HVAC Tutorial

Route a Duct

Version 2014

PART OF HEXAGON

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SECTION 3

Route a Duct

Objective

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

- Route an HVAC duct system by using **Route Duct**.

Before Starting this Procedure

- SP3D Overview
- SP3D Common Sessions

Overview

The HVAC environment allows you to model a comprehensive duct system by routing a duct and adding required objects such as features and components. You can route a duct by using the **Route Duct** command. This command enables you to create a new duct run, extend an existing run, and route a run to or from nozzles or features. You can also extend a duct by adding bends and branches to it. Using the **Route Duct** command, you can route a duct manually or use the **Offset** option to route a duct. The **Offset** option is useful when you route a duct from one point to another because this option allows you to determine the next point without calculating it manually. After you route a duct, you can add in-line components such as divisions and branches and features, such as transition and split features.

In the previous session, you placed equipment **AHU-01** on which you placed nozzle **SP-1**. In this session, you will route a duct from this nozzle. Then, you will extend the duct by routing ducts with bends and branches in different directions. While routing the ducts, you will also add in-line components and transition features to your duct system. This session covers the following tasks:

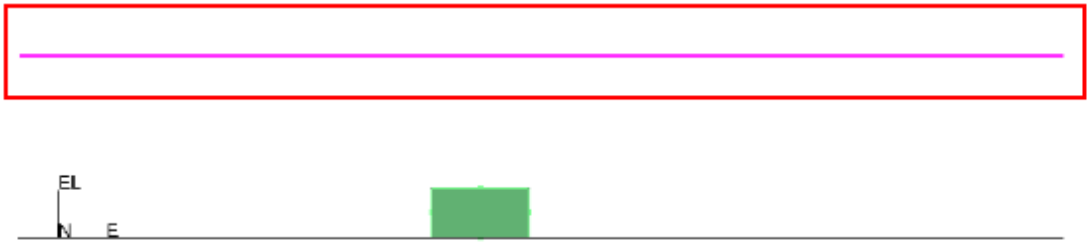
- Basic duct routing
- Inserting duct divisions
- Inserting transition feature
- Routing the duct with bends and branches
- Offset routing
- Placing reducing elbows

Basic Duct Routing

1. Define your workspace to include **Unit U06**.
2. If you are not in the HVAC environment, click **Tasks > HVAC**.
3. Set the **Active Permission Group** to **HVAC**.
4. Click **Tools > PinPoint** to display the **PinPoint** ribbon.
5. Change the active coordinate system to **HVAC_CS** under **A2 > U06 > HVAC > Grids** on the **PinPoint** ribbon.
6. Click **Set Target to Origin** on the **PinPoint** ribbon to move the target to the origin of the active coordinate system.

   The equipment on which you are routing the duct is placed at the first elevation plane.
7. You can hide the grid lines located at the second elevation plane. Select **Front** from the **Named Views** list on the **Common** toolbar to hide these grid lines.

8. Select the grid lines located at the second elevation plane as highlighted in the following figure. Click **Tools > Hide** to hide these grid lines.



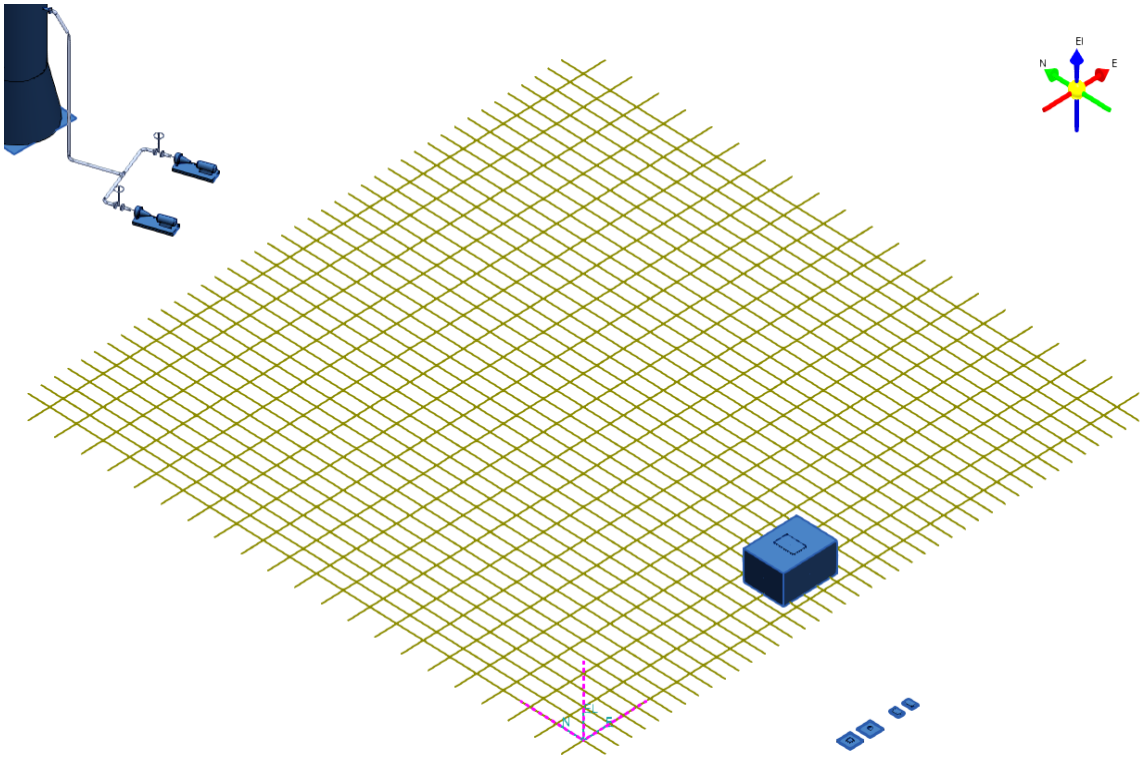
TIPS

- While hiding the grid lines, make sure that you have selected the **All** option in the **Locate Filter** drop-down list.
- Another way to hide any object is to right-click the object. Then, click **Hide** on the shortcut menu.

