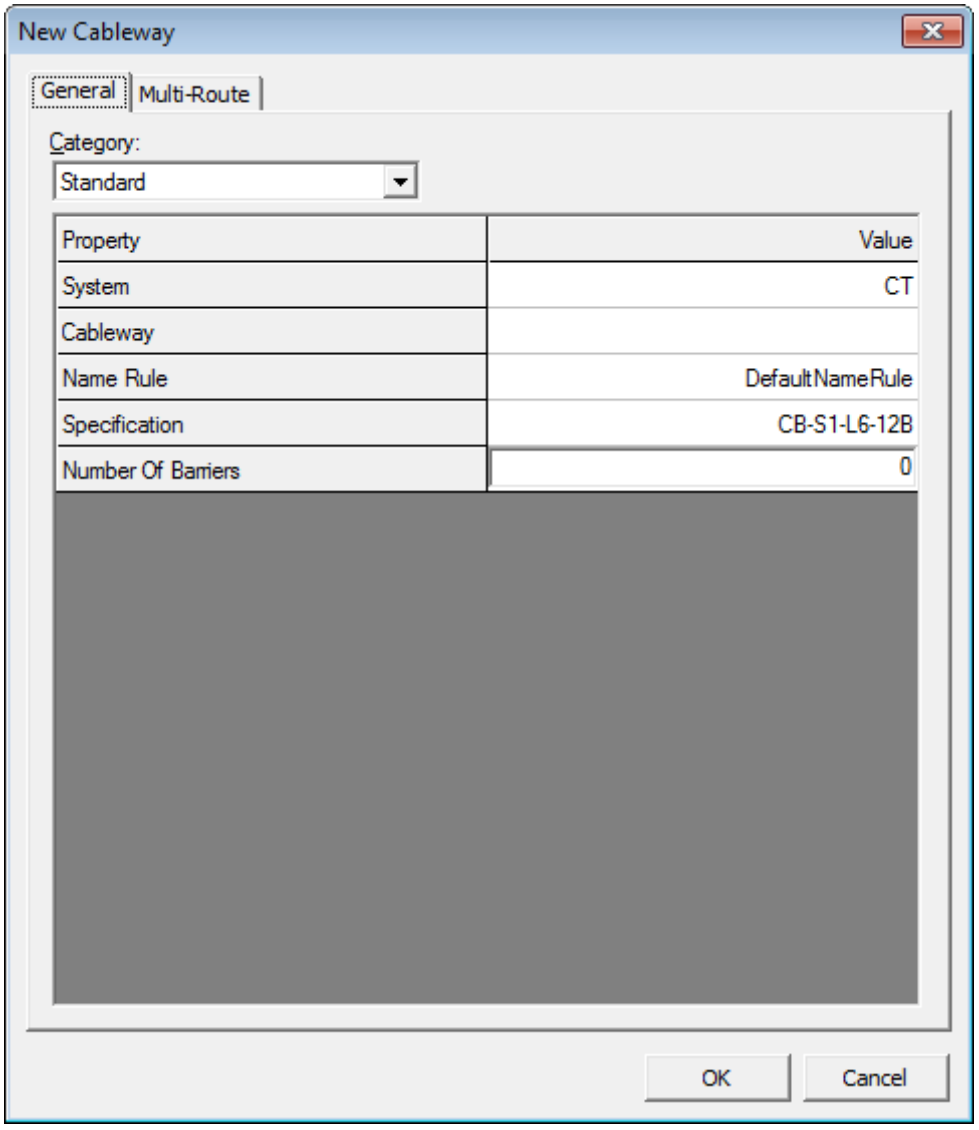
9. In the **Select System** dialog box, select **A2 > U04 > Electrical > Control > CT** and click **OK**.



10. In the **New Cableway** dialog box, verify the following cableway specifications:

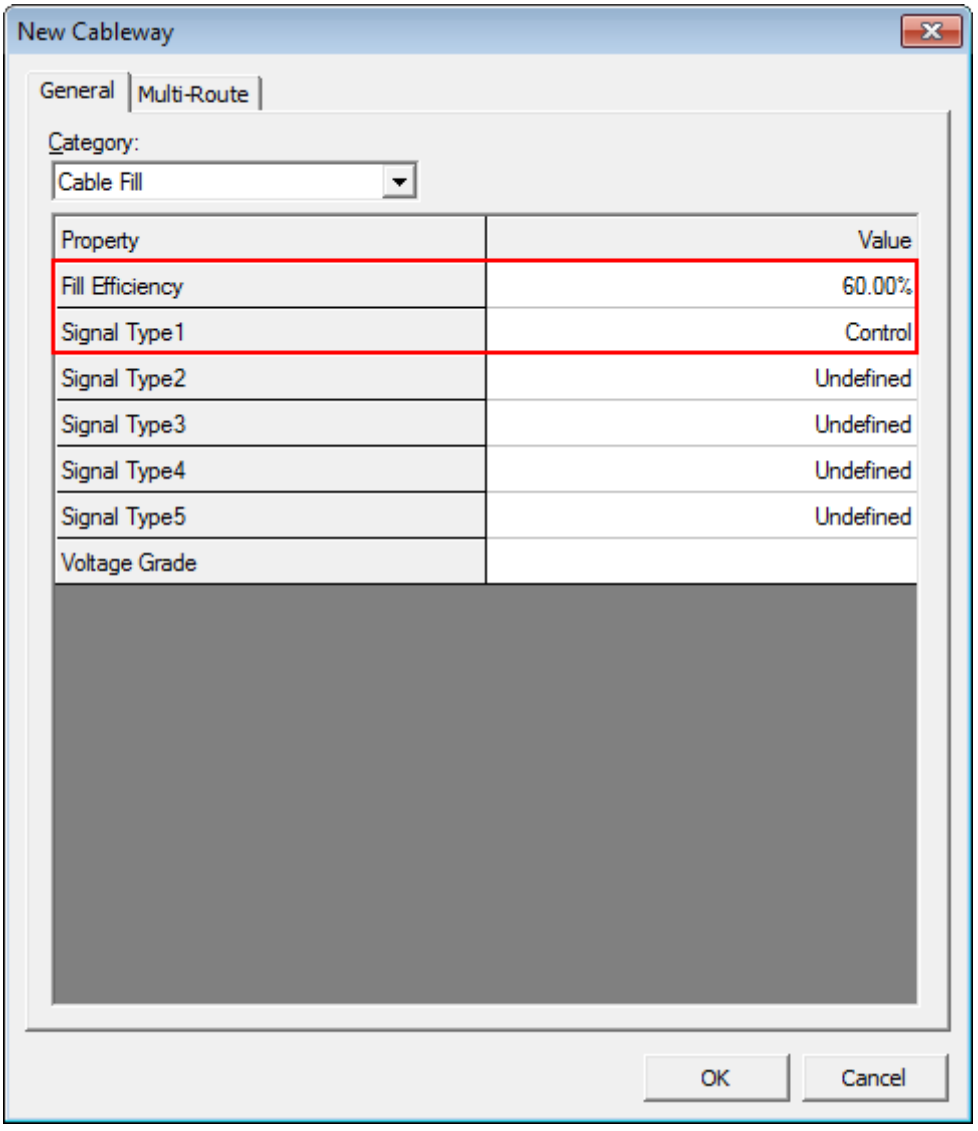
    System: CT
    Name Rule: DefaultNameRule
    Specification: CB-S1-L6-12B
    Number Of Barriers: 0

NOTE **Name Rule** specifies the naming rule that you want to use to name the cable run that you are routing. You can select one of the listed rules or select **User Defined** to specify the run name.



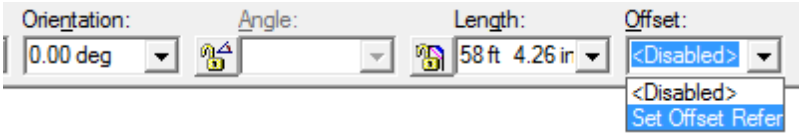
11. Select **Cable Fill** in the **Category** drop-down list and verify the following specifications and click **OK**:

Fill Efficiency: 60%
Signal Type 1: Control



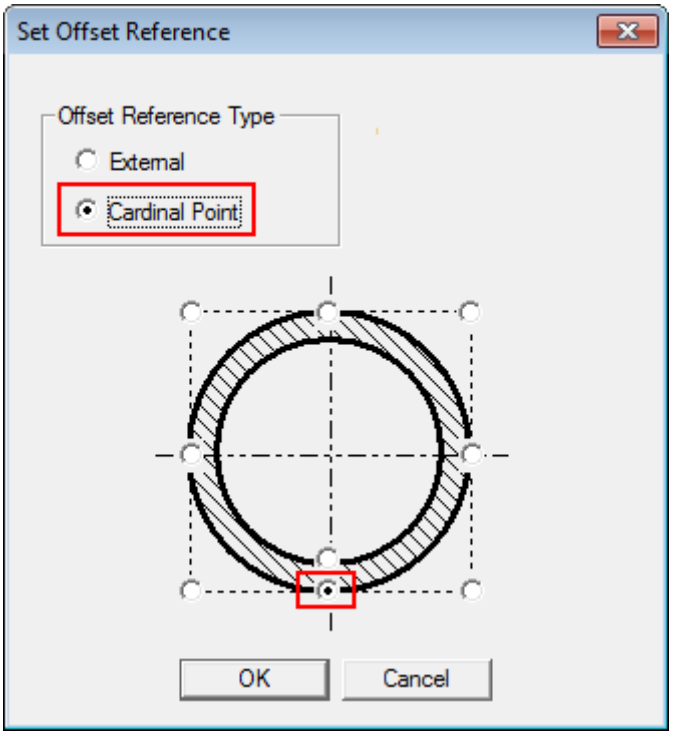
12. Under **Offset** on the **Route Cableway** ribbon, select the **Set Offset Reference…** option to set options for reference offsets while routing a cableway.

    *The **Offset** drop-down list on the Route Cableway ribbon displays an offset of the cable part surface from the working plane.*



13. Select the following in the **Set Offset Reference** dialog box and click **OK**:

    Cardinal Point option
    Bottom center option



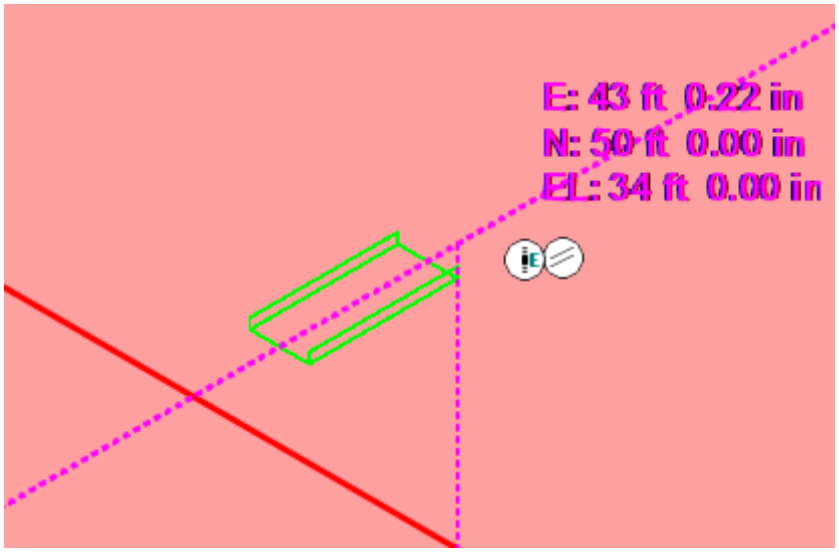
14. Select the **Rectangle** shape in the **Shapes** drop-down list and key in the following specifications on the **Route Cableway** ribbon to specify the width and depth of the cross section of the cable:

    Width: 2 ft
    Depth: 0 ft 4 in

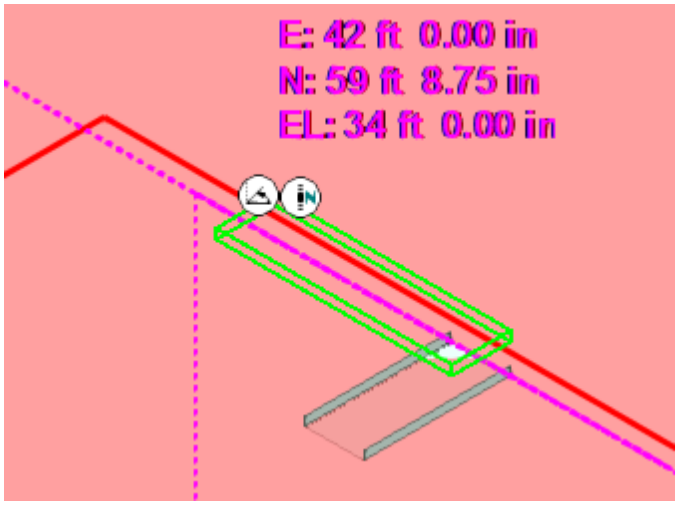
The Plane drop-down list on the Route Cableway ribbon activates options for selecting a working plane for the route path.

15. Select the **Plan Plane** option in the **Plane** drop-down list on the Route Cableway ribbon.

16. Position the cursor in east E direction and specify 5 ft in the Length box on the Route Cableway ribbon and click to define the end point.

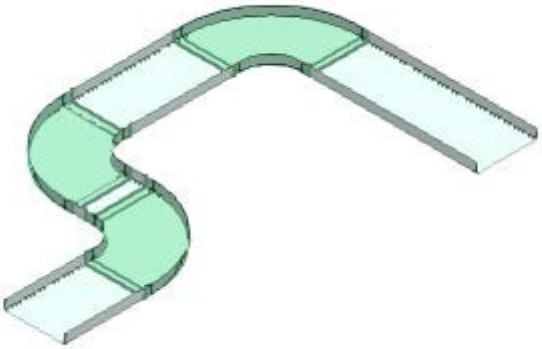


17. Position the cursor in the N direction to place 5 ft cableway. Click in the graphic view to accept the position.



18. Change the length to 8 ft on the Route Cableway ribbon, position the cursor in east E direction to place the 8 ft cableway tray, and click the graphic view to accept the position.

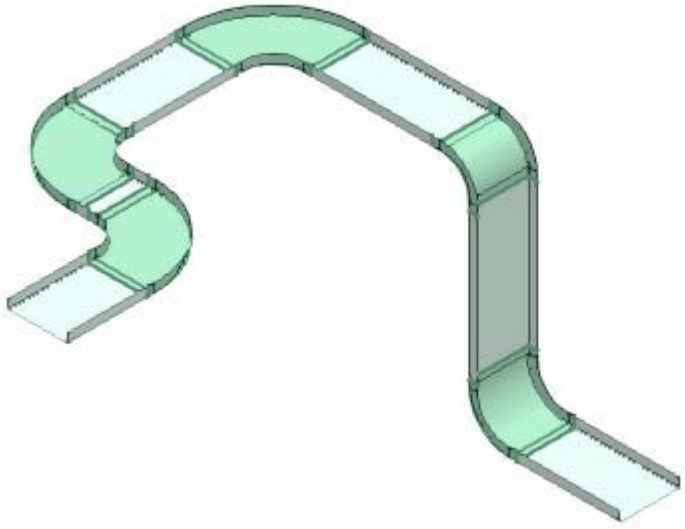
19. Position the cursor in the South direction and click in the graphic view to accept the position, as shown below.



20. Select the Elevation Plane: North-South option in the Plane drop-down list on the Route Cableway ribbon.

21. Position the cursor downwards to place 8 ft cableway tray going down. Click in the graphic view to accept the position.
22. Change the length to 5 ft on the Route Cableway ribbon and position the cursor in the south direction.

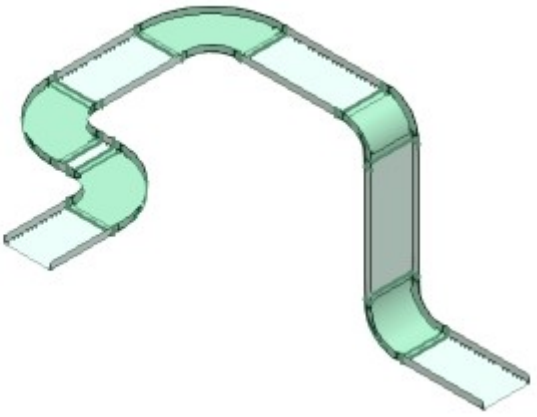
23. Click in the graphic view to place a 5 ft cableway tray going south. Right-click to terminate the Route Cableway command. The routed cableway should resemble Figure 40.



Cableway Routing using the End Feature

1. Click **Route Cableway** on the vertical toolbar.

2. Select **Cableway End Feature** of the cableway with non-zero spec placed earlier in this session.

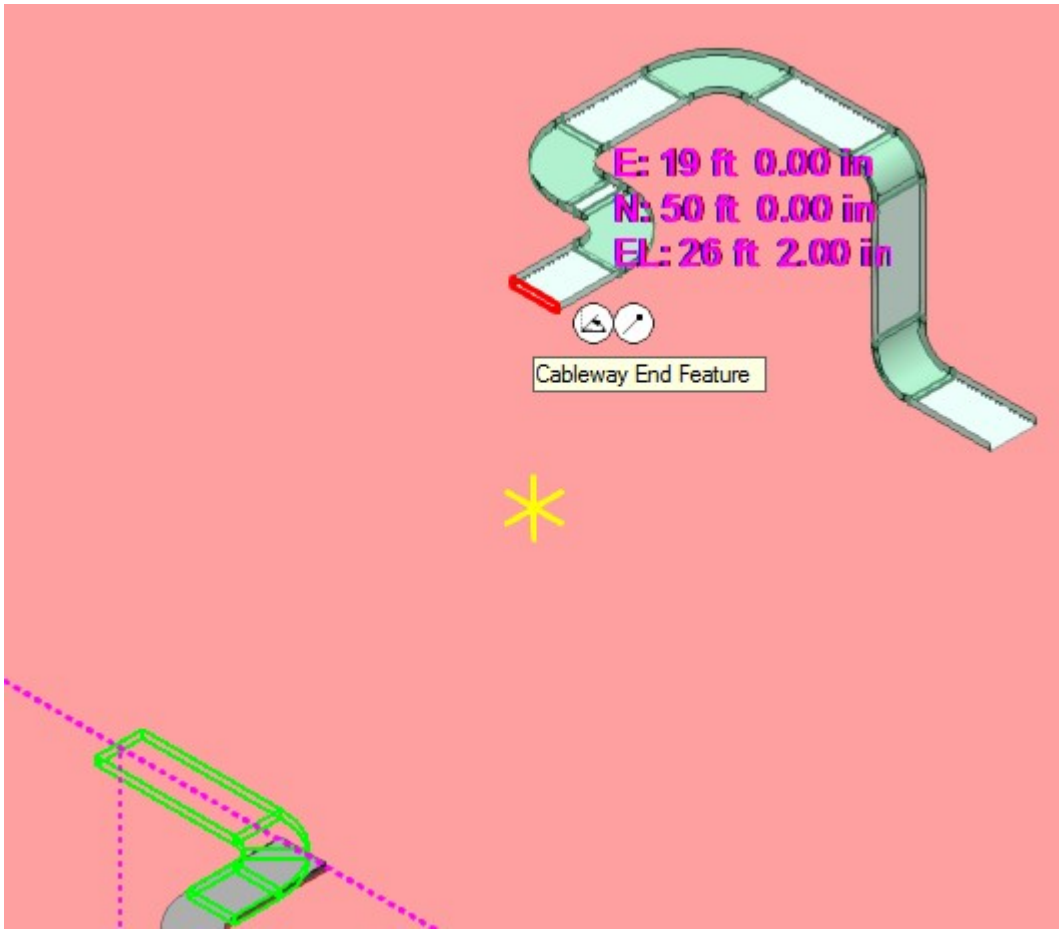


3. Select the Plan Plane option in the Plane drop-down list on the Route Cableway ribbon.
4. On the Route Cableway ribbon, select the <Disabled> option in the Offset drop-down list to disable the Cardinal Point option.