9. You might need to switch to different views such as **Looking Plan** and **Isometric** during the procedure to get a better view of the area where you are performing a task. To change the view, click **Common Views** on the **Common** toolbar.

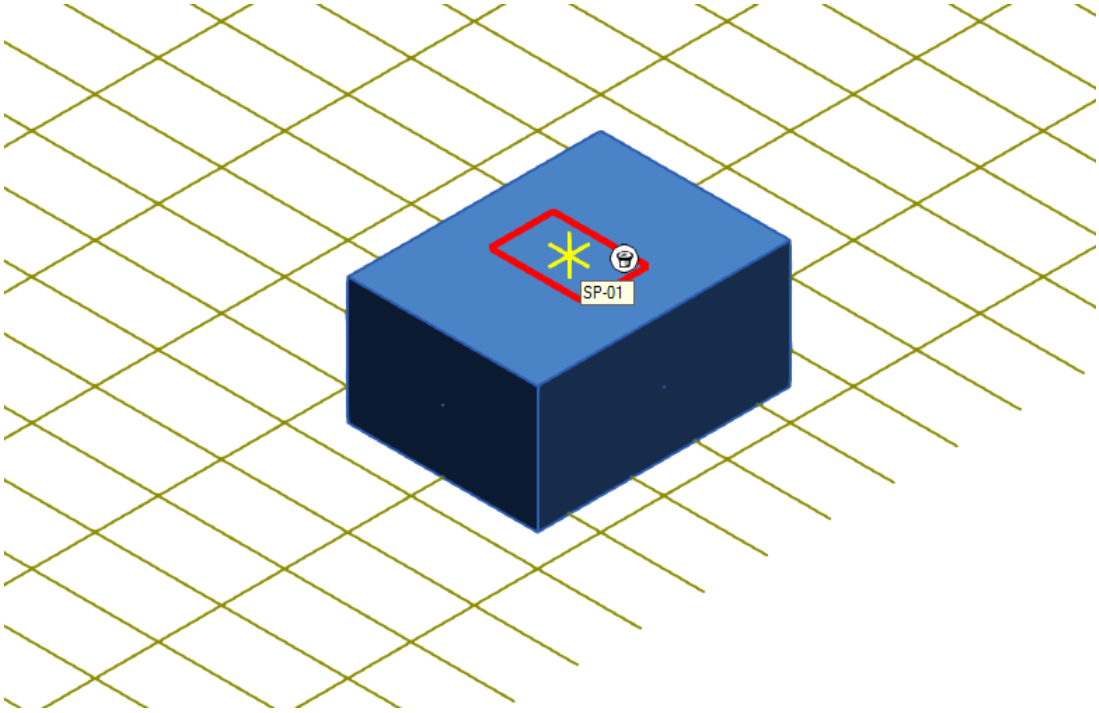
   *The **Common Views** dialog box displays.*

10. Change your workspace view to **Isometric**.



11. Click **Route Duct** on the vertical toolbar.
12. Click to select the port **SP-1** on the equipment **AHU-01** as the starting point of the duct.

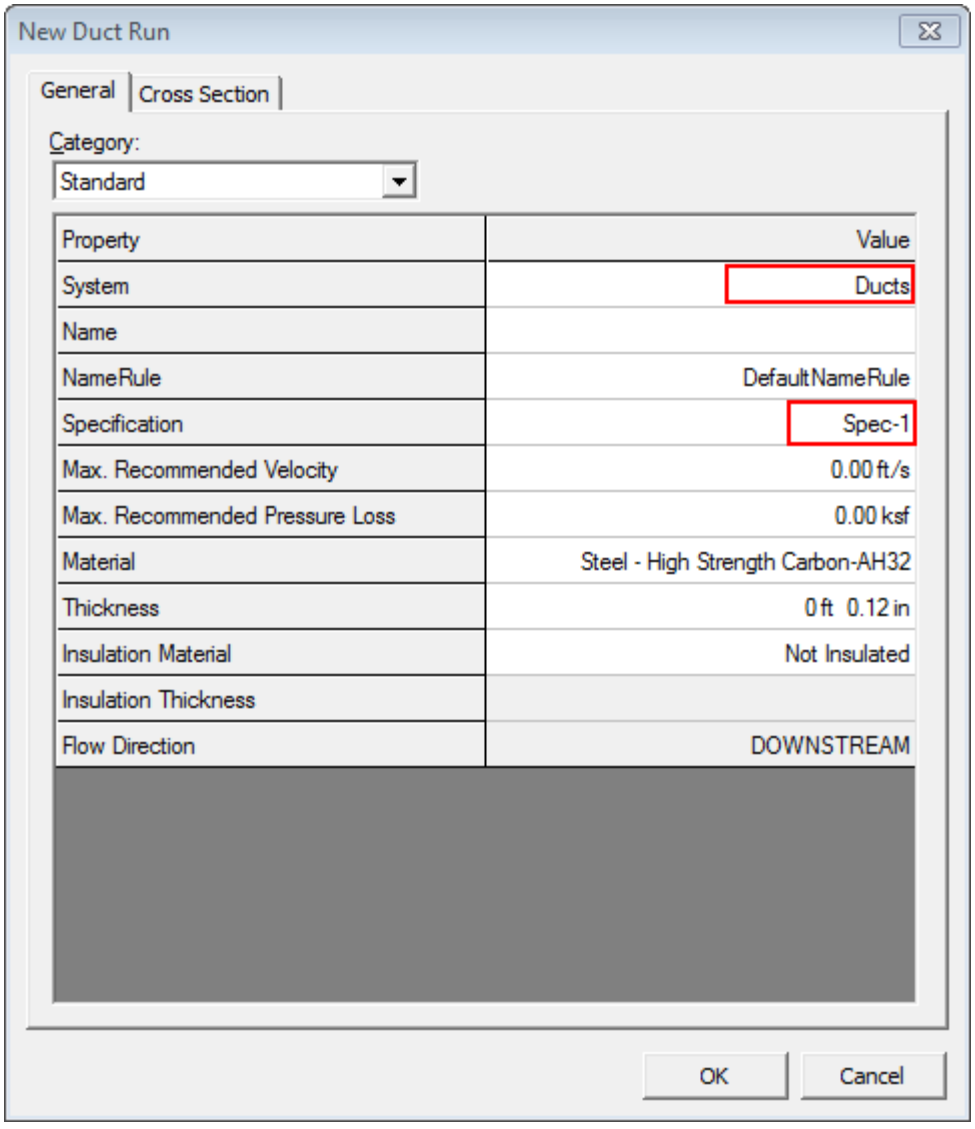
*The **New Duct Run** dialog box displays.*



NOTE If the point that you define as the starting point is not an end feature of an existing duct, then the software automatically displays the **New Duct Run** dialog box to specify the properties for the new duct.

13. Specify the following settings in the **New Duct Run** dialog box:
    - **System: A2 > U06 > HVAC > Supply > Ducts**

- **Specification: Spec-1**

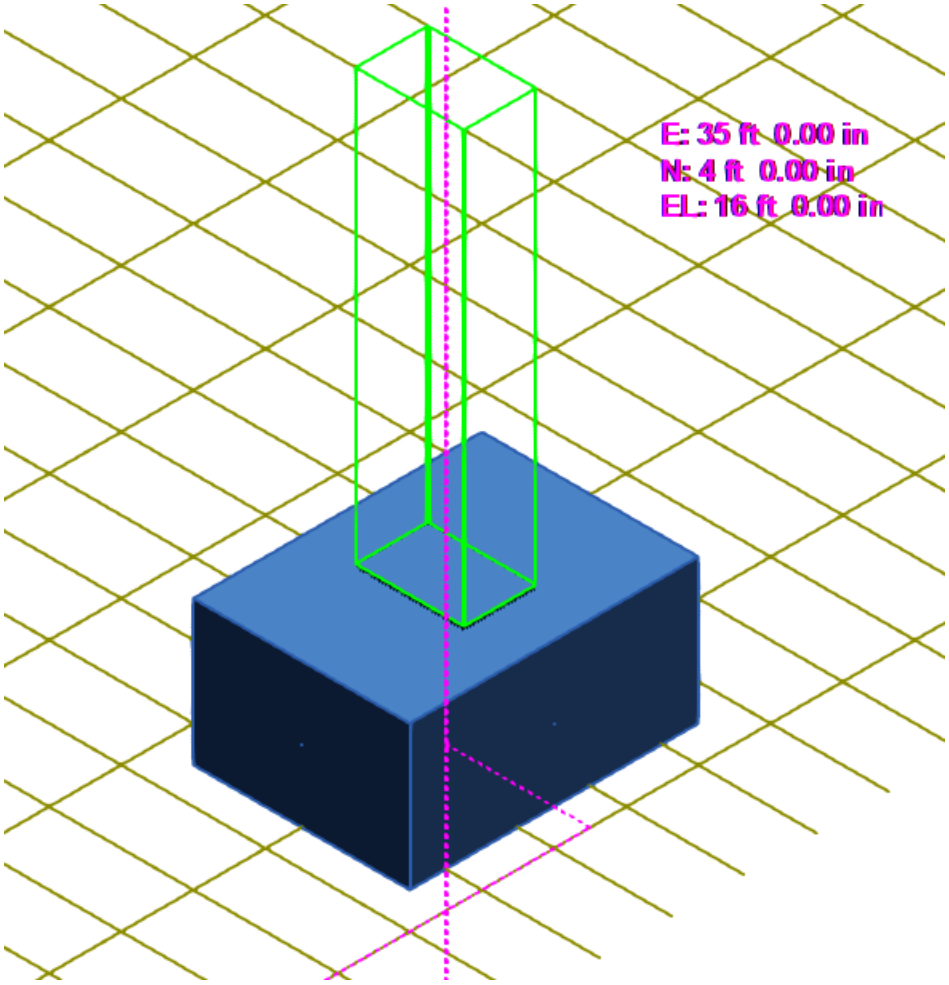


TIP Use the settings specified above on the **New Duct Run** dialog box whenever it appears while performing the subsequent procedures.

14. Click **OK** on the **New Duct Run** dialog box to define the duct run properties.
15. Route the duct upwards, and set the value for the elevation coordinate of the duct as **16 ft** on the **PinPoint** ribbon.

Smart 3D sets this elevation as the end point of your duct. Your duct will not move beyond this elevation.