   NOTE Disable the bottom of the tray (BOT) offset will help to joint the two cableways in later steps. The bottom of the cableway of non-zero spec is located at the correct elevation. As a result, we continue the routing by centerline.

5. Select the Angle field and key in 90 deg in the drop-down list.

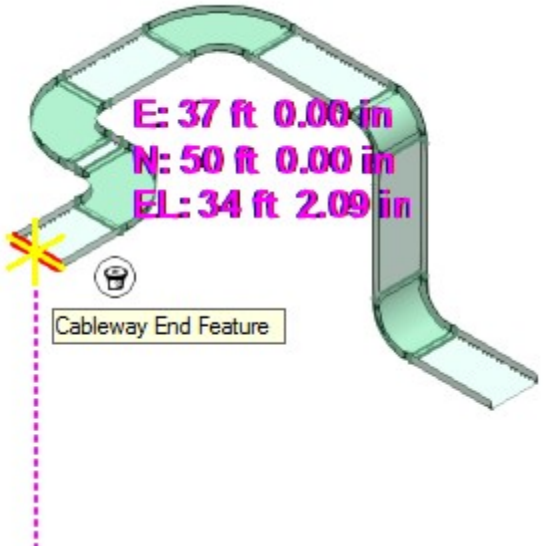
6. Move the cursor to the other end feature to get the northing coordinate as show in Figure 42 and click in the graphic view to place the cableway.



7. Right-click the graphic view to terminate the Route Cableway command.

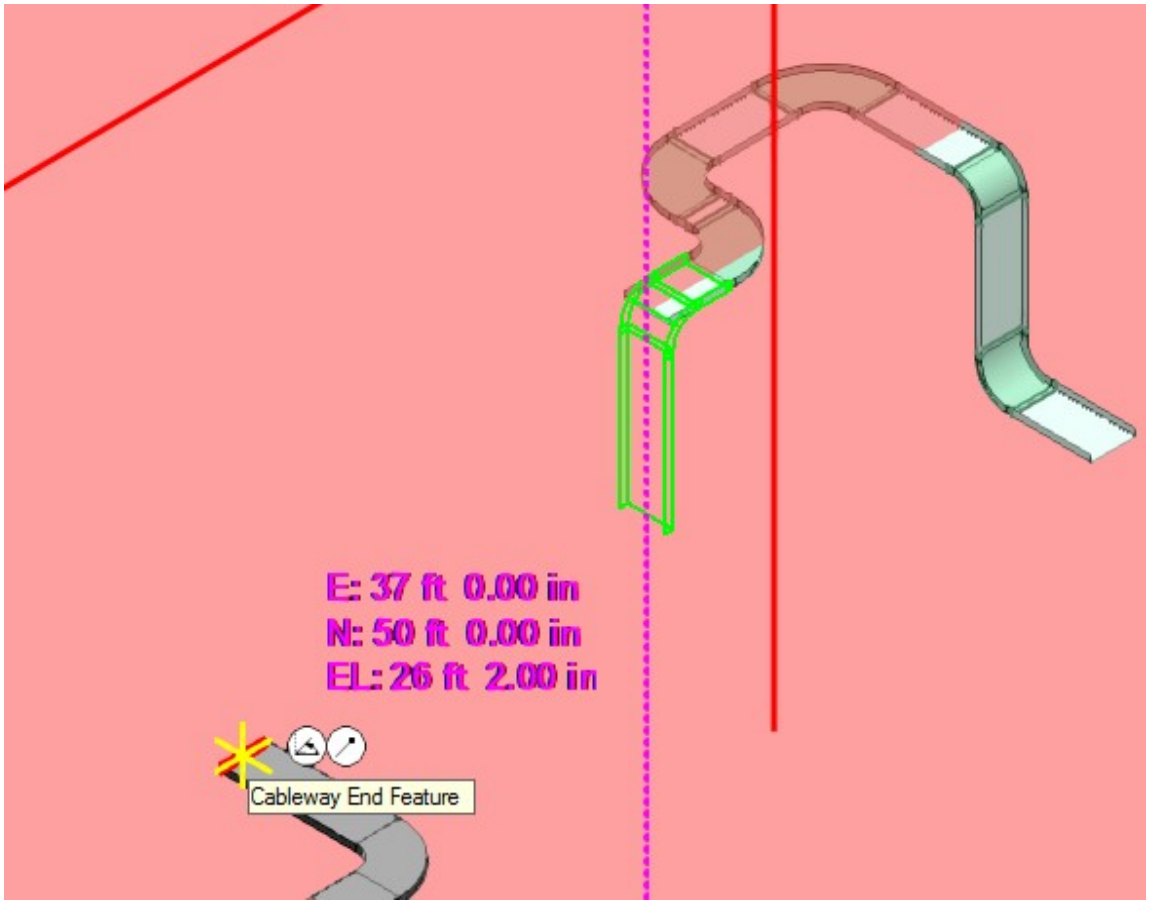
Connecting Cableways

1. Click Route Cableway on the vertical toolbar.
2. Select the Cableway End Feature of the cableway placed earlier in this session.

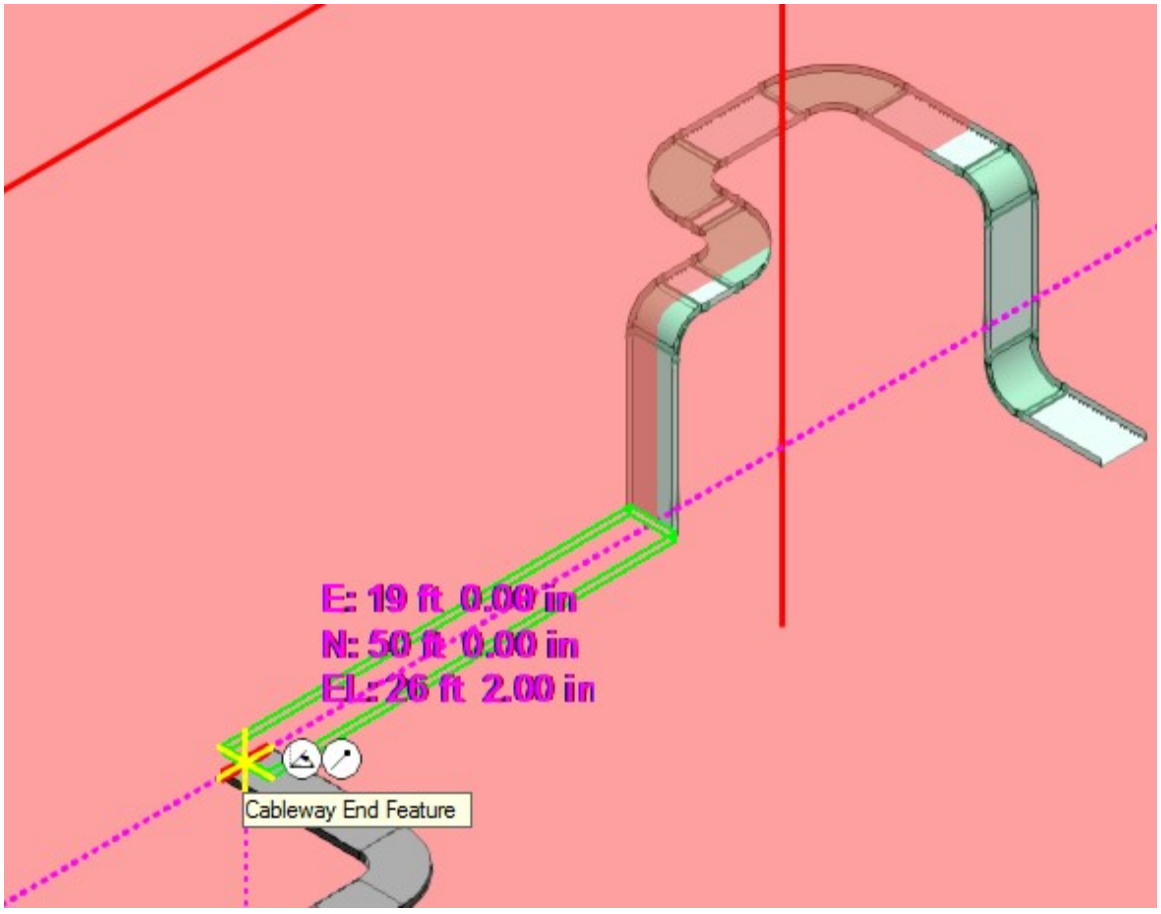


3. Key in 90 deg in the Angle field drop-down list in the Route Cableway ribbon.
4. Select the Elevation Plane: East-West Direction option in the Plane drop-down list on the Route Cableway ribbon.
5. Move the cursor to the other end feature of the cableway with non-zero spec to get the elevation coordinate.

NOTE You should have the cardinal offset set to disabled in this step. Since the end feature of the cableway with non-spec is at the correct elevation, you just need to finish the route by using the centerline option. As a result, SP3D will generate a 90 Horizontal Bend during the connection quite easily. Otherwise, you need to lining up the bottoms cardinal point of the cableways using the Move command.



6. Click in the graphic view to define the next data point. Again, move the cursor to the other end feature of the cableway with non-zero spec and click to join the two cableways.

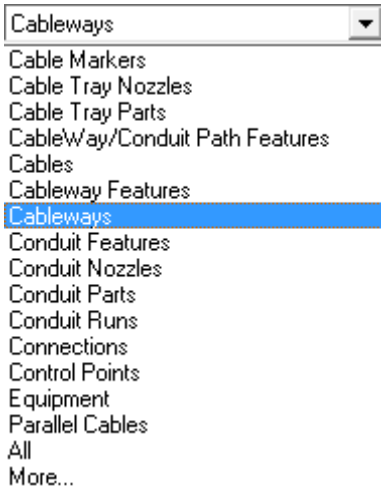


Changing Cableways to a Different Specification

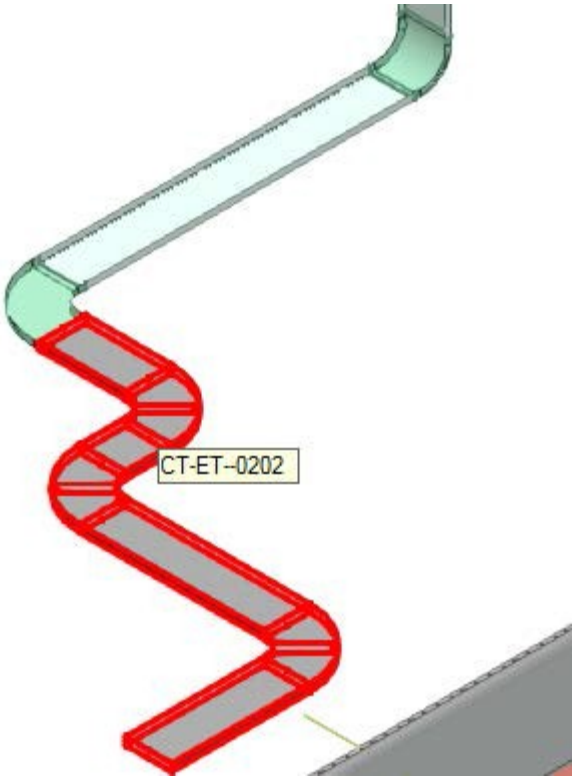
You can select a cableway with non-part specification and change it to use a part specification. SP3D will generate the tray parts for all the feature type located in the cableway system. If a part cannot be found for a specific feature, then Smart 3D will generate a To Do List item.

NOTE It is very important to match the specification of the other cableway so that Smart 3D will not place any transitions and the parts generated on both cableways are of the same manufacturer, tray type, material, and load span classification.

1. Select **Cableways** from the **Locate Filter** drop-down list to select only cableways from the graphic view.

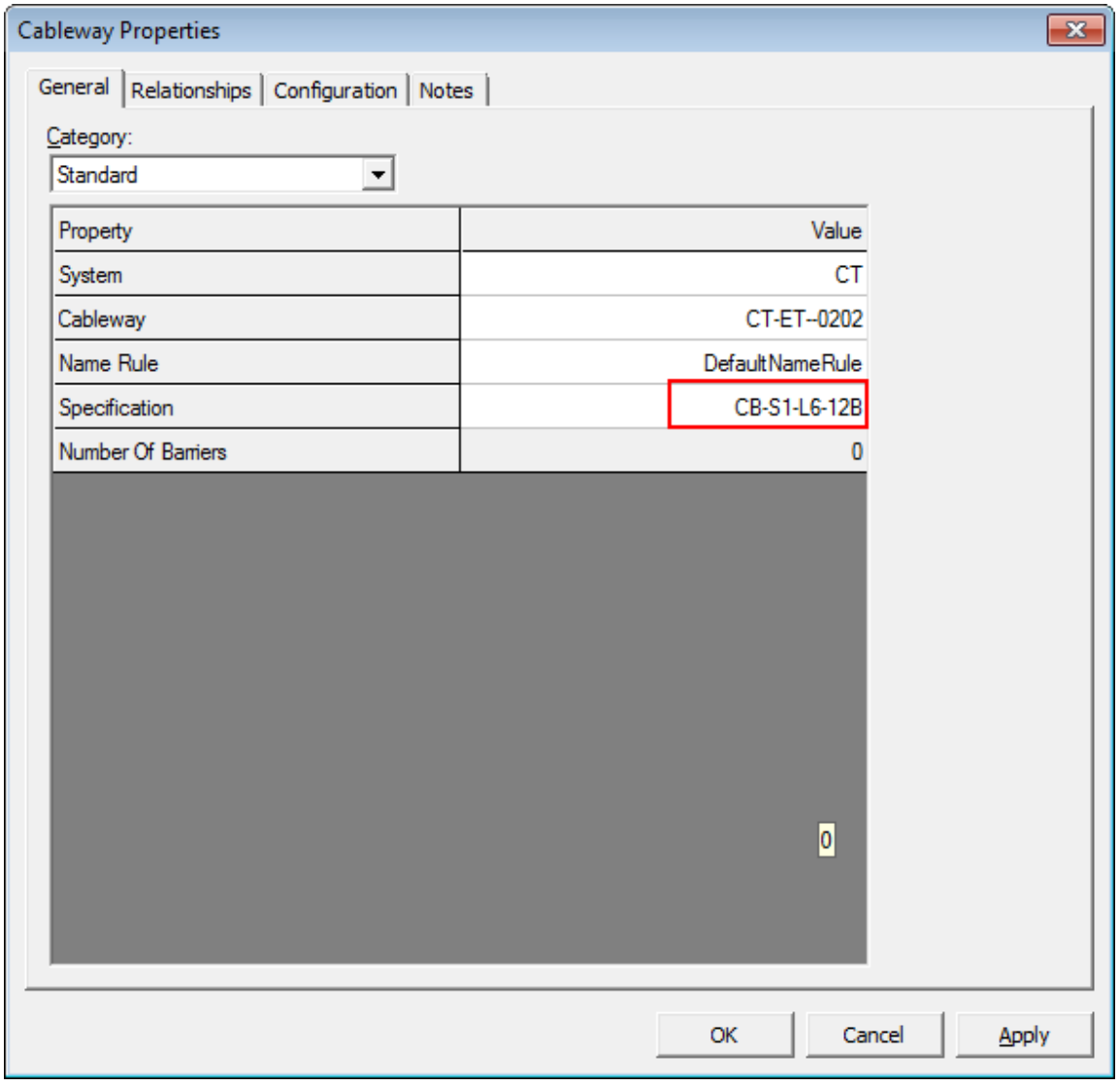


2. Select the cableway with non-zero spec from the graphic view.

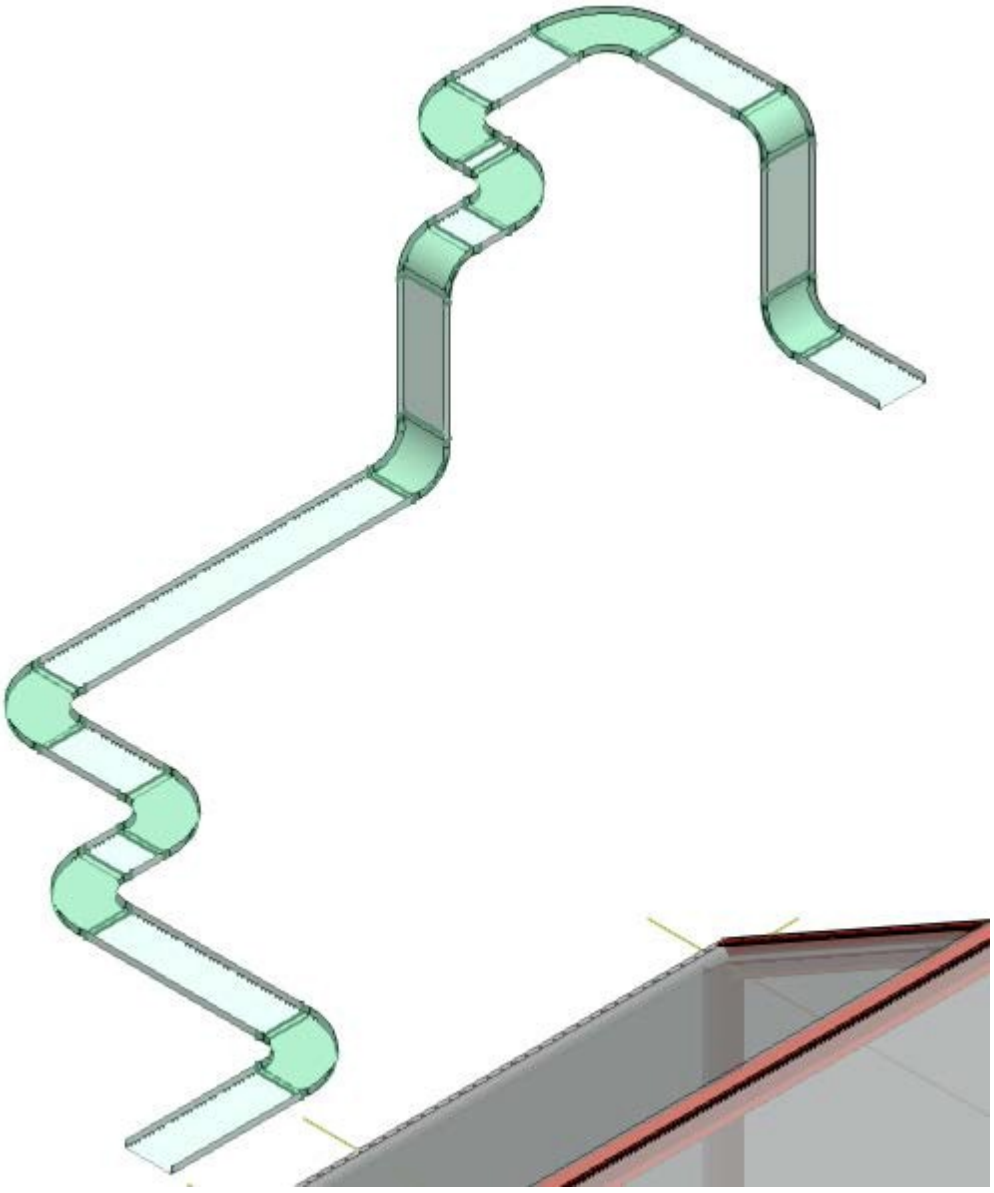


3. Right-click the selected cableway to access the Cableway Properties dialog box.

4. Select CB-S1-L6-12B from the Specification drop-down list on the Cableway Properties dialog box.



5. Click OK to apply the modified specification on the cableway.

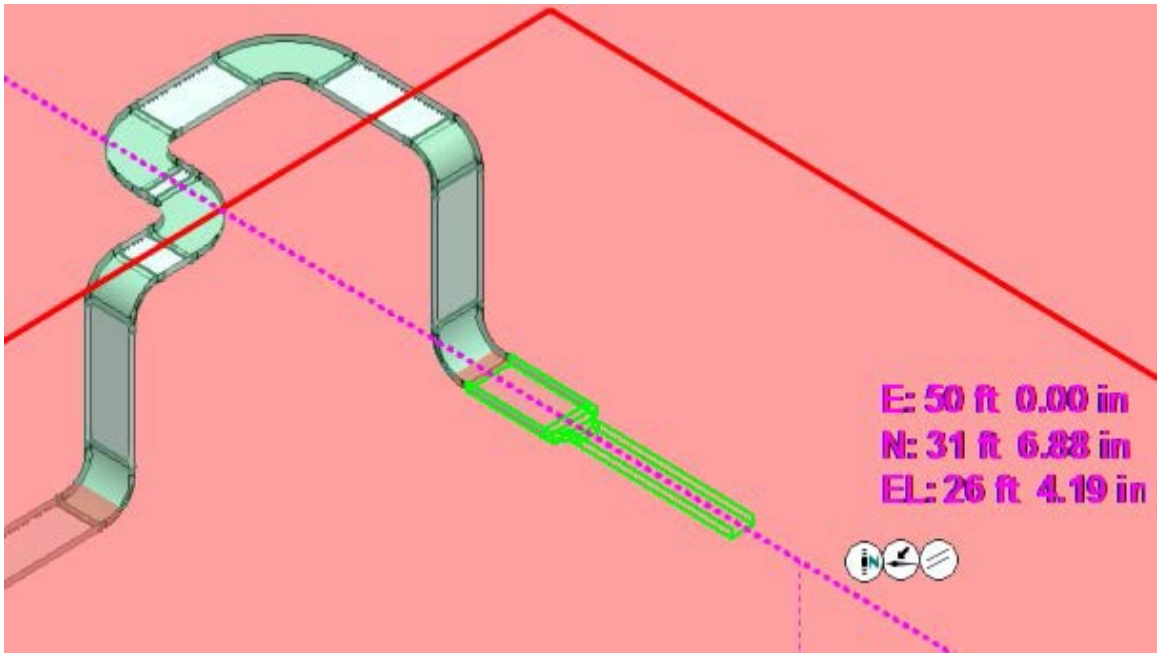


NOTE Smart 3D use the specification, the size and the feature type to generate the appropriate tray parts for the selected cableway.