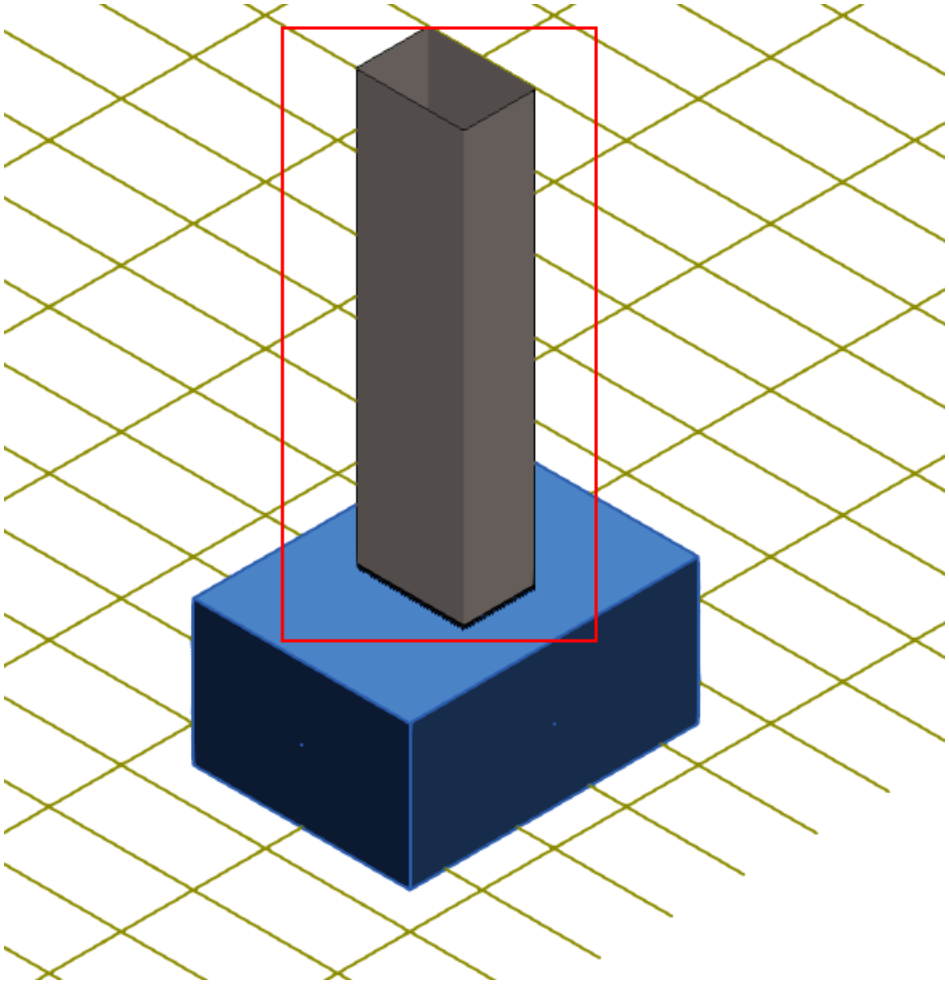
16. Move the duct straight upwards as shown in the following figure:



TIP The SmartSketch relationship indicators help you to position your duct correctly while routing.

17. When the duct is straight, click in your workspace to place the duct.

18. Right-click in the graphic view to stop the command.

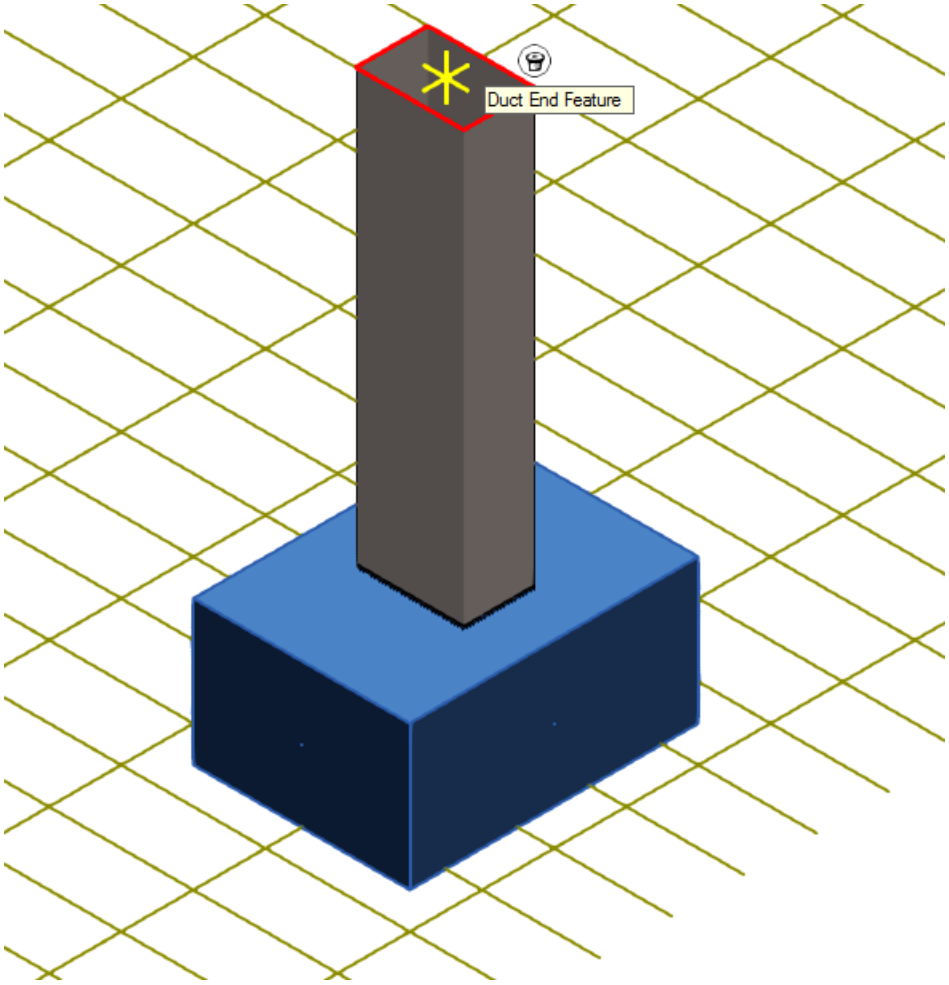


In the next part of the procedure, you will insert a division in the duct.

Insert Duct Divisions

1. Click **Insert In-line Component** on the vertical toolbar.

2. Select the end feature of the created duct.

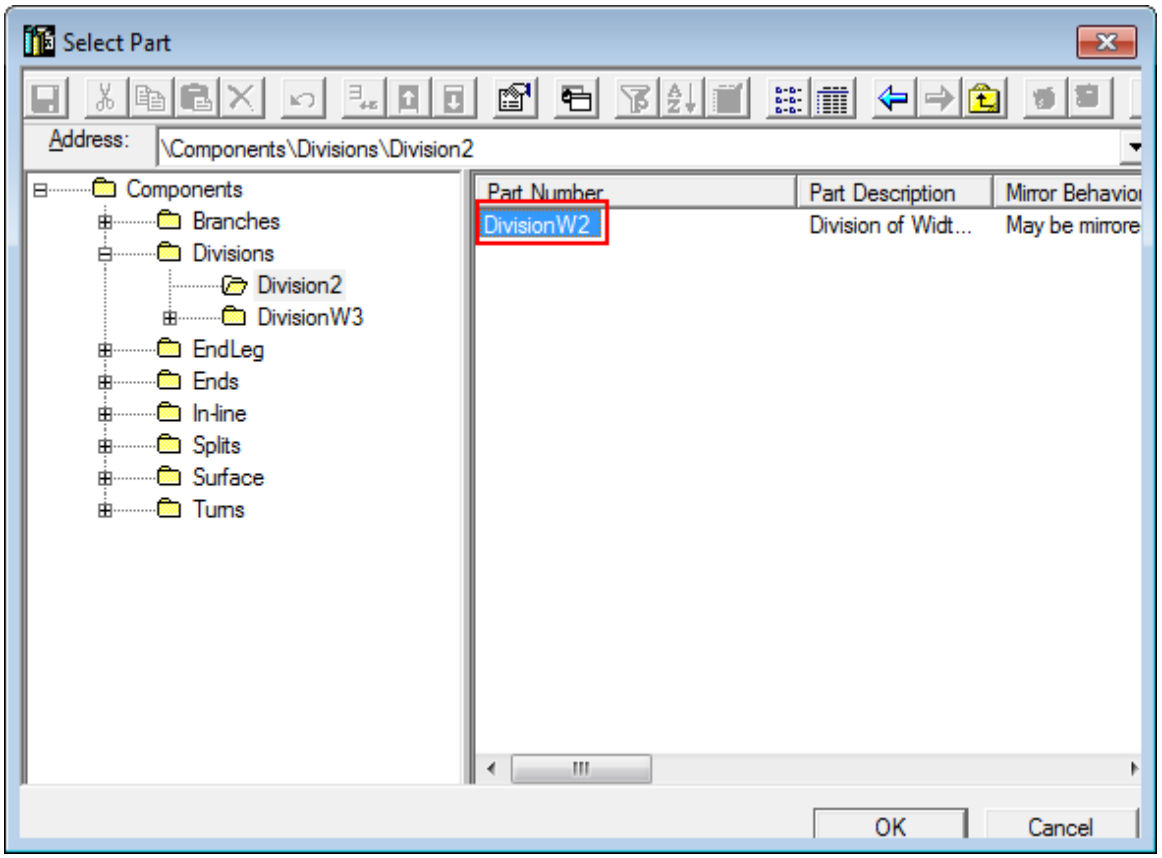


*As you select the end feature of the duct, the **Part** list on the **Insert In-line Component** ribbon automatically opens. You can select the component to be inserted from the catalog.*

3. Select **More** from the **Part** list.

*The **Select Part** dialog box displays.*

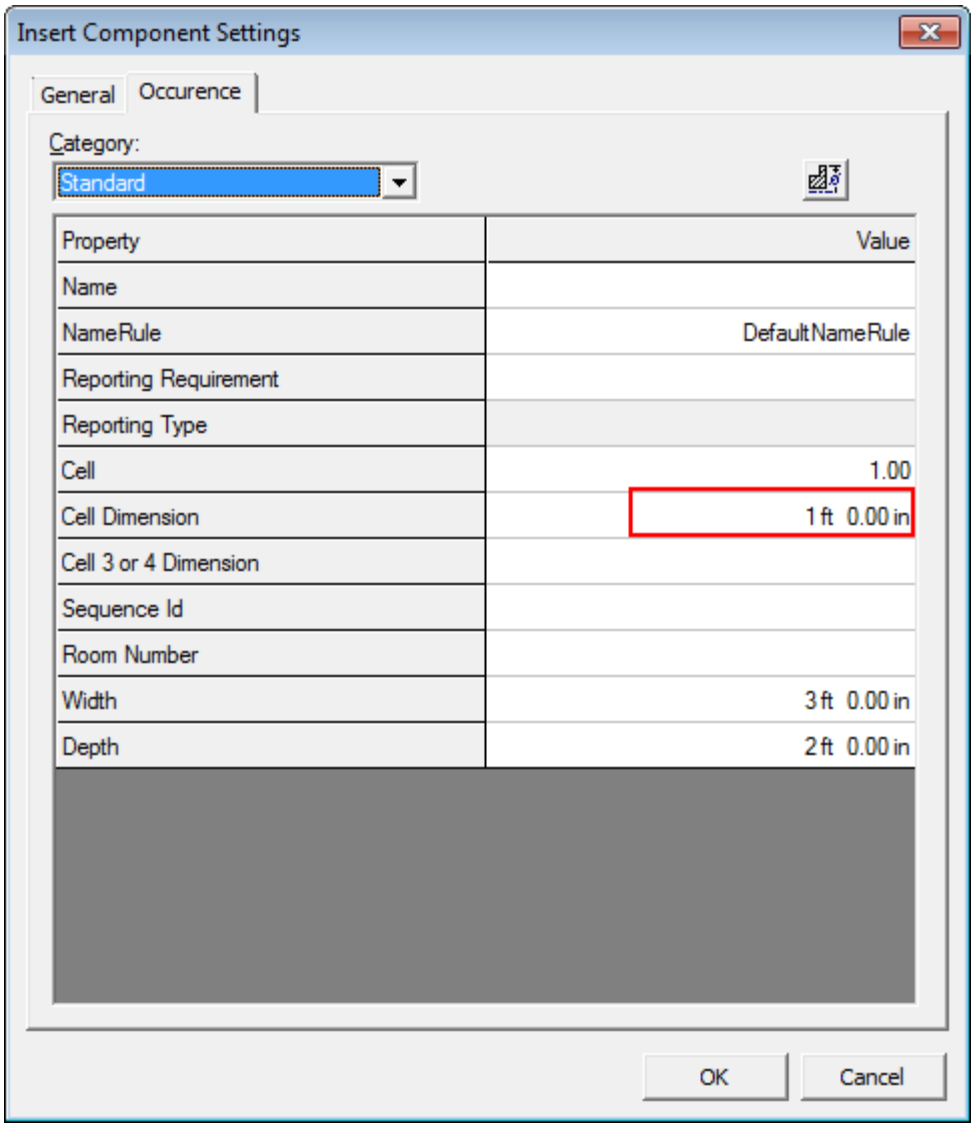
4. Select the type of component you want to insert. Expand **Components > Divisions > Division2** until you see the part **DivisionW2**. Select this part, and click **OK**.