Cableway Routing with a Size Change

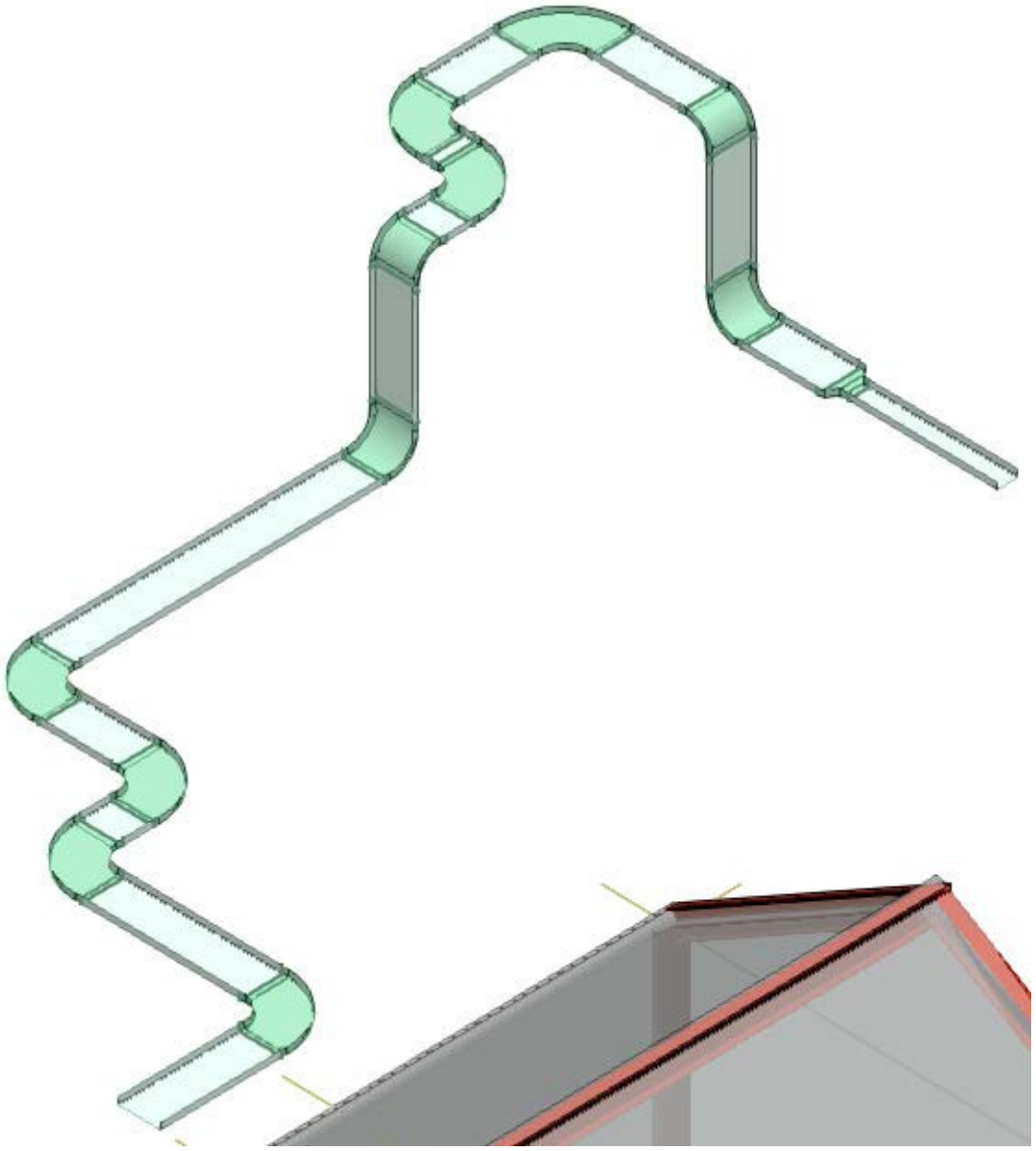
A size change reduces the size of the cableway that you route compared to the existing one.

1. Click Route Cableway on the vertical toolbar.
2. Select the Plan Plane option in the Plane drop-down list on the Route Cableway ribbon.
3. Select the Cableway End Feature of the cable tray placed earlier in this session.
4. Change the width to 1 ft and depth to 4 in and length to 8 ft on the Route Cableway ribbon.
5. Position the cursor towards the south direction in the graphic view, as shown in Figure 50.



6. Click the graphic view to accept the position.

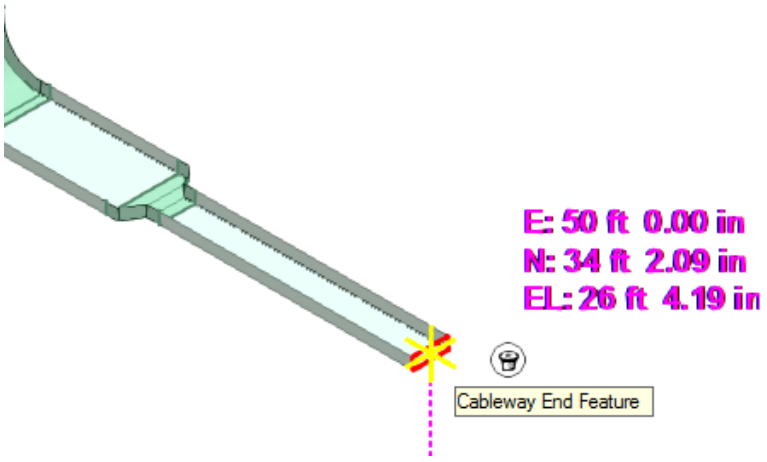
After the size change the cableway network should look like this.



To Do List Items

While routing a cableway if there is any inconsistency in the cableway features they will appear as To Do List items and they need to be resolved.

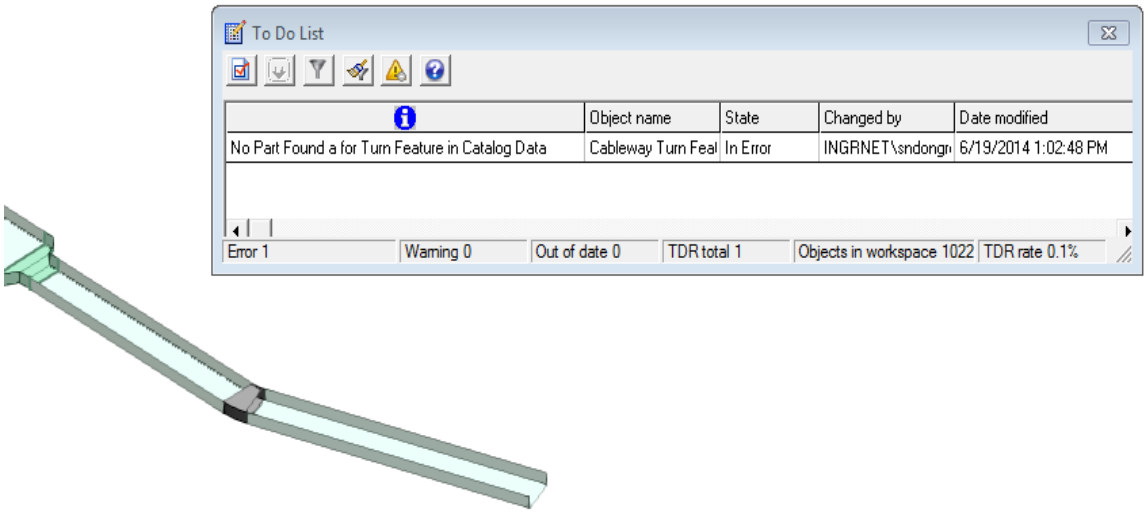
1. Click **Route Cableway** on the vertical toolbar.
2. Select **Cableway End Feature** of the cable tray you just placed.



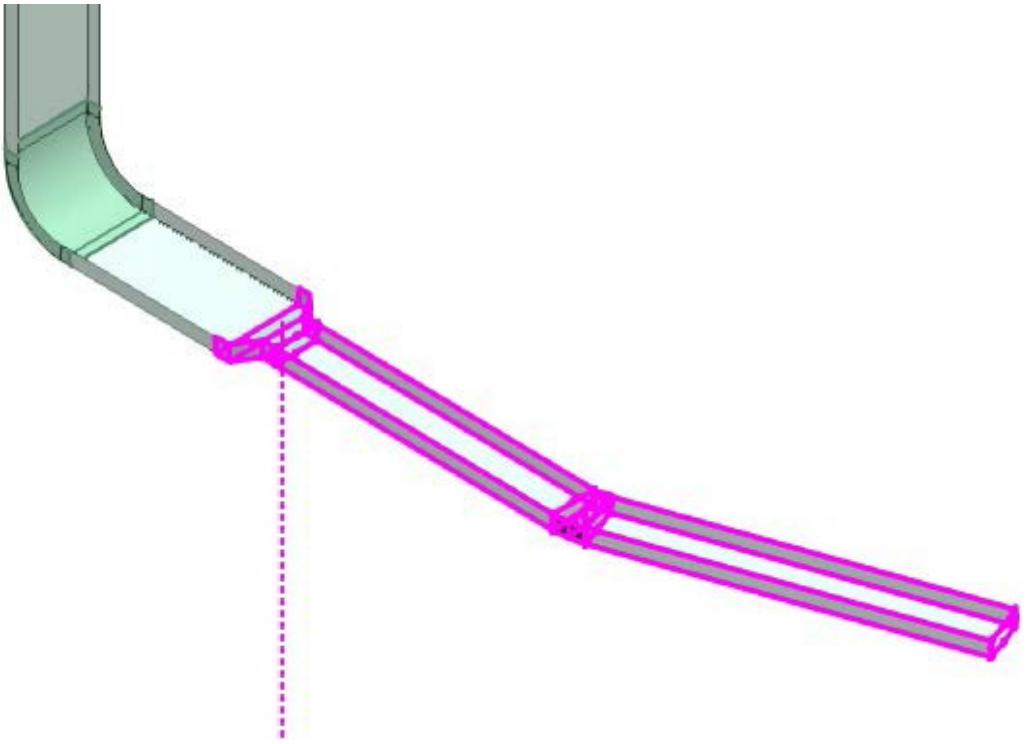
3. On the **Route Cableway** ribbon, key in 8 ft in the Length drop-down list and 20 deg on the Angle drop-down list.

4. Click in the graphic view to define the next data point. System displays a message dialog box 'No Part Found for a Turn Feature in Catalog Data'.
5. Click **OK** to close the message dialog box.

6. Select **View > To Do List** option to open the **To Do List** dialog box. Review the information column for a description of the error.

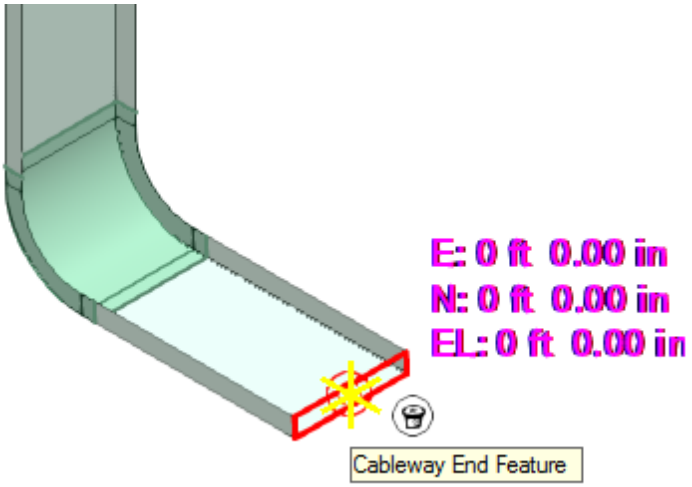


7. Close the **To Do List** dialog box.
8. One option to resolve the **To Do List** is to re-route the cableway path. As an example, let's delete some of the features and re-route the cableway path.
9. Select all features between the transition feature and the straight feature you just placed.

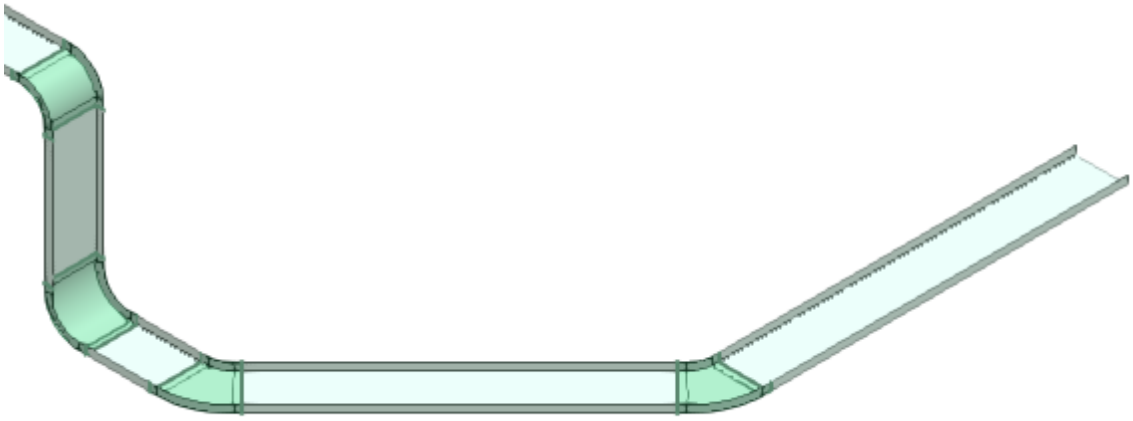


10. Click **Delete** to delete the selected features.

11. Click **Reposition Target** on the PinPoint ribbon and put the target at the free end of the tray.



12. Click **Route Cableway** on the vertical toolbar.
13. Select the end feature at south end of the tray network to start the route.
14. Click the **Plane** drop-down list on the ribbon and select **Plan Plane** to route the tray.
15. On the **PinPoint** ribbon, key in 10 ft East, -10 ft North.
16. Click in the graphic view to place the tray.
17. Now, you will route the next segment of the cabletray in the East direction.
18. In the **Route Cableway** ribbon, unlock the angle constraint and key in **15 ft** in the **Length** drop-down list. Move the cursor in the east direction and click in the graphic view to place a **15 ft** cable tray.
19. Right-click in the graphic view to terminate the command.



Routing Multi Trays

Smart 3D supports the routing of multiple cableways, cable tray runs, or multi trays. You can route them in one of two modes: **Vertical** (stacked) or **Horizontal** (side-by-side). To route multi trays, you use **Route Cableway** and set the required options on the **Multi-Route** tab of the **New Cableway Properties** dialog box. The software creates a master run and several slave runs. You route the master run, and the slave runs follow along.

The cableway runs have identical properties as you route them. After the cableways are routed, they are individual cableway runs without any relationship with each other. You can change a property on the master run. But it won't affect any of the slave runs.

Smart 3D maintains the properties based on the users intent when the route path changes or turns. It predicts a stepping order in the turning of each of the trays to maintain the distance gap specified for the multi-tray routing.