5. Click **Properties** on the **Insert In-line Component** ribbon to define the properties of the component.

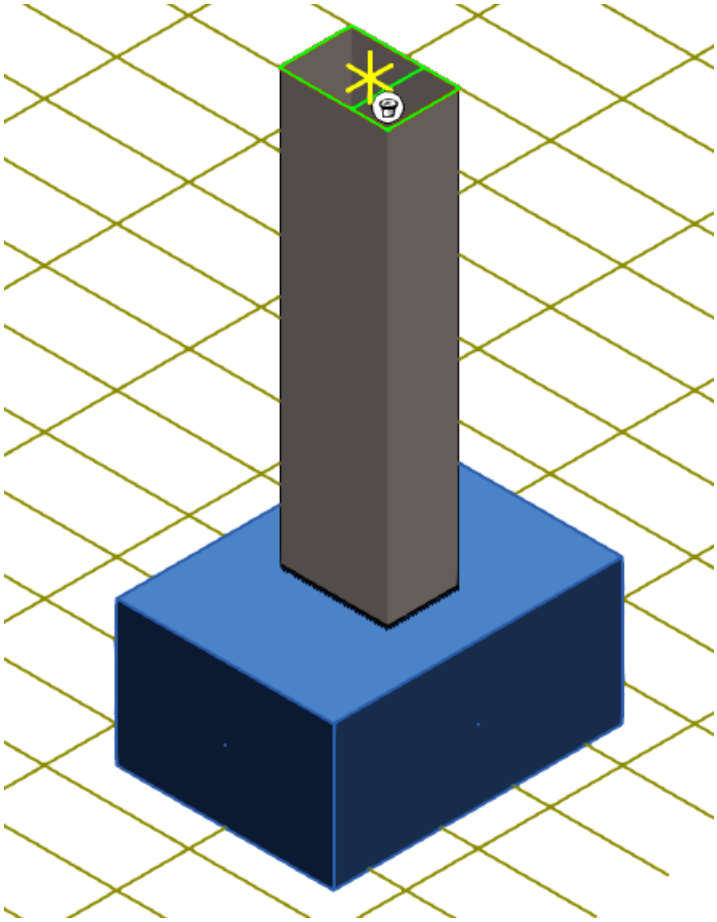
   *The **Insert Component Settings** dialog box displays.*

6. Click the **Occurence** tab, and set the **Cell Dimension** as **1 ft**. Keep the other attributes as defaults.

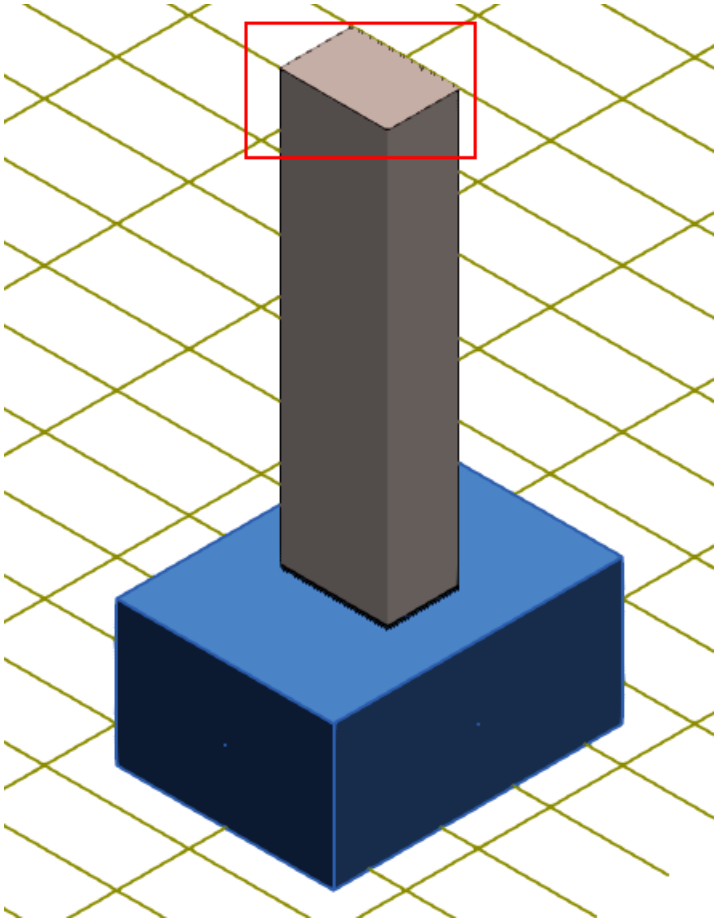


7. Click **OK**.

Smart 3D displays a line that splits the duct into two divisions.