Routing Horizontal Multi Trays

Route a horizontal multi tray with the following specifications starting from the coordinate points E: 53 ft 2 in, N: 37 ft 2 in, El: 6 ft in U03 CS of your workspace by using the Route Cableway button on the vertical toolbar:

Standard category:

System: CT
Name Rule: DefaultNameRule
Specification: CB-S1-L6-12B

Cable Fill category:

Fill Efficiency: 60%
Signal Type 1: Control

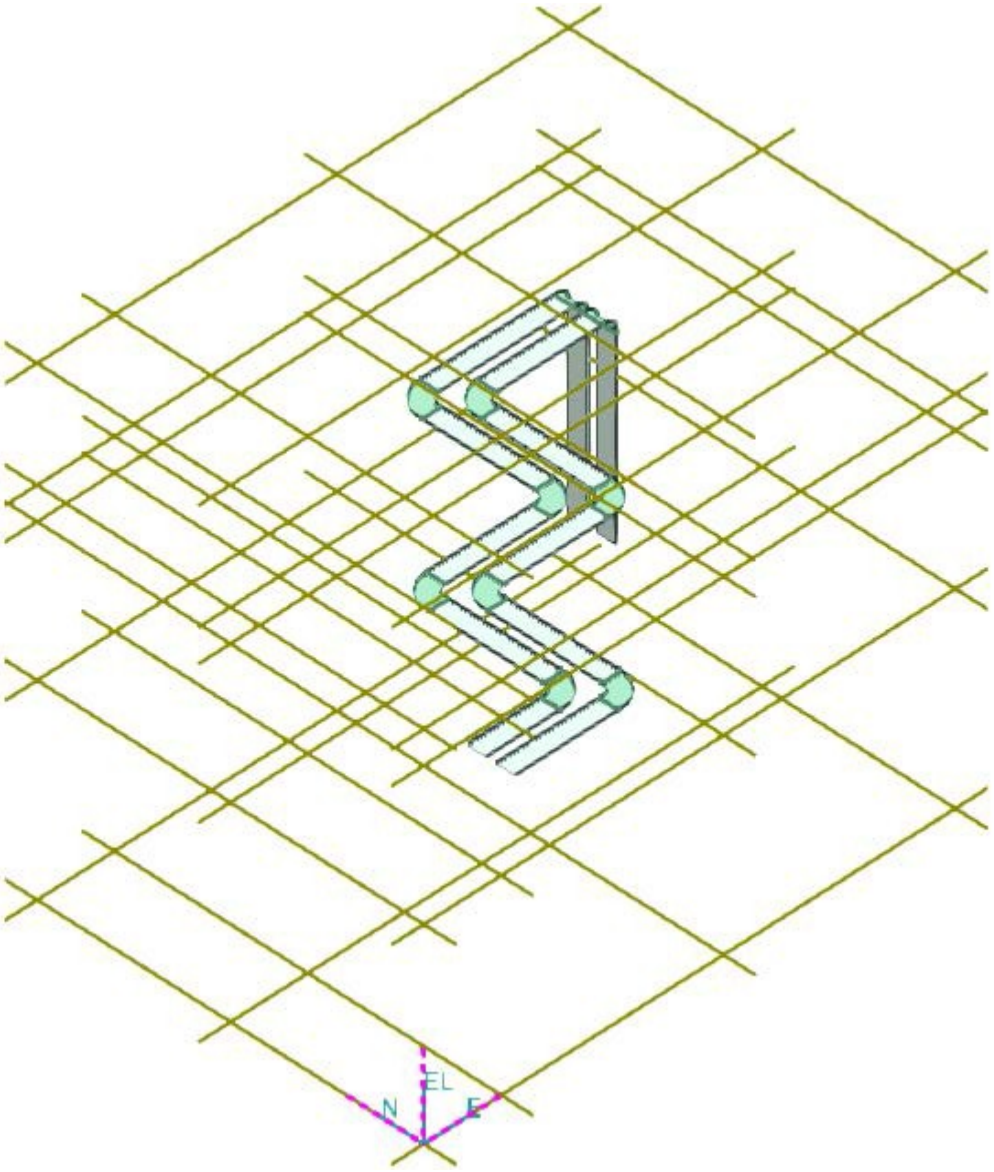
Multi-Route tab:

Mode: Along Width
Vertical Distance Between Trays: 1 ft
Cableways to Left of Master Run: 1
Horizontal Distance Between Trays: 1 ft

Route Cableway ribbon:

Width: 2 ft
Depth: 0 ft 4 in

The view of the model after routing the horizontal multi tray should look like Figure 58.



Before you start routing a multi tray, set the following in your workspace:

- Define your workspace to show coordinate system **U03 CS**. In your training plant, select **U03 CS** from **Plant Filters > Training Filters** in the **Select Filter** dialog box.
- If you are not in the **Electrical** task, then select the **Tasks > Electrical** command and set the **Active Permission Group** to **Electrical**.
- Activate the **PinPoint** ribbon and change the **Active Coordinate System** to **U03 CS** on the **PinPoint** ribbon.
- Click **Set target to Origin** on the **PinPoint** ribbon to move the target to the origin of the current coordinate system.

1. Click the Route Cableway button on the vertical toolbar.
2. Specify the following coordinates on the PinPoint ribbon as starting points and click the graphic view:

   E: 53 ft 2 in
   N: 37 ft 2 in
   El: 6 ft

   *The **New Cableway** dialog box is displayed.*
3. On the **General** tab, define the cableway specifications as follows:

   Under the **Standard** category:

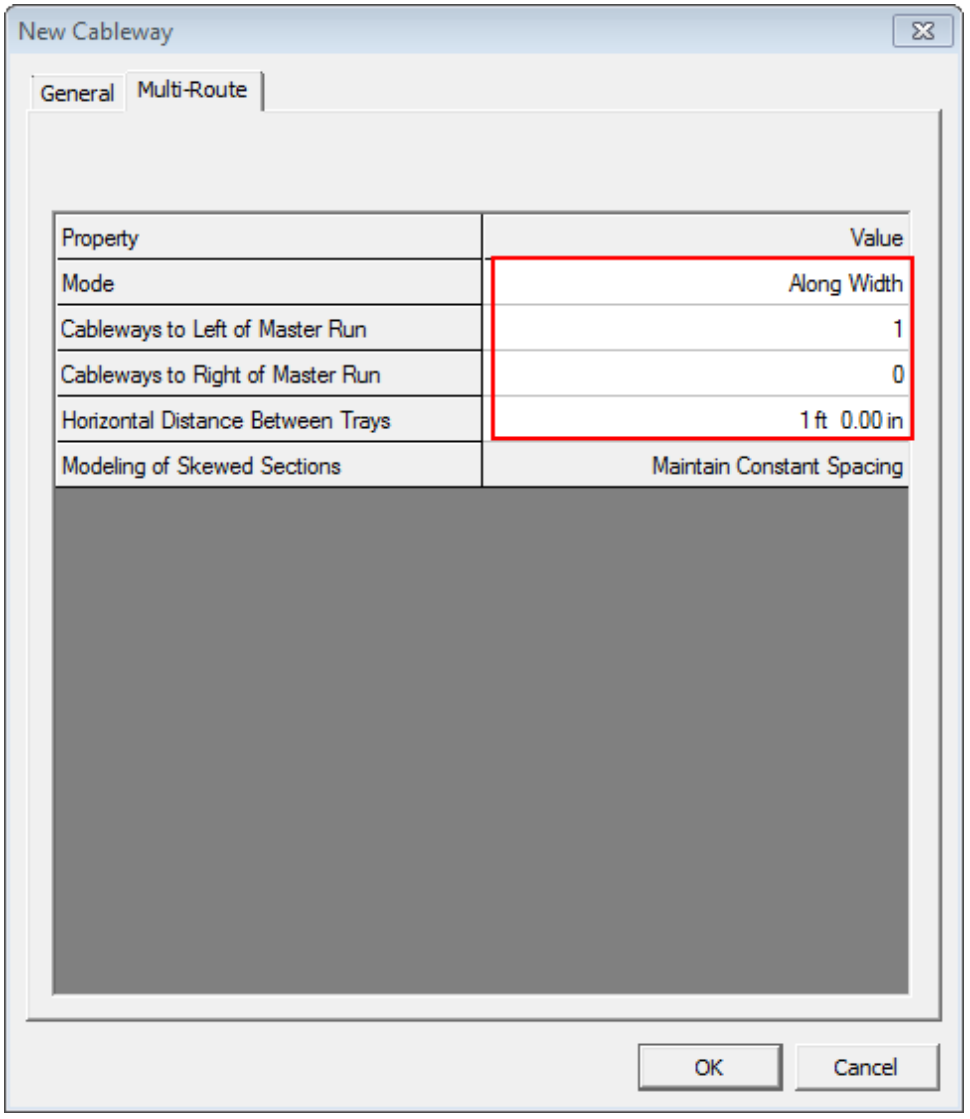
   System: SP3DTrain\A2\U03\Electrical\Control\CT
   Name Rule: DefaultNameRule
   Specification: CB-S1-L6-12B

   NOTE Use **Database** option in the **Select System** dialog box.

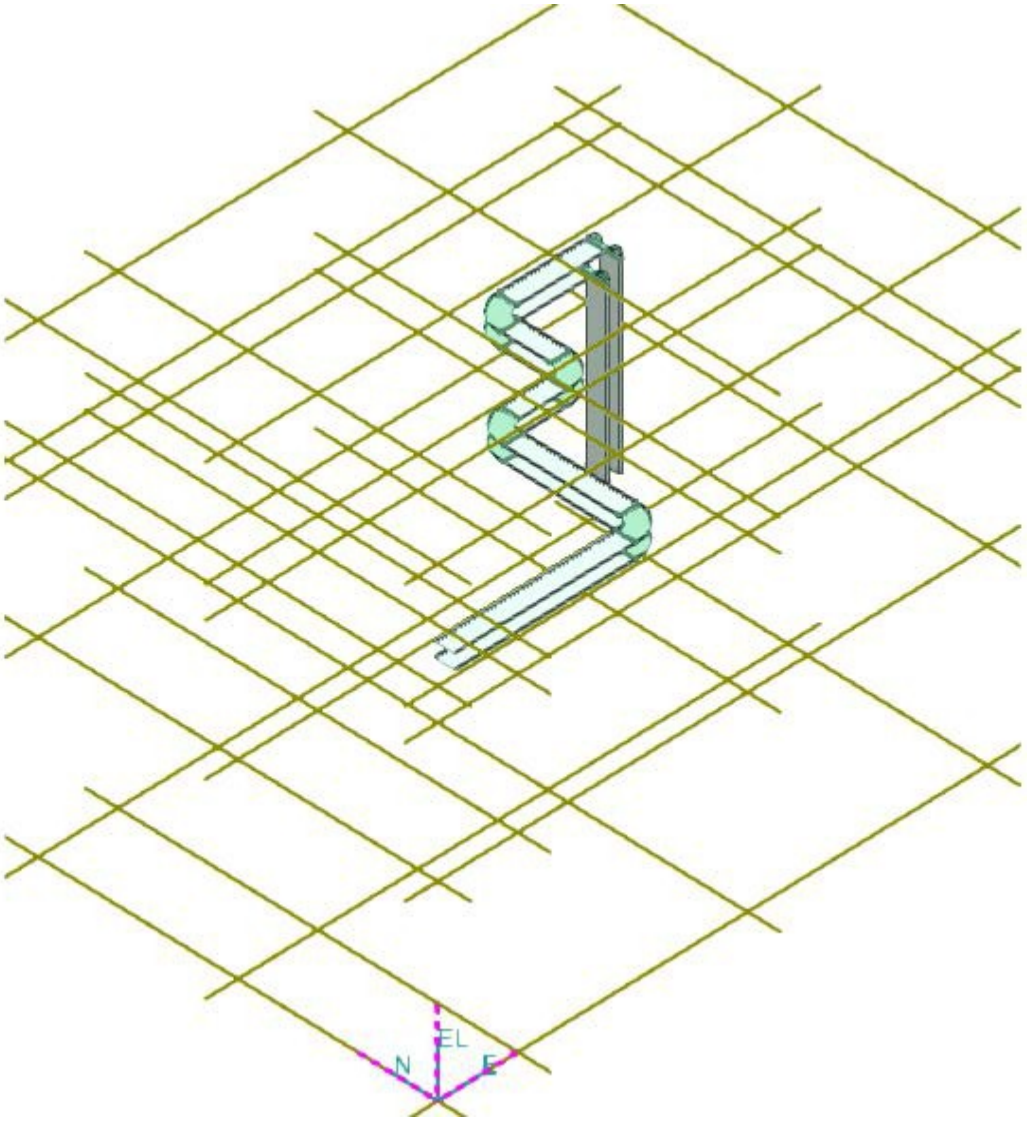
   Under the **Cable Fill** category:

   Fill Efficiency: 60%
   Signal Type 1: Control
4. Now select the **Multi-Route** tab in the **New Cableway** dialog box, select the following specifications, and click **OK**:

Mode: Along Width
Cableways to Left of Master Run: 1
Cableways to Right of Master Run: 0
Horizontal Distance Between Trays: 1 ft



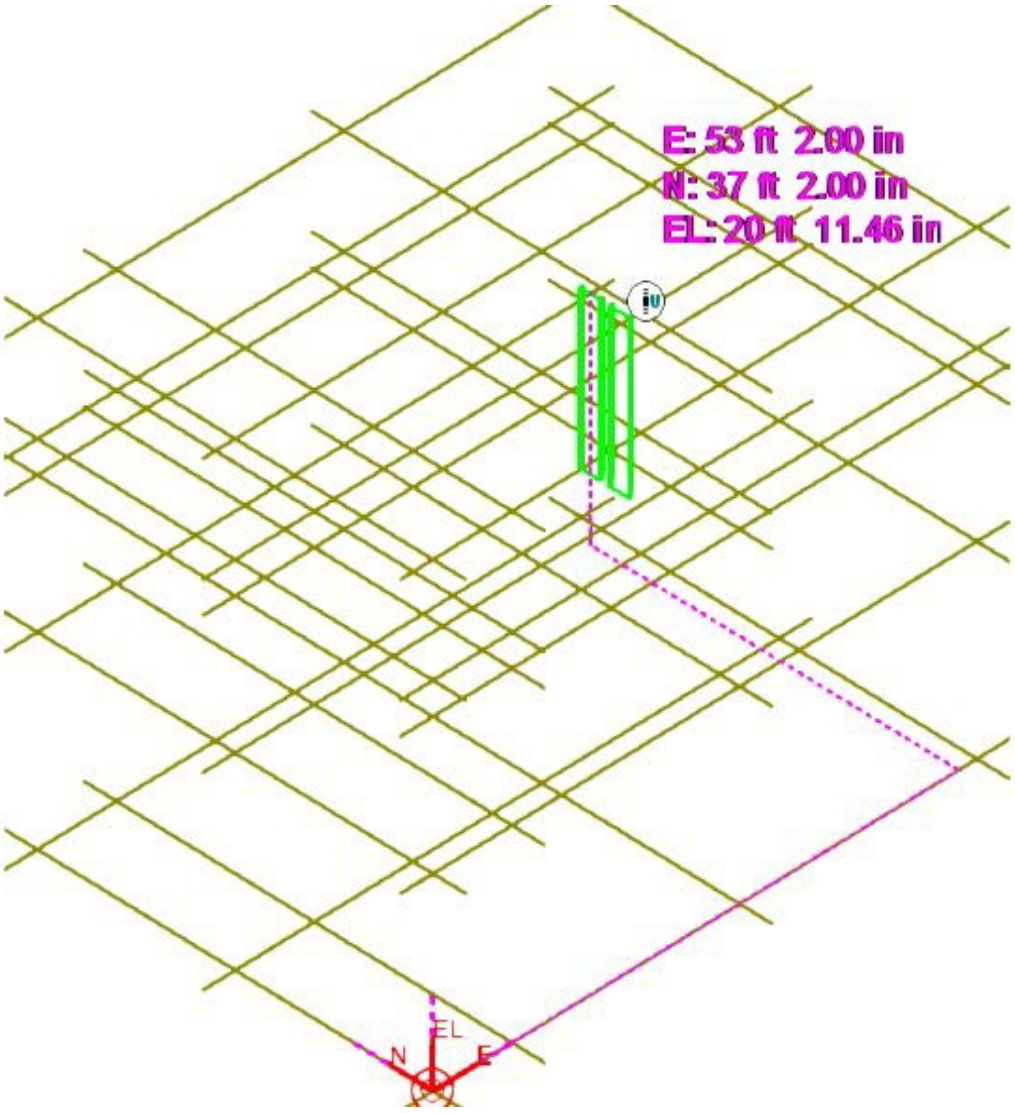
TIP If you want to route a vertical multi tray, you can select the Along Depth option in the Mode drop-down list in the New Cableway dialog box. The rest of the steps for routing vertical multi trays are the same as the steps for routing horizontal multi trays. If you route a vertical multi tray, the multi tray will look like below.



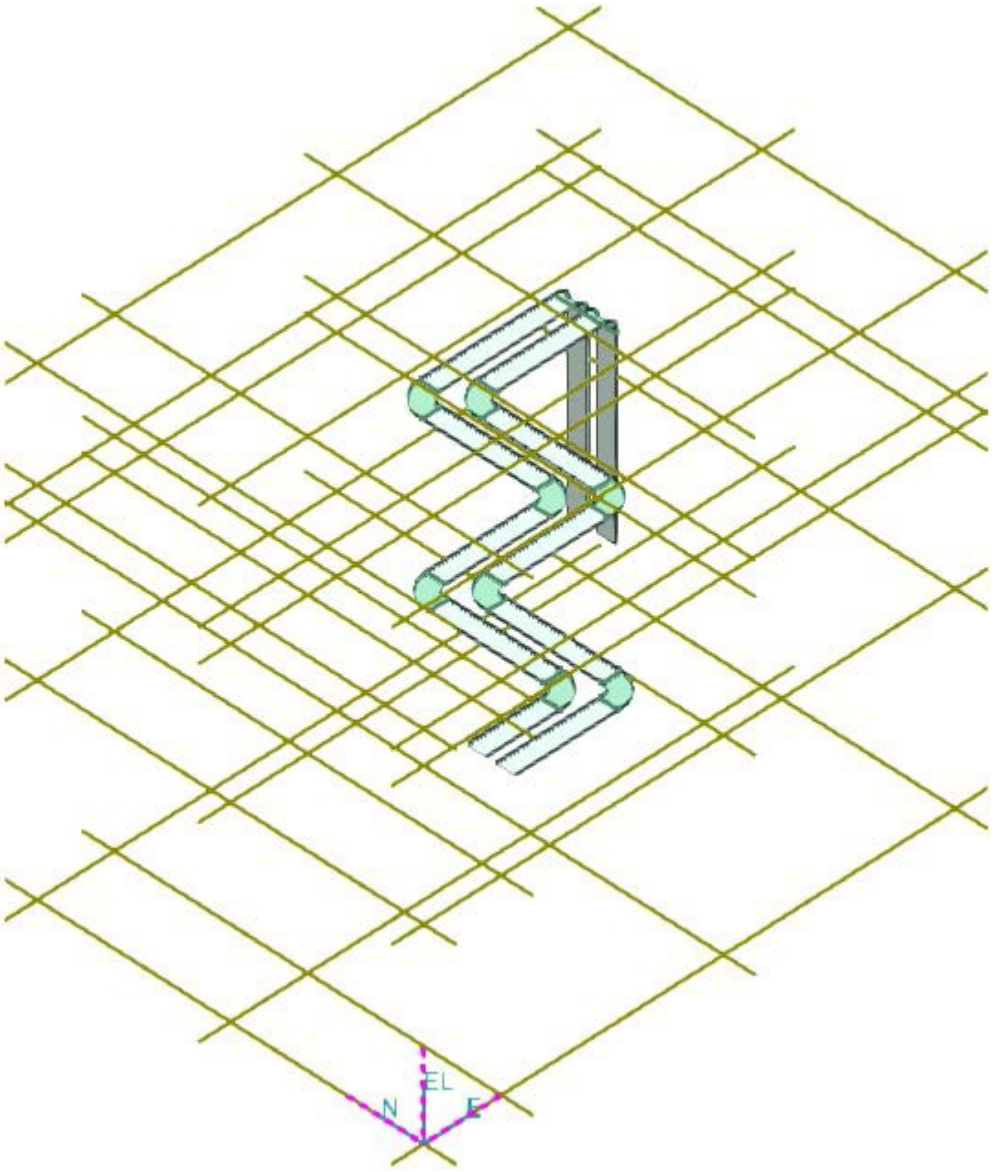
The option **Cableway to Left of Master Run** or **Cableway to Right of Master Run** specifies the number of slave runs above and below or to the left and right of the master run.