8. Click **Finish** on the **Insert In-line Component** ribbon to place the division.

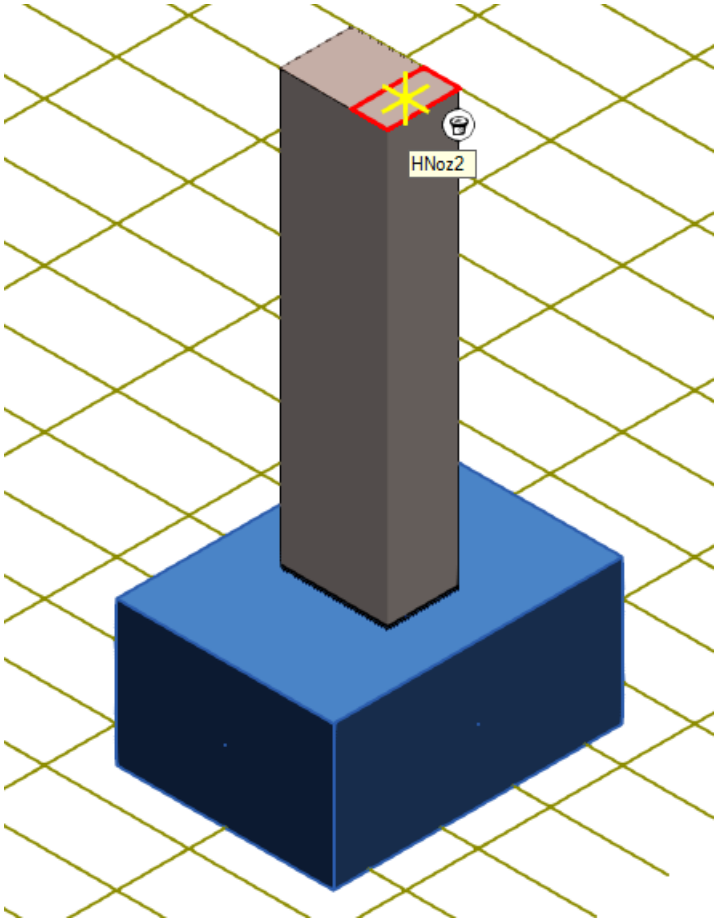


After placing a division, insert a transition feature on the smaller cell of the division. You can place the transition feature on an end feature or any HVAC port.

Insert Transition Features

1. Click **Insert Transition** on the vertical toolbar.

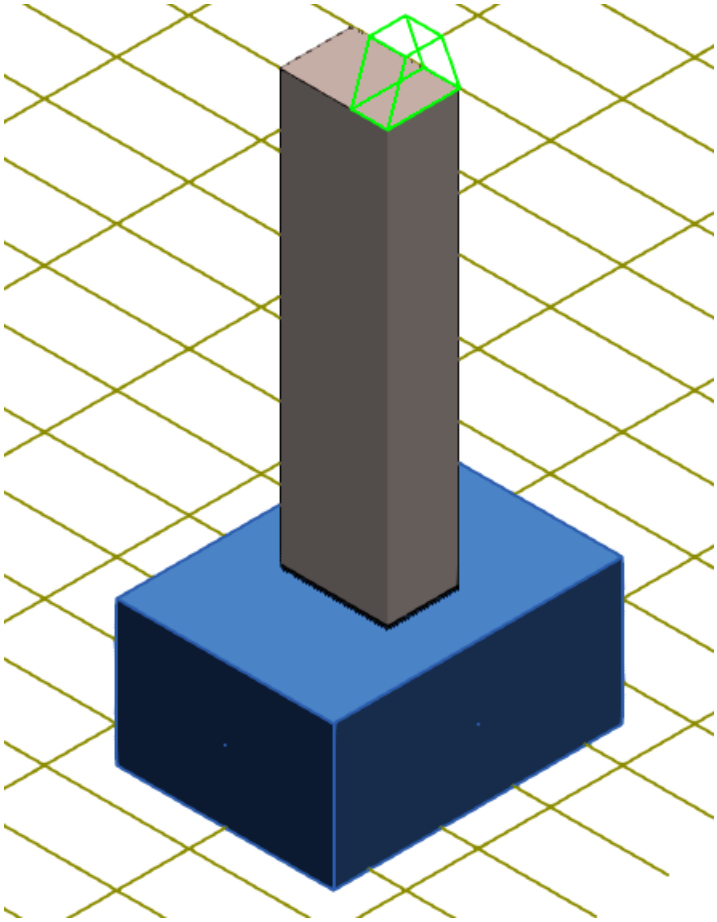
2. Select the smaller section of the division as the starting point.



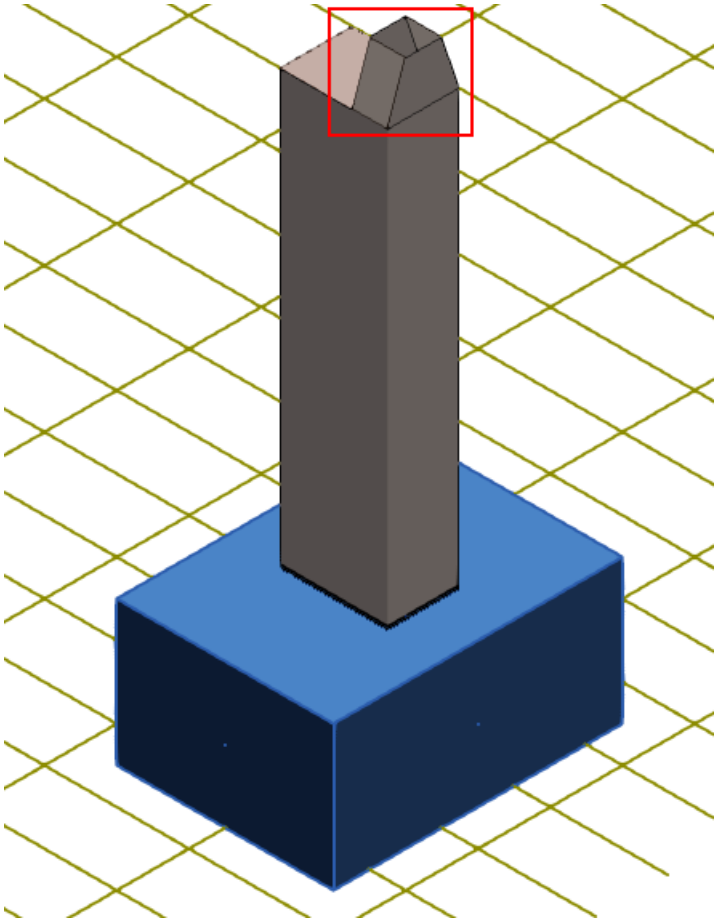
*When you select the smaller section of the division, the **New Duct Run** dialog box displays. Retain the properties on this dialog box that you specified while performing the steps to perform basic duct routing.*