1. Specify 2 ft as the width and 4 in as the depth on the **Route Cableway** ribbon.

2. Start routing the multi tray starting from the El direction about 15 ft.

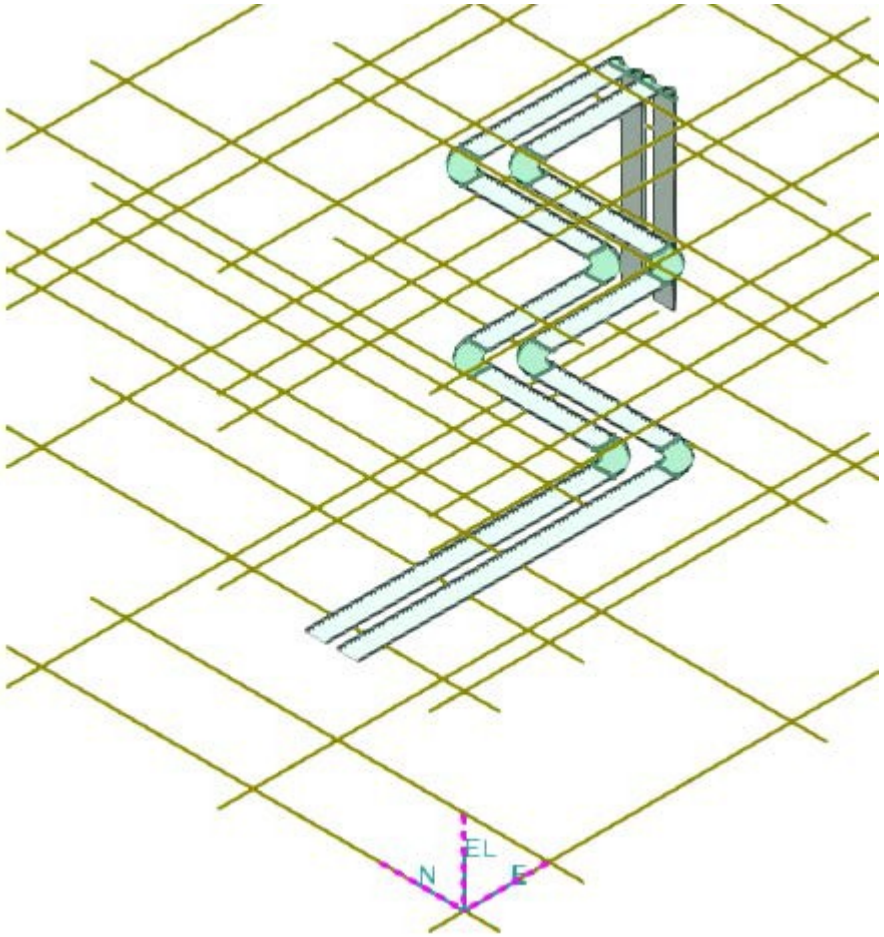


3. Now route the cable in the west direction and then in the south direction three times.

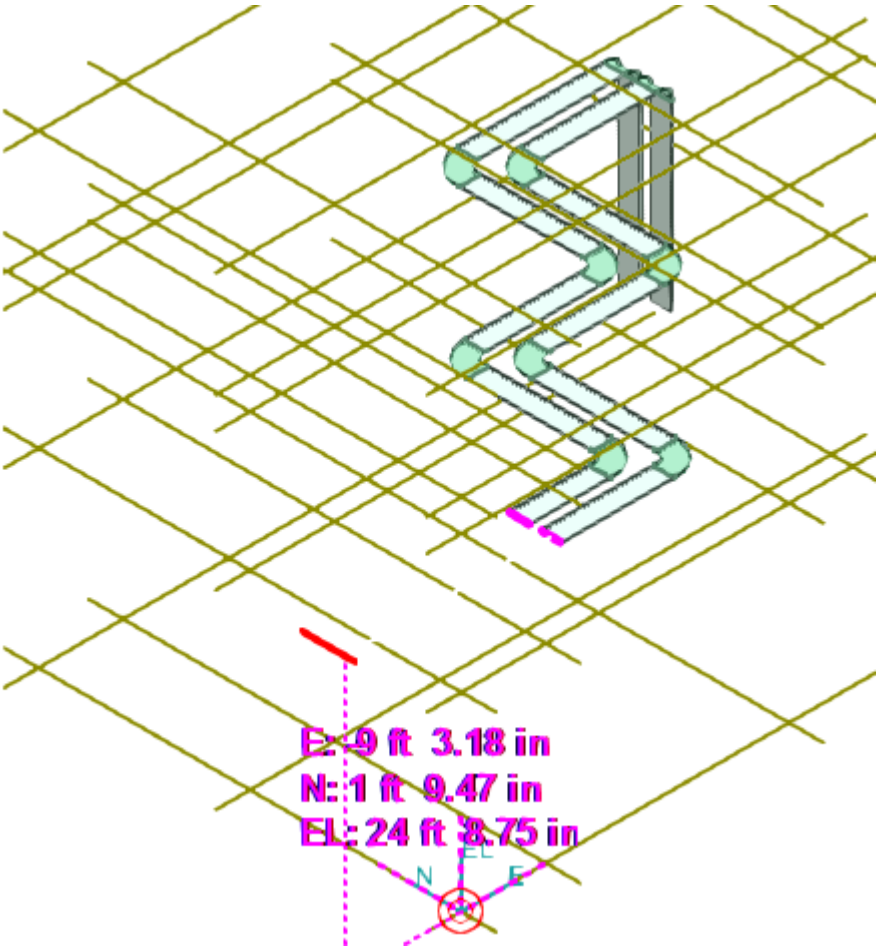


Extending Multi Trays

Extend the multi trays that you routed above by 10 ft in the west direction. The workspace after extending the multi trays should resemble this.



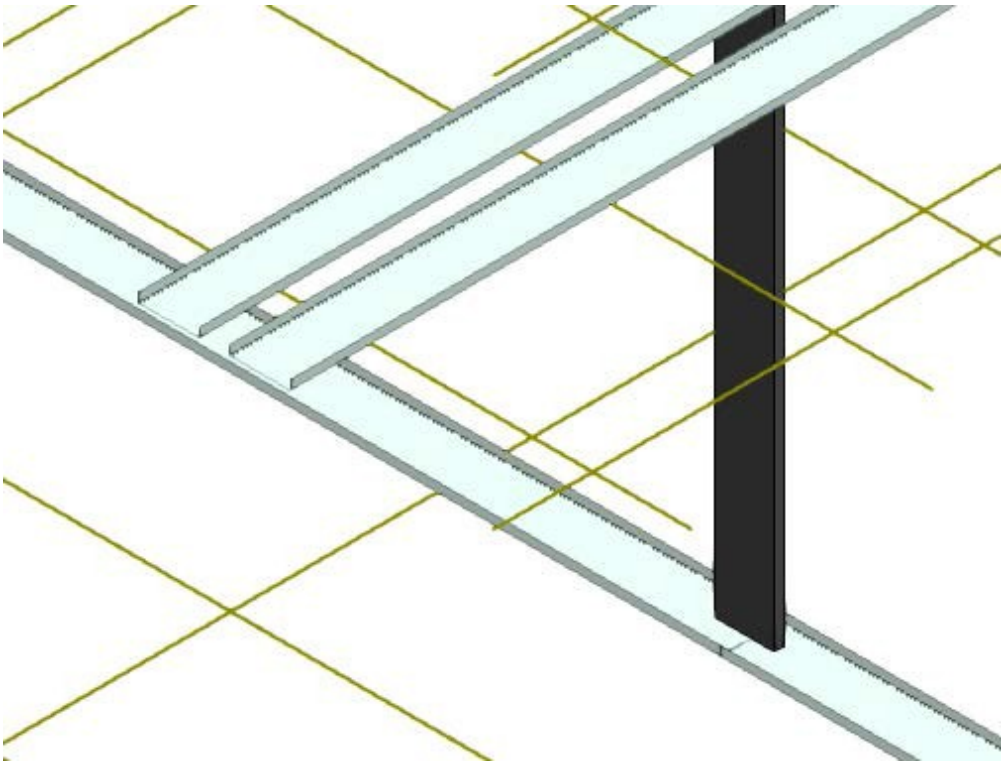
1. Select the **Cableway Features** option in the **Locate Filter** drop-down list.
2. Select the **Cableway End Feature** of both the cable trays by using the left mouse button in conjunction with the Ctrl-key to do multi-select option or just use the fence inside option.
3. Then use **Move** to move the two objects. Recall the common move command requires that when two objects are selected, that a From Point be set.
4. On the **Move** ribbon bar, check the **Fast move** option. Set the **From point** to be the **End Feature** of one of the cable trays.
5. Use Pin Point ribbon to set the **E** value to -9 ft 3.18 in.
6. Position the cursor in the west direction.



7. Click in the graphic view to accept the extension of the multi trays.

Placing a Vertical Drop Out

You can model vertical drop outs with a non-part specification cableway between crossing cableway systems using **Auto Connect** on the vertical toolbar.

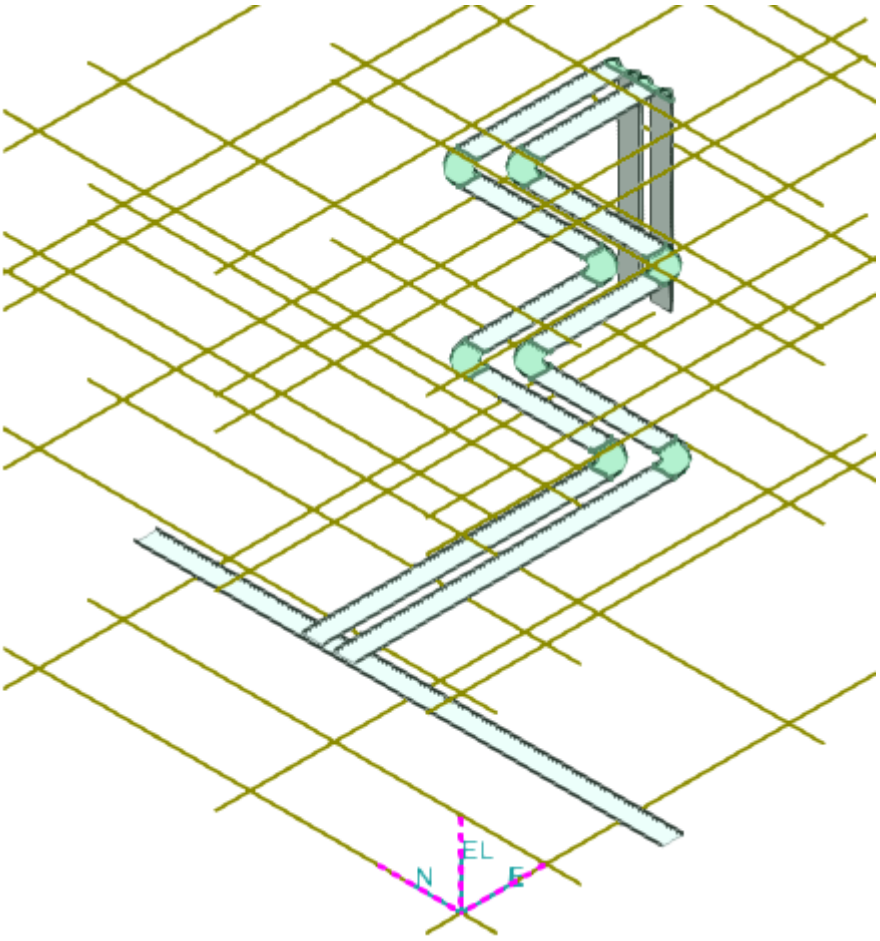


1. Route one cable tray using the last used specification starting at the following coordinates:

   E: 10 ft
   N: 40 ft
   El: 6 ft

2. Specify 2 ft as the width and 4 in as the depth on the **Route Cableway** ribbon.

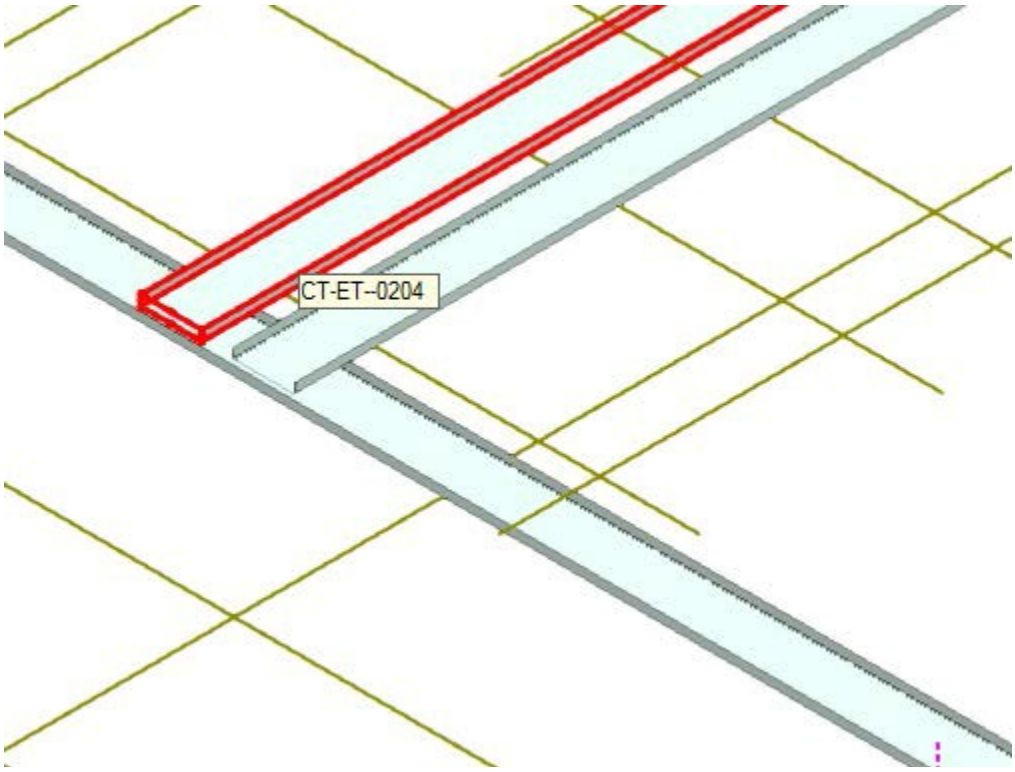
3. Start routing the cableway to the south direction about 50 ft.



4. Right-click the graphic view to terminate the **Route Cableway** command.
5. Click **Auto Connect** on the vertical toolbar.

   The Select Cableway Runs/Features or Conduit End Features To Connect From prompt displays.

6. Select one of the cable tray.



7. Click **Select to Runs** on the **Auto Connect** ribbon.

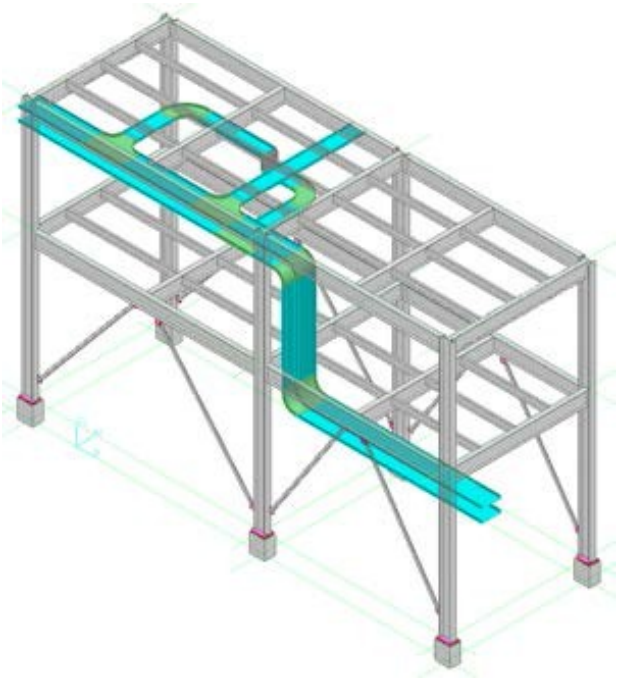
   The prompt Select Cableway Runs/Features or Conduit End Features To Connect To displays.

8. Select the other cable tray.
9. Click **Finish**.

For more information related to routing cableways, refer to the Routing Cableway topic in the user guide ElectricalUsersGuide.pdf.

Creating Cable Tray Network

Create a cable tray network by routing the cable trays from the coordinate points E: 43 ft, N: 1 ft 8 in, EL: 15 ft 6 in in Unit U02. Place two reducing tees on the top cable tray and then connect the top cable trays with the bottom cable trays using a connecting cableway. Extend the free end of the cable trays by an offset from the top of the steel. All trays and connecting cableway must have “Power” as the signal type for each run. The routed cable trays should resemble this.



Before you start routing the cable trays, define your workspace to show Unit U02.

10. Select **Tasks > Electrical** to enter the **Electrical** task.
11. Verify the **Active Permission Group** is set to **Electrical**.
12. Activate the **PinPoint** ribbon and set the active coordinate system to **U02 CS** on the **PinPoint** ribbon.
13. Click **Set Target to Origin** option on the **PinPoint** ribbon to move the target to the origin of the current coordinate system.
14. Click **Route Cableway** on the vertical toolbar.
15. Key in the following coordinates on the PinPoint ribbon and click in the graphic view to accept the starting point:

    E: 43 ft
    N: 1 ft 8 in
    El: 15 ft 6 in

    The New Cableway dialog box appears.
16. Select **More …** in the **System** drop-down list of the dialog box to specify the system where you want to place the cableway.
17. In the **Select System** dialog box, select **A2 > U02 > Electrical > Low Voltage > CT** and click **OK**.
18. In the **New Cableway** dialog box, verify the following cableway specifications:

    System: CT
    Name Rule: DefaultNameRule
    Specification: CB-S1-L6-12B

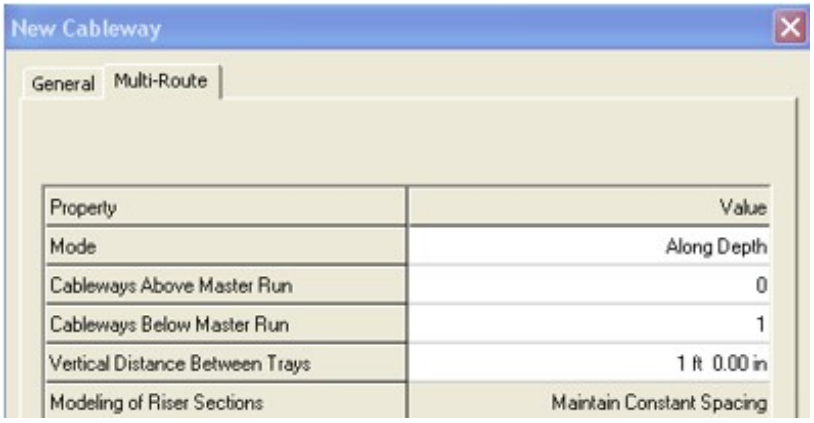
19. Select the **Cable Fill** option in the **Category** drop-down list and verify the following specifications:

    Fill Efficiency: 60%
    Signal Type 1: Power

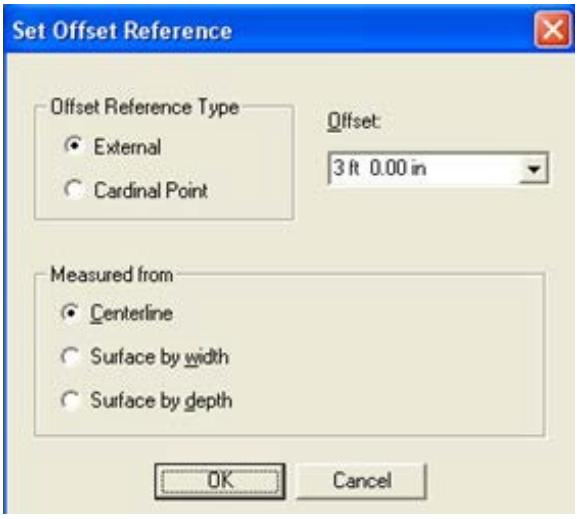
20. Switch to the **Multi Route** tab.

21. Make the following changes:

    Mode: Along Depth
    Cableways above Master Run: 0
    Cableways below Master Run: 1
    Vertical Distance between Trays: 1 ft



22. Set **Offset Reference Type** to **External** and key in 3 ft in the **Offset** drop-down list in the **Set Offset Reference** dialog box.

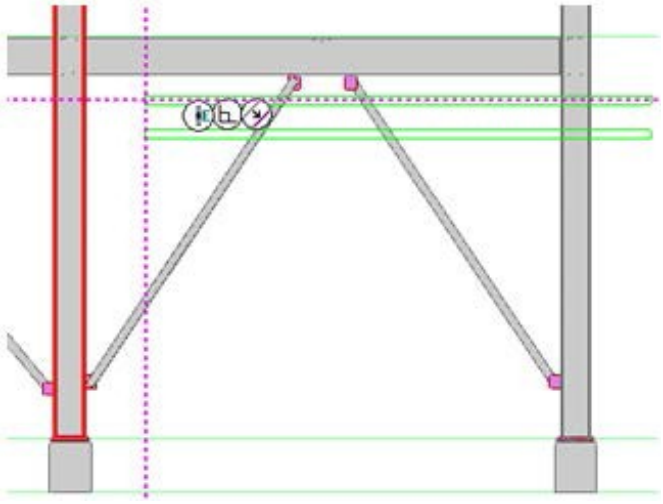


23. Select the **Rectangle** shape in the **Shapes** drop-down list and key in the following specifications on the **Route Cableway** ribbon to specify the width and depth of the cross section:

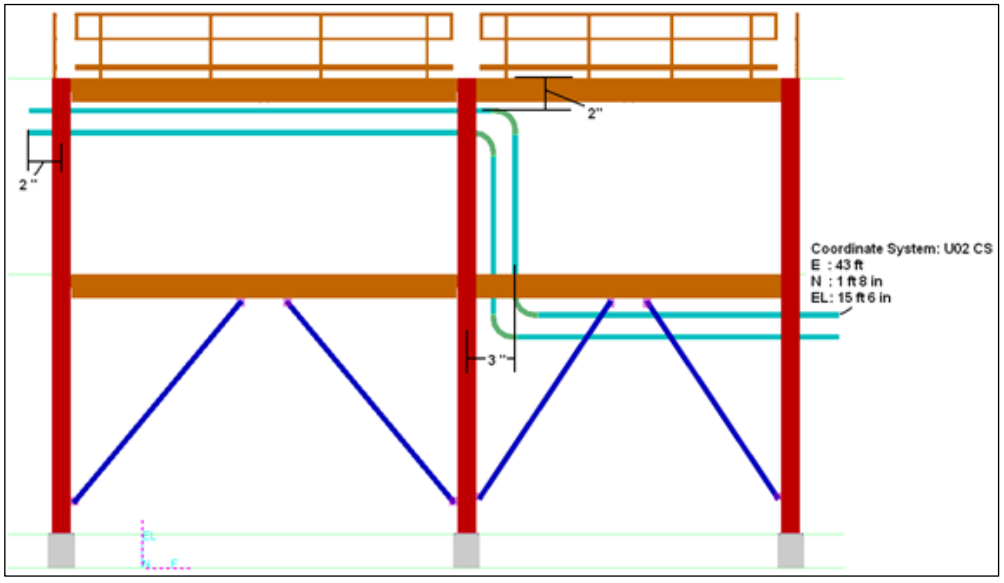
    Width: 2 ft
    Depth: 0 ft 4 in

24. Change the view of the model to **Looking North** by using the **Common Views** dialog.
25. Select the **East-West Plane** option in the **Plane** drop-down list on the **Route Cableway** ribbon.
26. Route the trays as shown below. Pay attention to the offset values from top of steel and column.

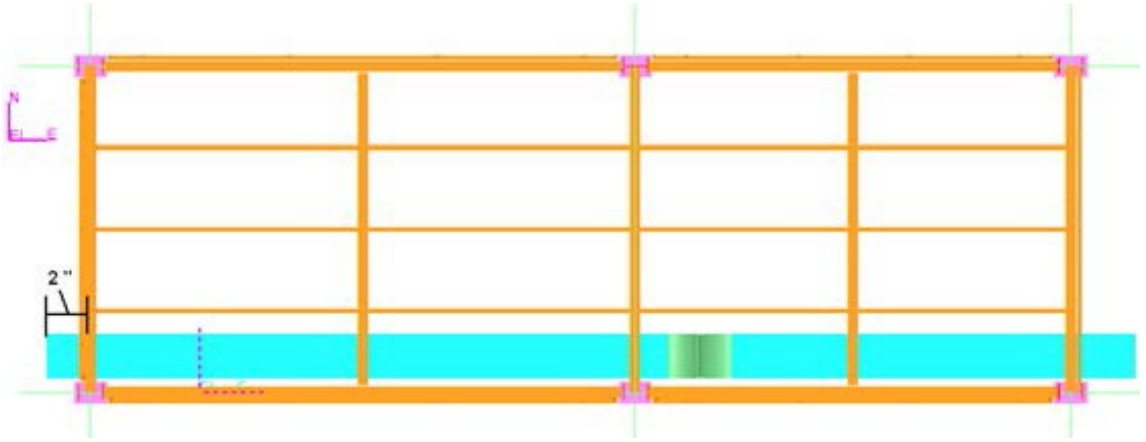
    NOTE To find the offset point, move the cursor over the **Column** until the offset glyph appears and move slowly away from **Column** until perpendicular projection line is displayed.



Projection LIne Indicating 3 ft Offset from Column

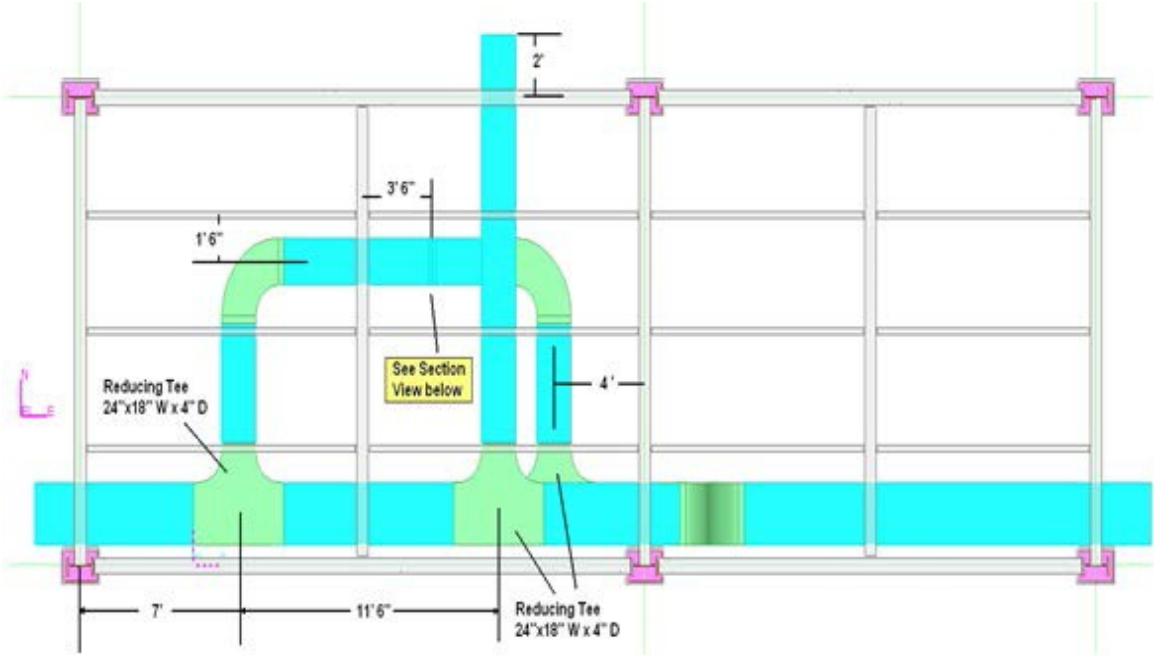


North Elevation View



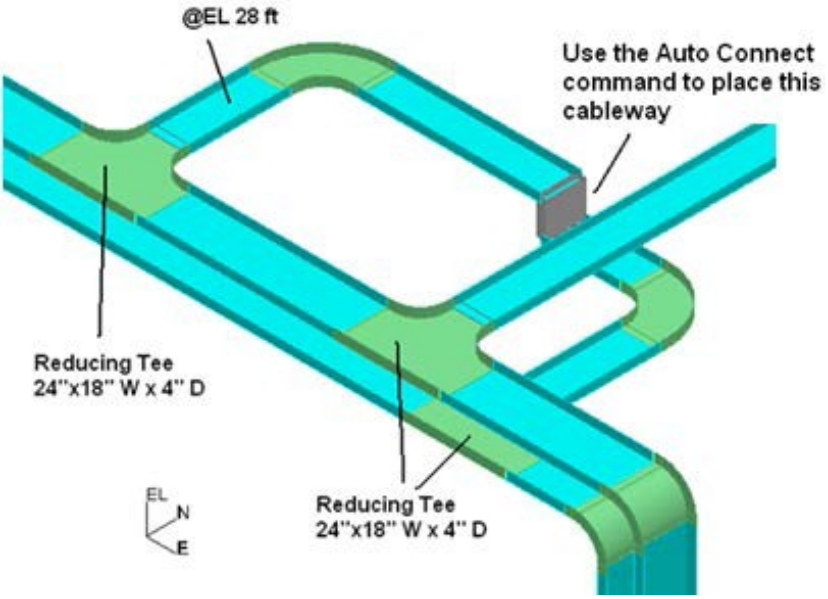
Plan View

27. Continue to route the trays with the following configuration. This is the plan view of the building to give better perspective of the extent and offset of the trays.



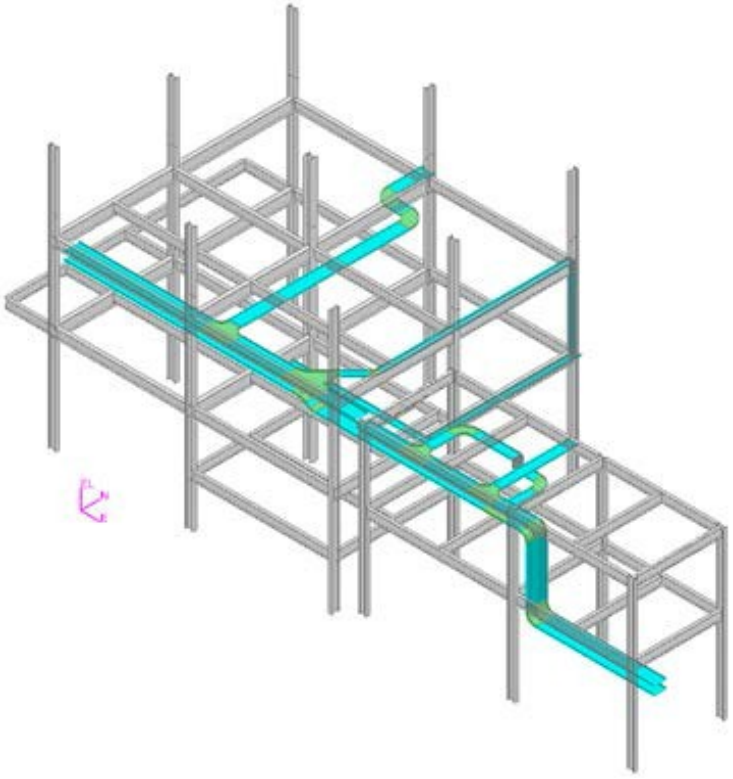
Routed Cable Trays

28. Below is the section view of the elevation change between the stacked trays. Place a “Zero-Specs” cableway section to connect the two trays using the Auto Connect command.



Section View – Cableway section

Create a second cable tray network by routing the cable trays from the coordinate points E: 9 ft, N: 1 ft 10.60 in, EL: 29 ft in Unit U03. Place fittings in these trays and then connect both cable trays networks. Extend the free end of the cable trays by an offset from the steels. All trays and connecting cableway must have “Power” as the signal type for each run. The routed cable trays should resemble this.



Routed Cable Trays

29. Re-define your workspace to show Unit U03.
30. Activate **PinPoint** and set the active coordinate system to **U03 CS** on the PinPoint ribbon.
31. Click **Set Target to Origin** on the **PinPoint** ribbon, to move the target to the origin of the current coordinate system.
32. Click **Route Cableway** on the vertical toolbar.
33. Key in the following coordinates on the **PinPoint** ribbon, and click in the graphic view to accept the starting point:

    E: 9 ft
    N: 1 ft 10.60 in
    El: 29 ft

    The New Cableway dialog box appears.
34. Select **More …** in the **System** drop-down list of the dialog box to specify the system where you want to place the cableway.
35. In the **Select System** dialog box, select **A2 > U03 > Electrical > Low Voltage > CT** and click **OK**.
36. In the New Cableway dialog box, verify the following cableway specifications:

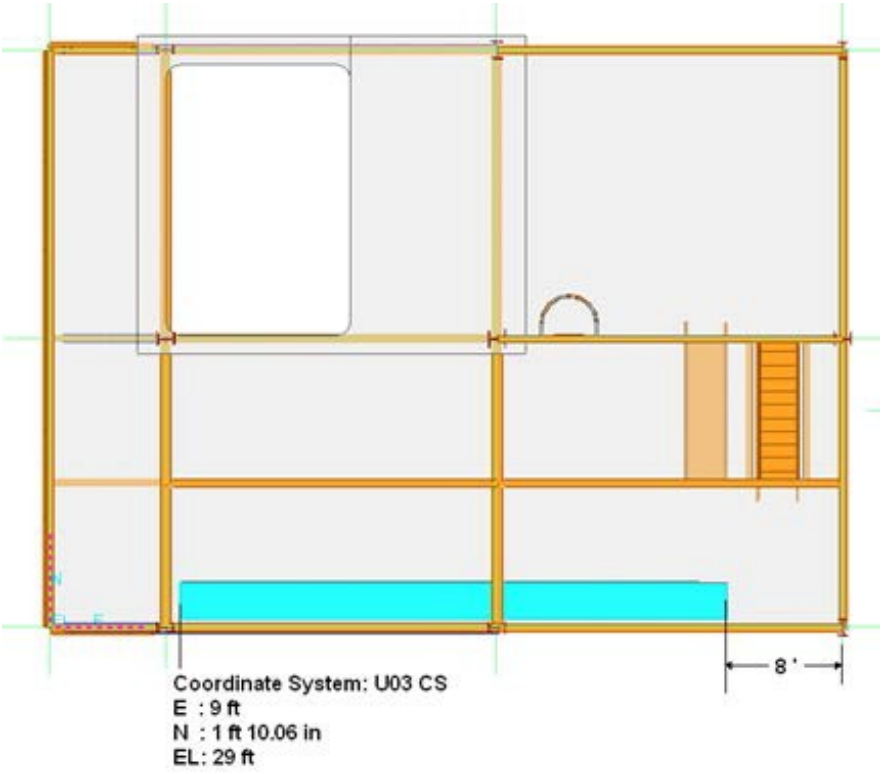
    System: CT
    Name Rule: DefaultNameRule
    Specification: CB-S1-L6-12B
37. Select **Cable Fill** in the **Category** drop-down list and verify the following specifications:

    Fill Efficiency: 60%
    Signal Type 1: Power
38. Switch to **Multi Route** tab.
39. Make the following changes:

    Mode: Along Depth
    Cableways above Master Run: 0
    Cableways below Master Run: 1
    Vertical Distance between Trays: 1 ft
40. Set the **Offset Reference Type** to **External** and key in 8 ft in the **Offset** drop-down list in the **Set Offset Reference** dialog box.
41. Select the **Rectangle** shape in the **Shapes** drop-down list and key in the following specifications on the **Route Cableway** ribbon to specify the width and depth of the cross section of the cable:

    Width: 2 ft 6 in
    Depth: 0 ft 4 in
42. Change the view of the model to **Looking Plan** by using the **Common Views** dialog.
43. Select the **Plan Plane** option in the **Plane** drop-down list on the **Route Cableway** ribbon.

44. Route the trays as shown below. Pay attention to the offset value from top of steel.

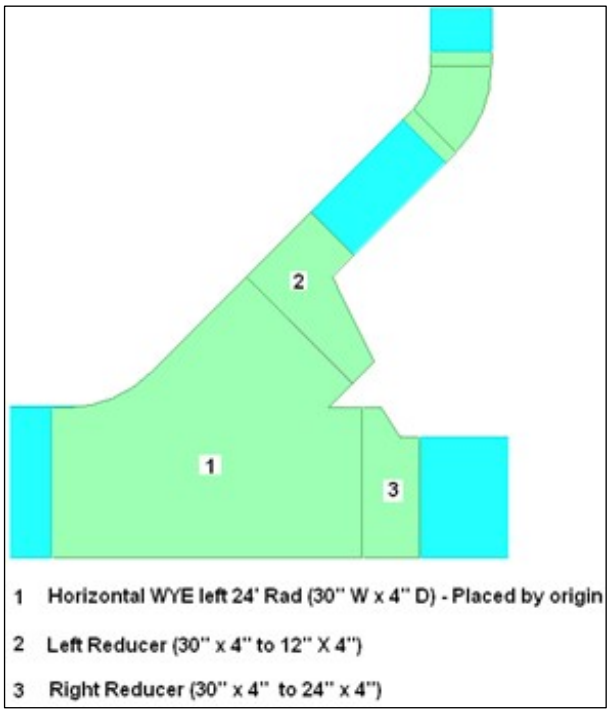


Plan View

45. Finish the top tray routing as shown.

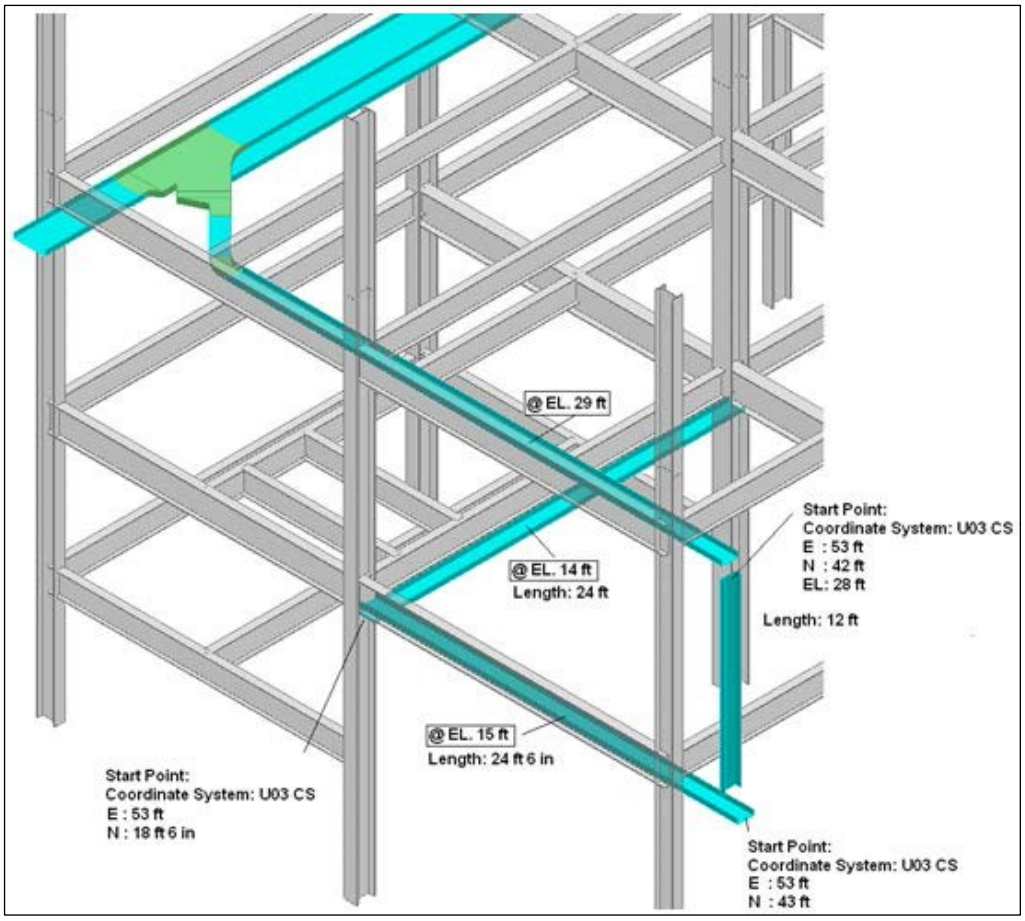
Routed Top Cable Trays

46. Below is the section view of the components placed using the **Insert Component** command.

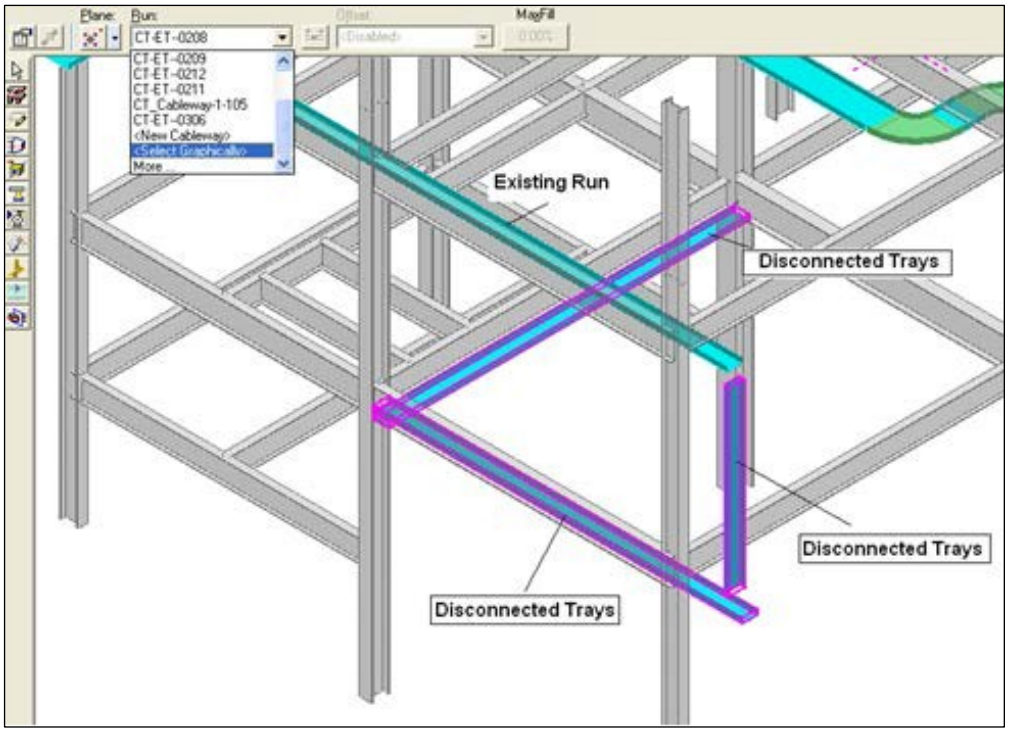


47. Continue routing the trays with the following configuration:

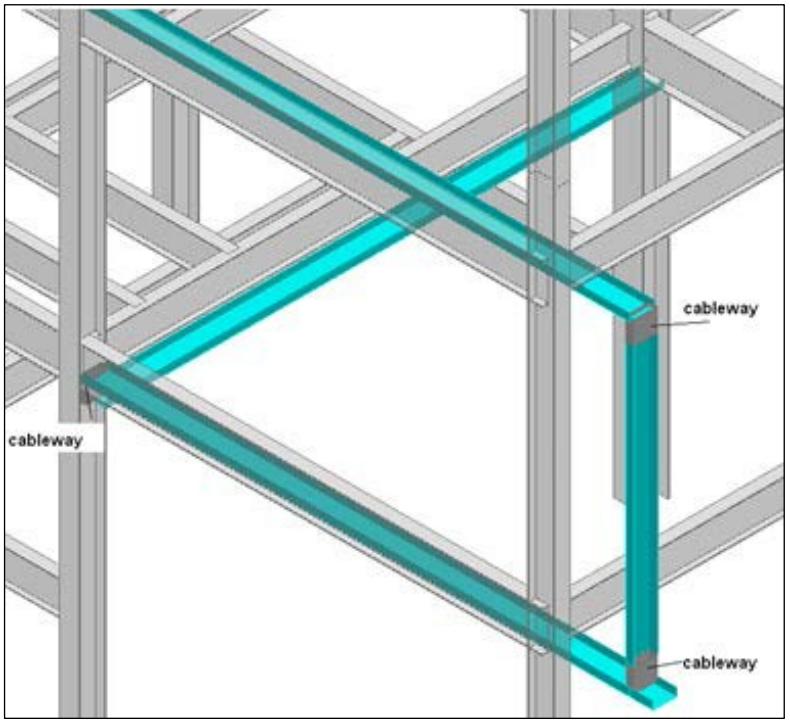
NOTE Cable tray modeling without fitting is a common practice in the industry. All Elevation values are measured from centerline of the trays.



48. Group the three trays into the same cableway run as show below. To do this, select all three straight features (disconnected trays) and use the **Select Graphically** option in the edit ribbon to select the existing run you want to group.

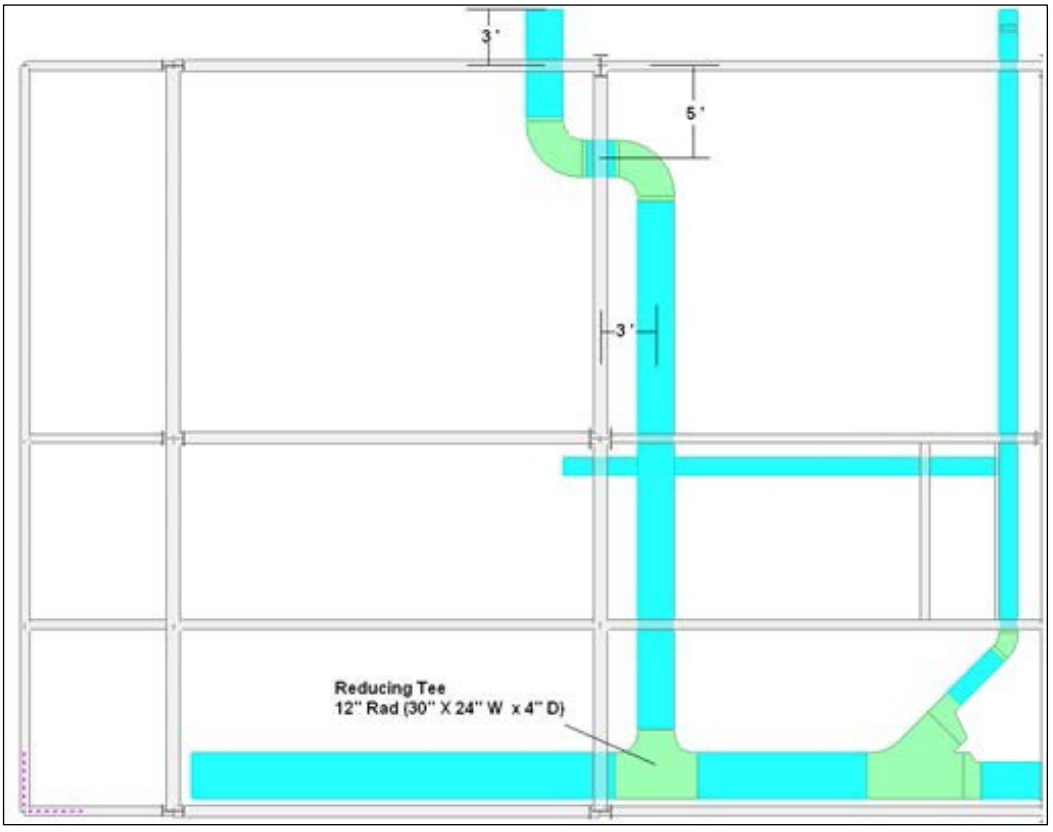


49. Connect the trays using **Zero-Specs** cableway for cable routing to be possible in this cableway. The **Auto Connect** command can be used to create the connecting cableways.



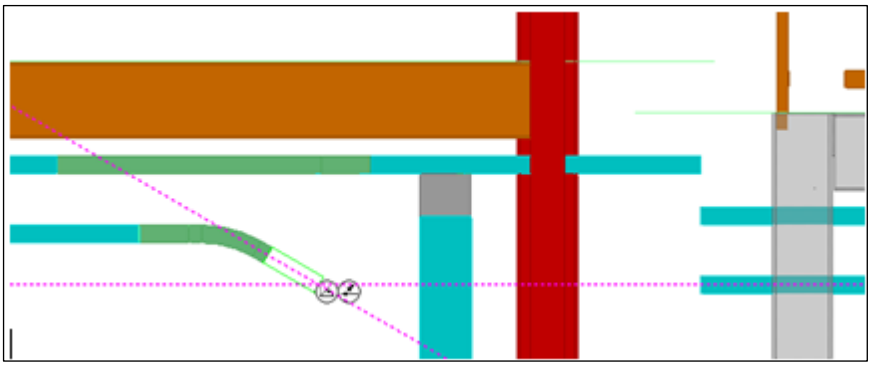
50. Click **Route Cableway** on the vertical toolbar.

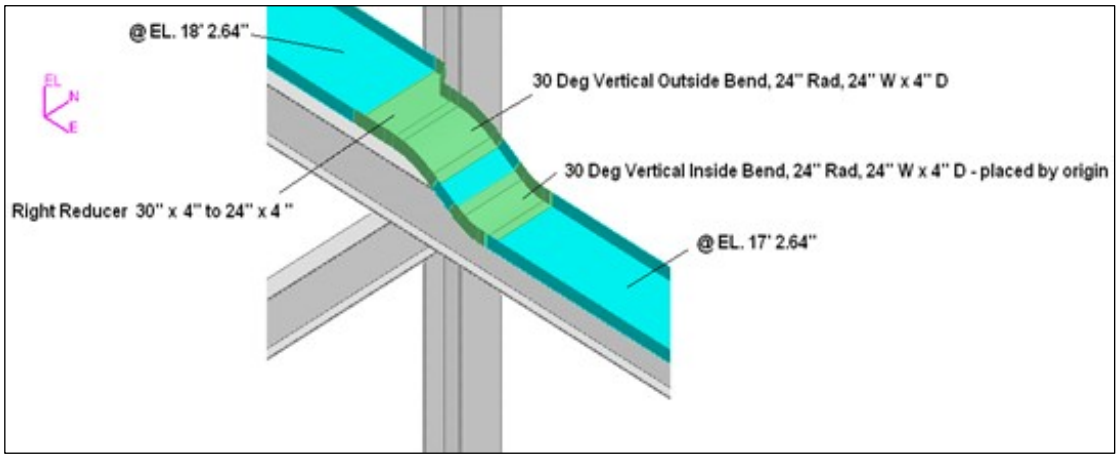
51. Continue to route the top trays with the following configuration:



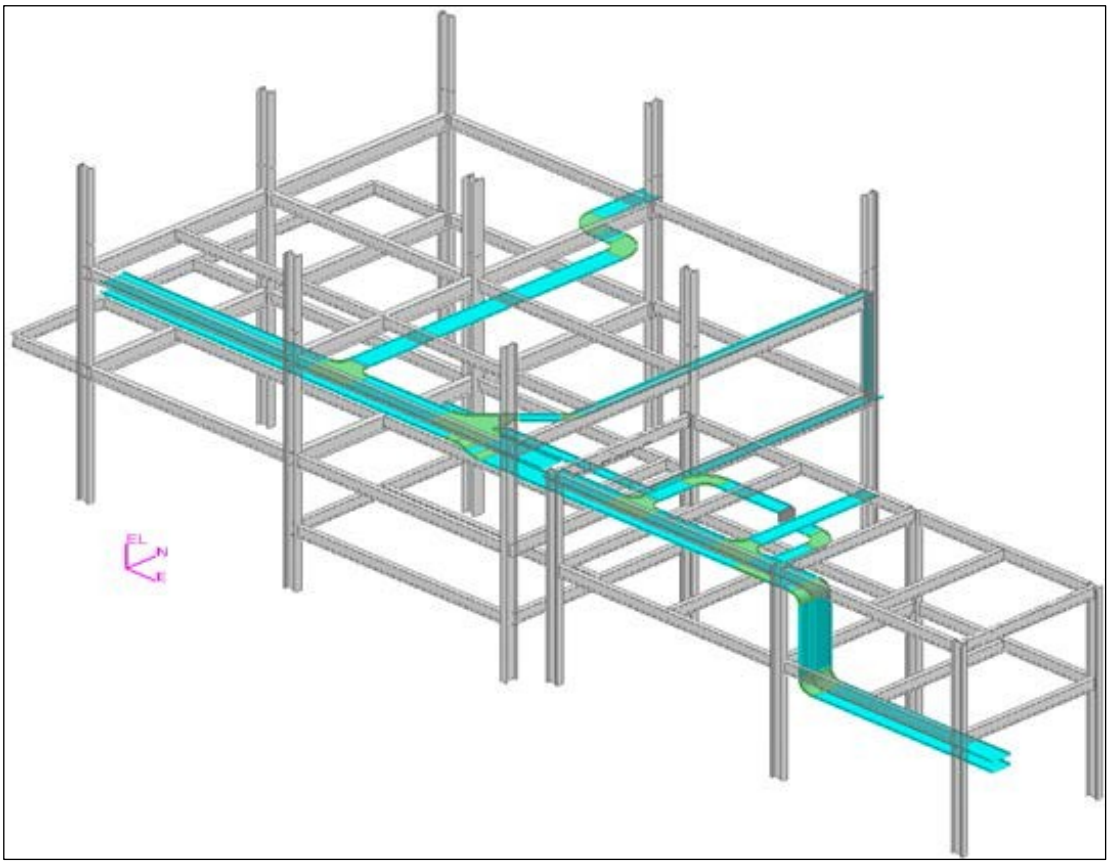
52. Re-define your workspace to display U02 and U03 Units.

53. Connect the bottom trays between the two Units as shown below. To do this, place first the right reducer and the 30 deg vertical outside bend using the insert component command. Then, start routing from the 30 degree bend, and route to same elevation as the bottom tray in U02 Unit. Place the 30 deg vertical inside bend by its origin using the insert component command. Complete the path using the route cableway command.



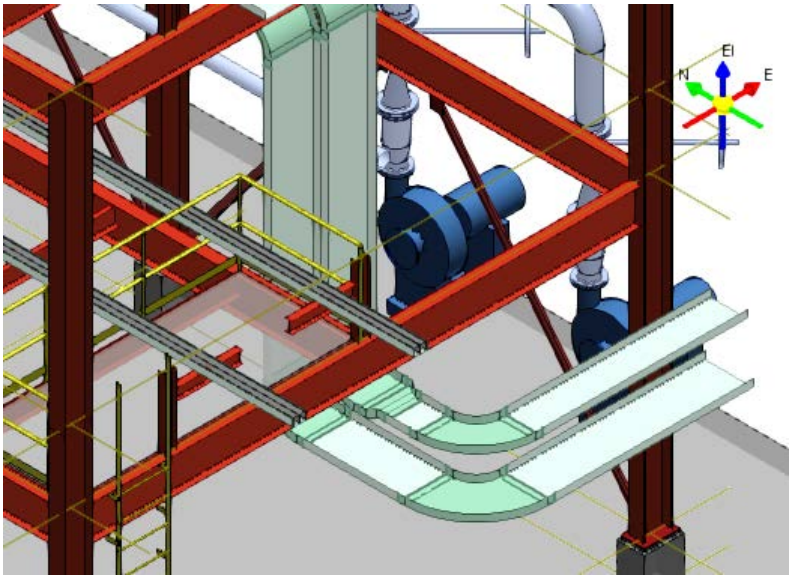

@EL. 18' 2.64"
30 Deg Vertical Outside Bend, 24" Rad, 24" W x 4" D
30 Deg Vertical Inside Bend, 24" Rad, 24" W x 4" D - placed by origin
Right Reducer 30" x 4" to 24" x 4 "
@EL. 17' 2.64"

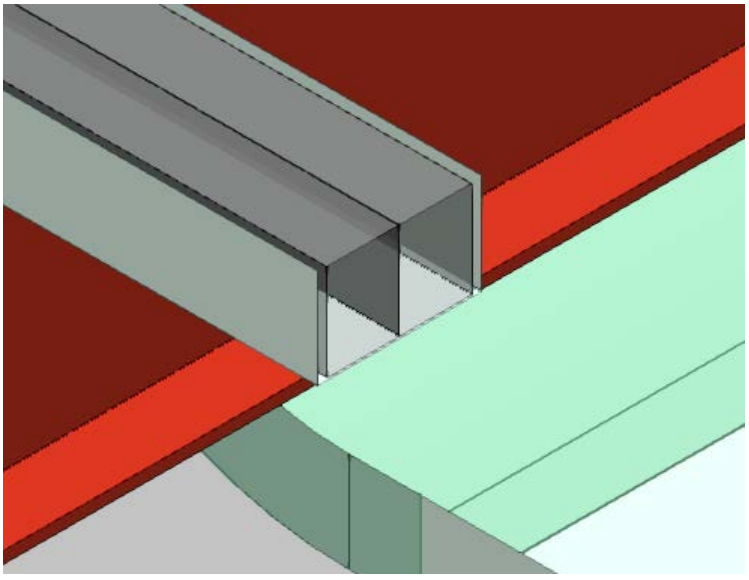
54. After inserting the bends and connecting the trays, the routed cable trays should resemble this.



Routing Electrical Cableways with Barriers

Create a cable tray network by routing one cableway from the coordinate points E: 5’ 6", N: 35 ‘, EL: 17’ 3". After creating this cable tray copy the newly created cable tray using the midpoint of the Cable tray supports as from and to points. The routed and copied cable trays should resemble the picture shown below.

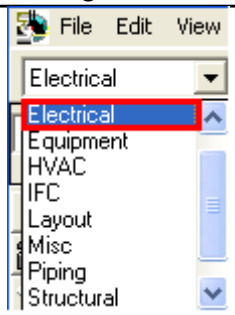




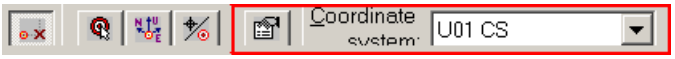
Before Starting this Procedure

- Define your workspace to display **Unit U01** and coordinate system **U01 CS**. In your training plant, select **U01** from **Plant Filters > Training Filters** in the **Select Filter** dialog box.

1. Select **Tasks > Electrical** to go to the Electrical task.
2. Make sure the **Active Permission Group** is set to **Electrical**.



3. Activate the **PinPoint** ribbon and set the active coordinate system to **U01 CS** on the PinPoint ribbon.



4. Click **Set Target to Origin** on the **PinPoint** ribbon, to move the target to the origin of the current coordinate system.

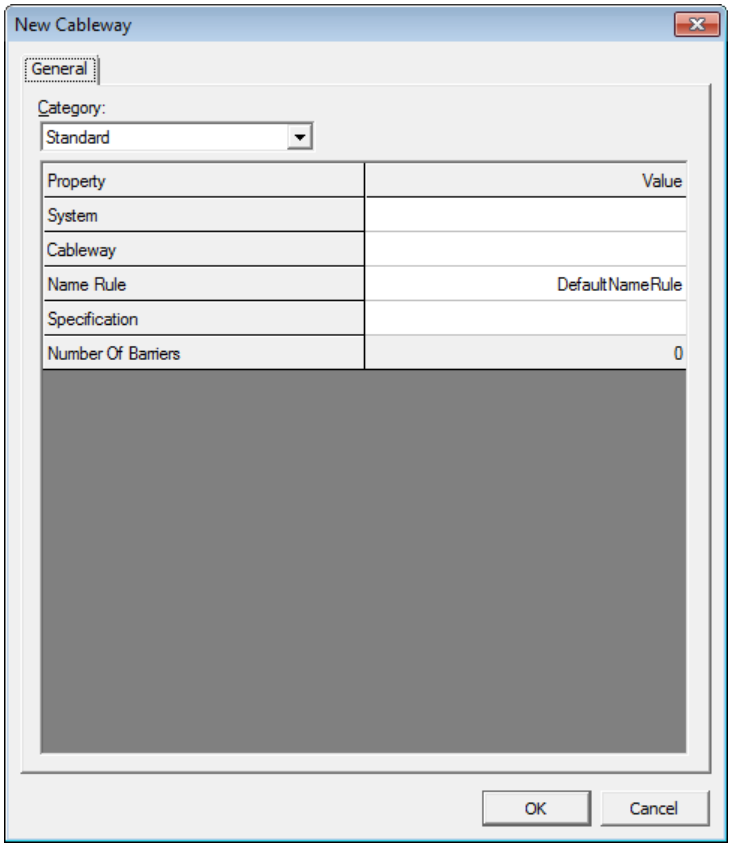
5. Click **Route Cableway** on the vertical toolbar.

6. Key in the following coordinate specifications on the PinPoint ribbon and click in the graphic view:

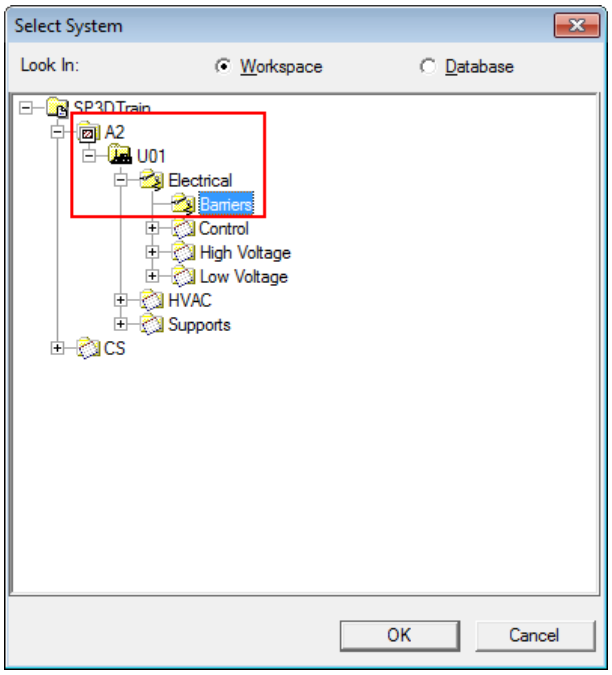
   E: 5’ 6"
   N: 44’
   EL: 17’3"

   The New Cableway dialog box appears.

7. Select **More** in the **System** drop-down list to specify the system where you want to place the cableway.

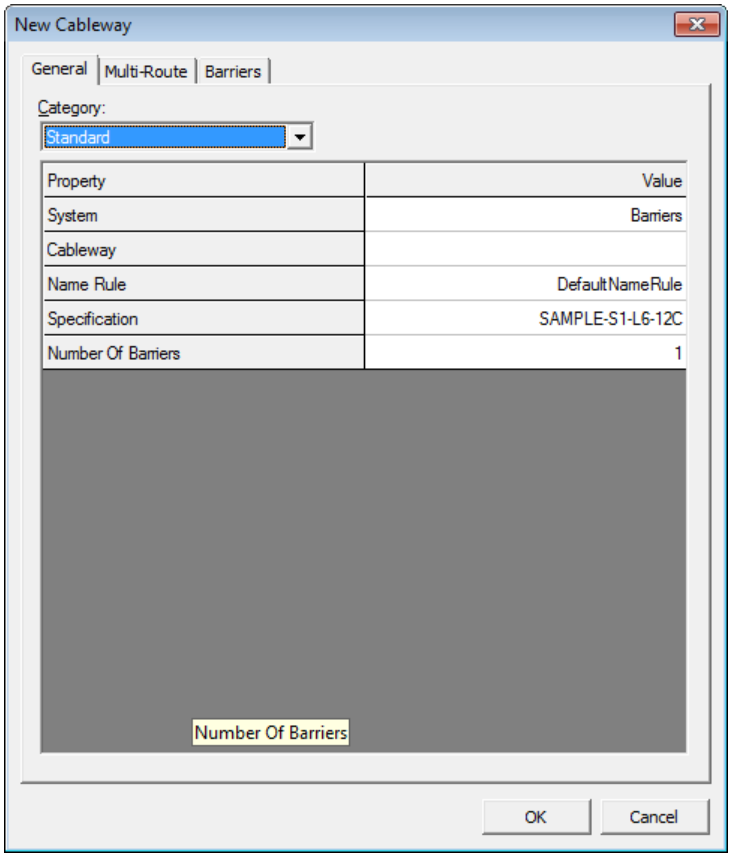


8. In the **Select System** dialog box, select **A2 > U01 > Electrical > Barriers**, and click **OK**.



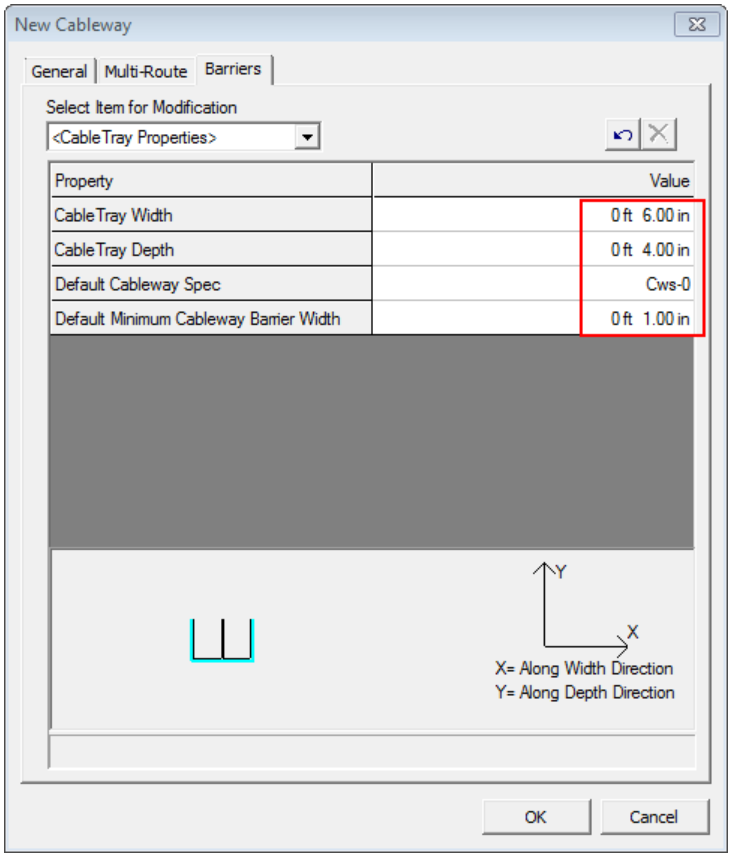
9. In the New Cableway dialog box, verify the following cableway specifications:

System: Barriers
Name Rule: DefaultNameRule
Specification: SAMPLE-S1-L6-12C
Number of Barriers: 1(Select Tab or Enter after Entering # of Barriers)



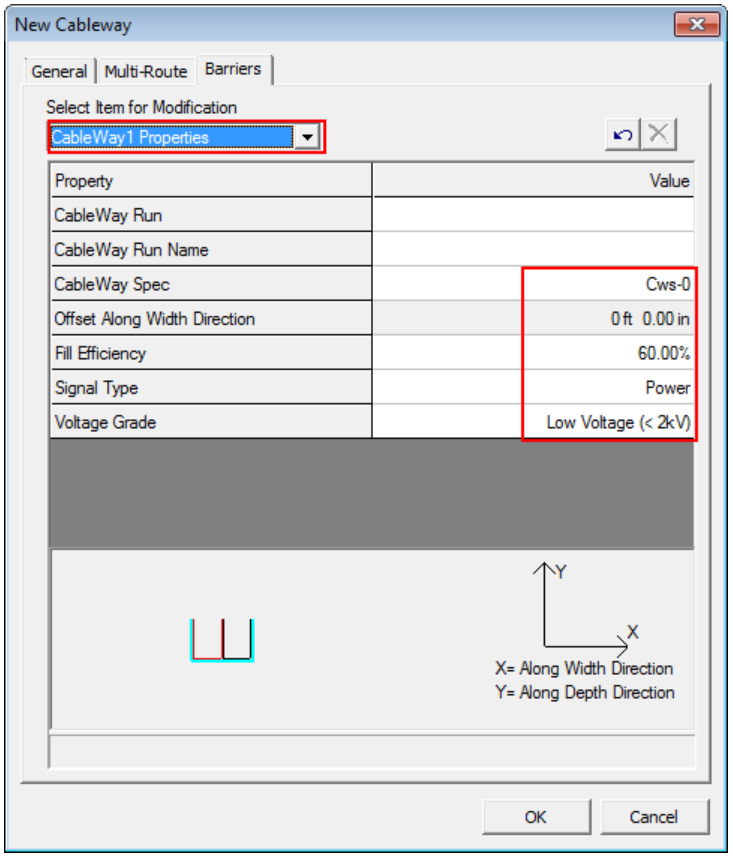
10. Select the **Barriers** tab in the **New Cableway** dialog box
11. Key in the following specifications:

Cable Tray Width: 6in
Cable Tray Depth: 4in
Default Cable Way Spec: Cws-0
Default Min Cableway Barrier Width: 1in



12. Select **Cable way1** from the **Select Item for Modification** drop down menu. Then type the following specifications.

Cable Way Spec: Cws-0
Fill Efficiency: 60%
Signal Type: Power
Voltage Grade: Low Voltage (< 2kV)



13. Continue to enter the following specification for Cableway2, and click **OK**.

    CableWay2
    Cable Way Spec: Cws-0
    Fill Efficiency: 60%
    Signal Type: Control
    Voltage Grade: Low Voltage (600V cables for 480/277V Power)

14. Select **Set Offset Reference…** option from the **Offset** drop-down list on the **Route Cableway** ribbon, to set options for reference offsets while routing a cableway.

The Offset drop-down list on the Route Cableway ribbon displays an offset of the cableway surface from the working plane.

The Set Offset Reference dialog box appears.

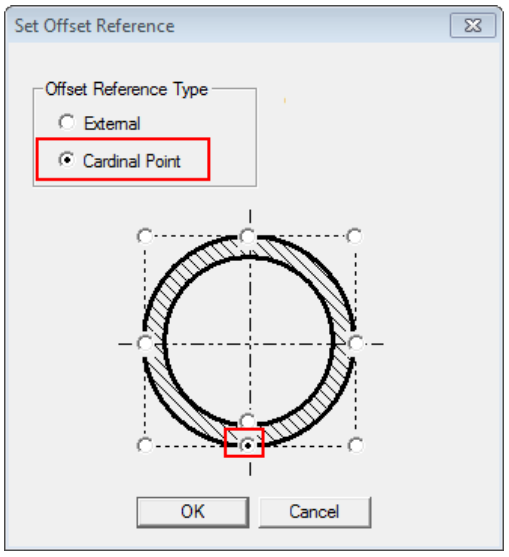
There are two types of offset references available in the Set Offset Reference dialog box while routing a cableway:

- **External** - Routes a cableway at a specified distance from another object, such as a cableway running parallel to the cableway you are placing.

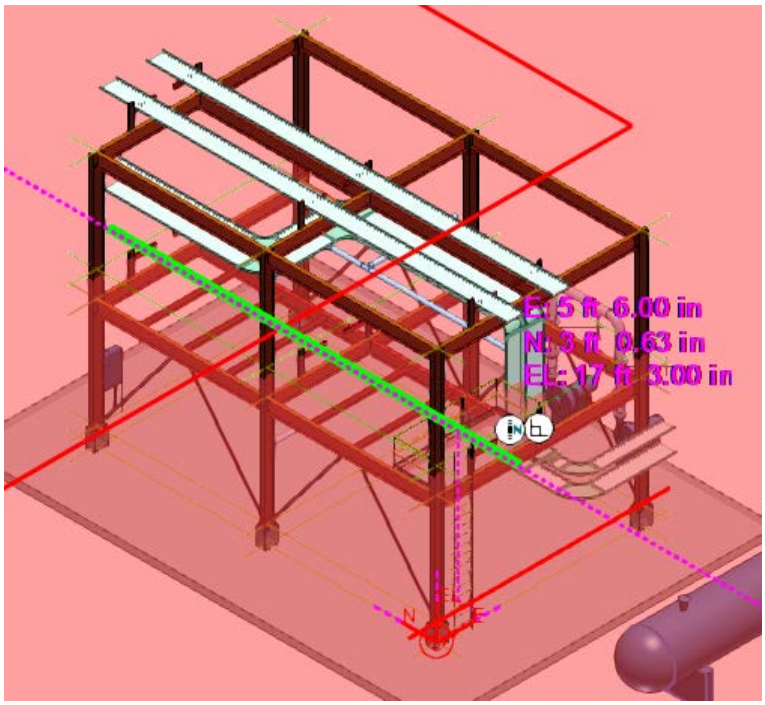
- **Cardinal Point** - Routes a cableway by the top, sides, bottom, or invert elevation of the cableway instead of the cableway centerline.

15. Select the following options in the **Set Offset Reference** dialog box, and click **OK**.

    Cardinal Point option
    Bottom center option

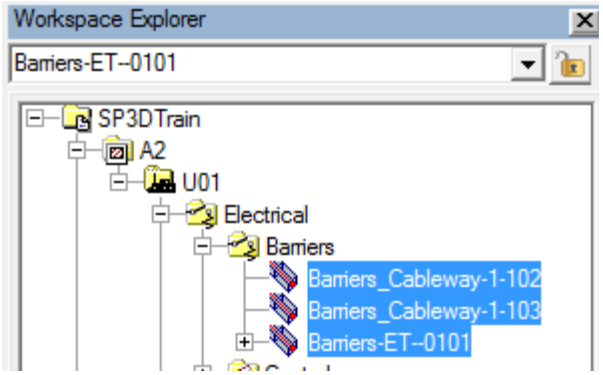


16. On the Route Cableway ribbon, key in 48 ft in the Length box
17. Position the cursor in the north N direction and click to define the end point to place 48 ft cableway, a shown.



18. Select **Cableways** from the **Locate Filter** drop-down list to select only the (we are selecting Cableways in next step) in the graphic view that you need to copy and paste.

19. Select the three cableways just created from the workspace explorer.



TIP Due to naming rule your cableways will be named uniquely and not name Cableways 1,2,3 and 4)

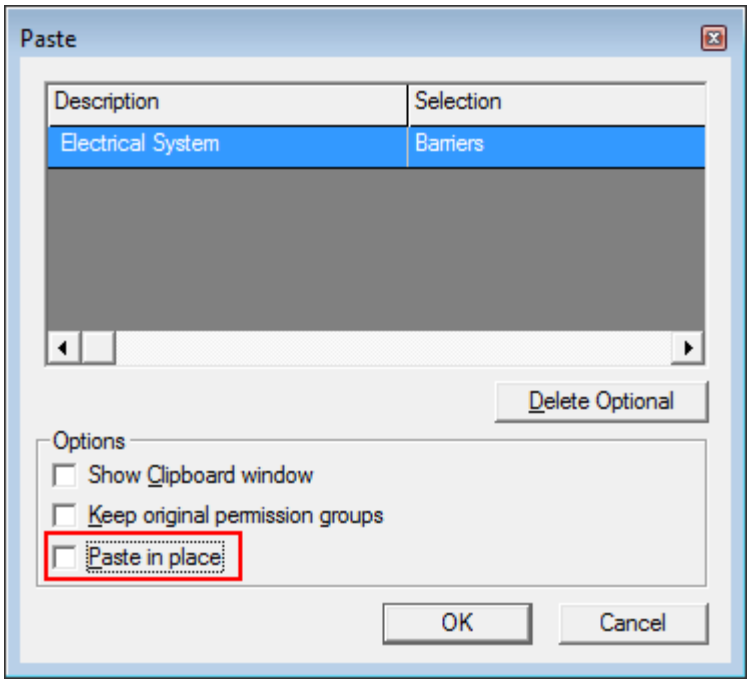
20. Click **Copy** on the Common toolbar.
21. Select the **Midpoint** of the supporting member as the **Copy from Point**.

22. Select **Paste**.

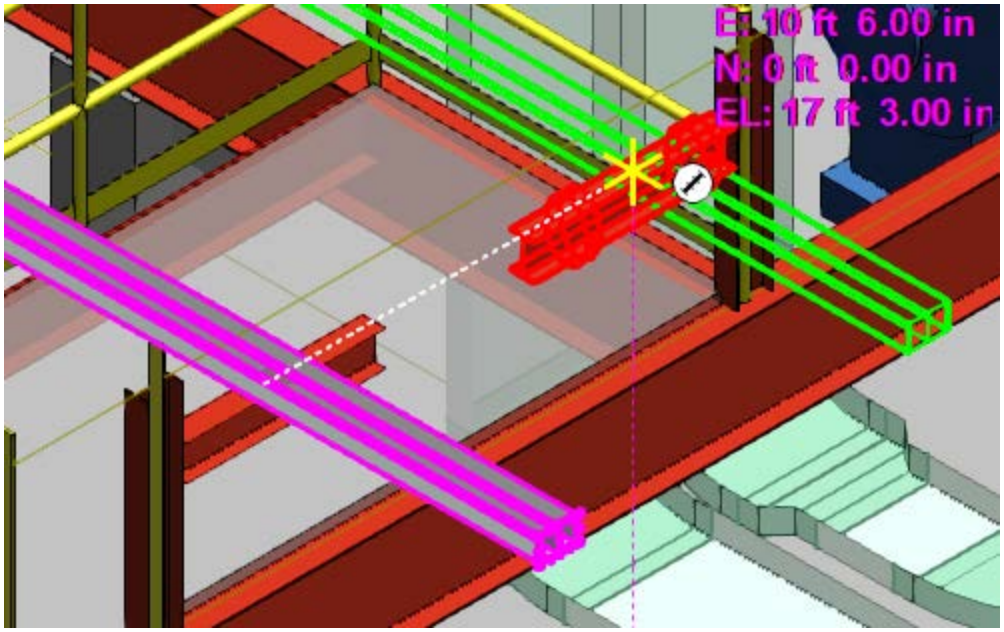
    The Paste dialog box appears.

23. Keep the default parent system for the new objects to be pasted on the model.

24. Clear the **Paste in place** check box in the **Paste** dialog box, and click **OK**.



25. Select the midpoint of the supporting member as the **Paste from** point as shown below.



26. Click in the graphic view to place the Cableways.