3. Click **OK**.
4. Specify the following settings on the **Insert Transition** ribbon.
   - **Width: 1 ft**
   - **Length: 1 ft 6.00 in**

The outline of the transition feature displays.



5. Click **Finish** on the **Insert Transition** ribbon to place the transition.



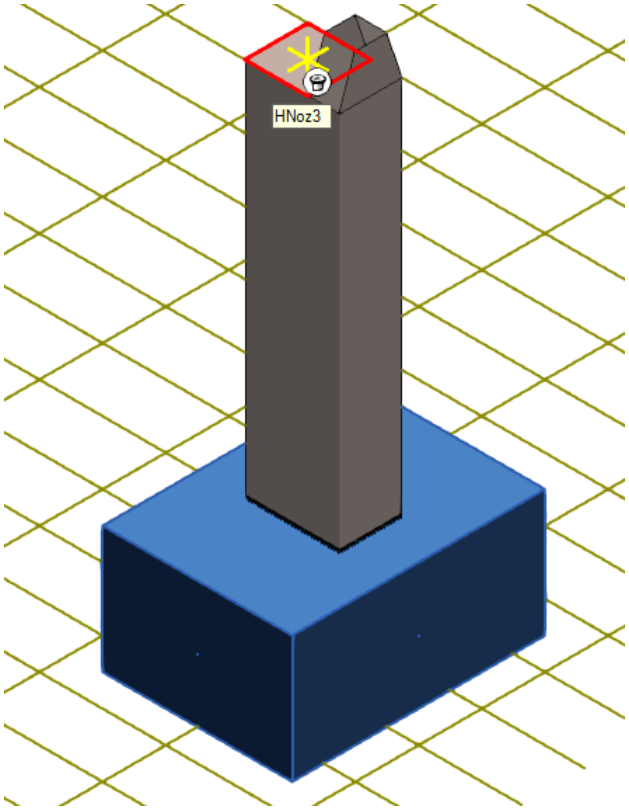
After inserting the transition feature, the duct can be routed with bends and branches.

Route a Duct with Bends and Branches

To create a duct with the bend, follow the same steps that you followed to perform the basic duct routing. However, there are few differences which are listed below:

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

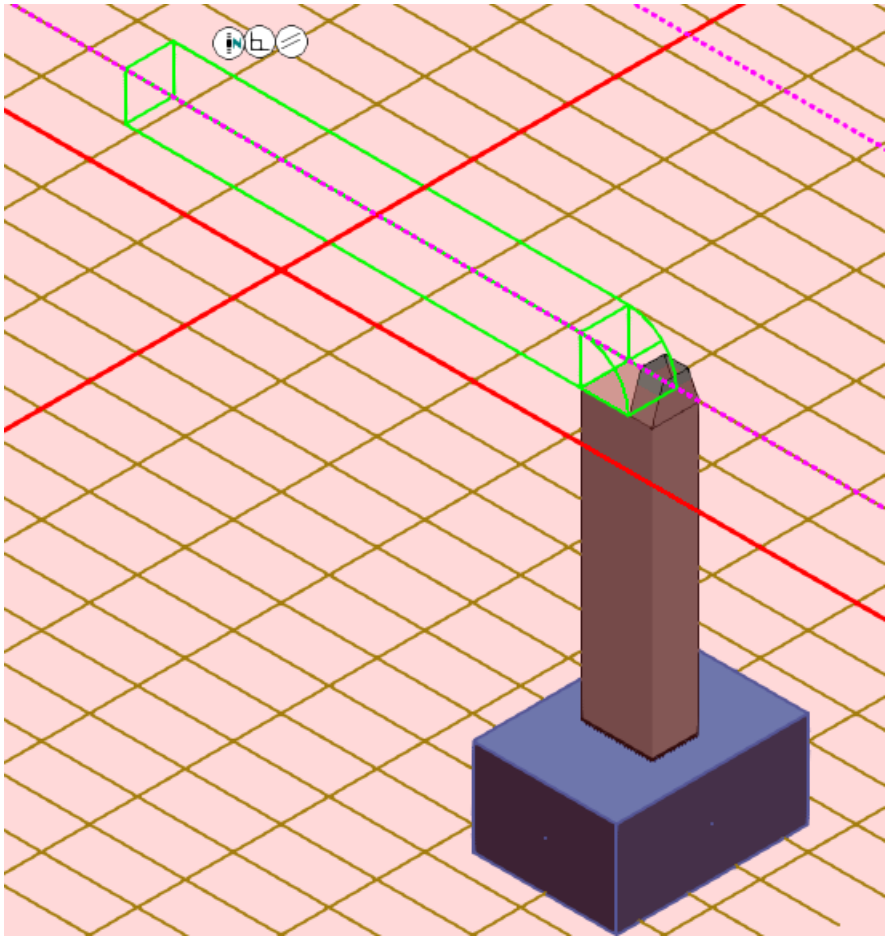
2. Select the largest port of the duct run as the starting point.



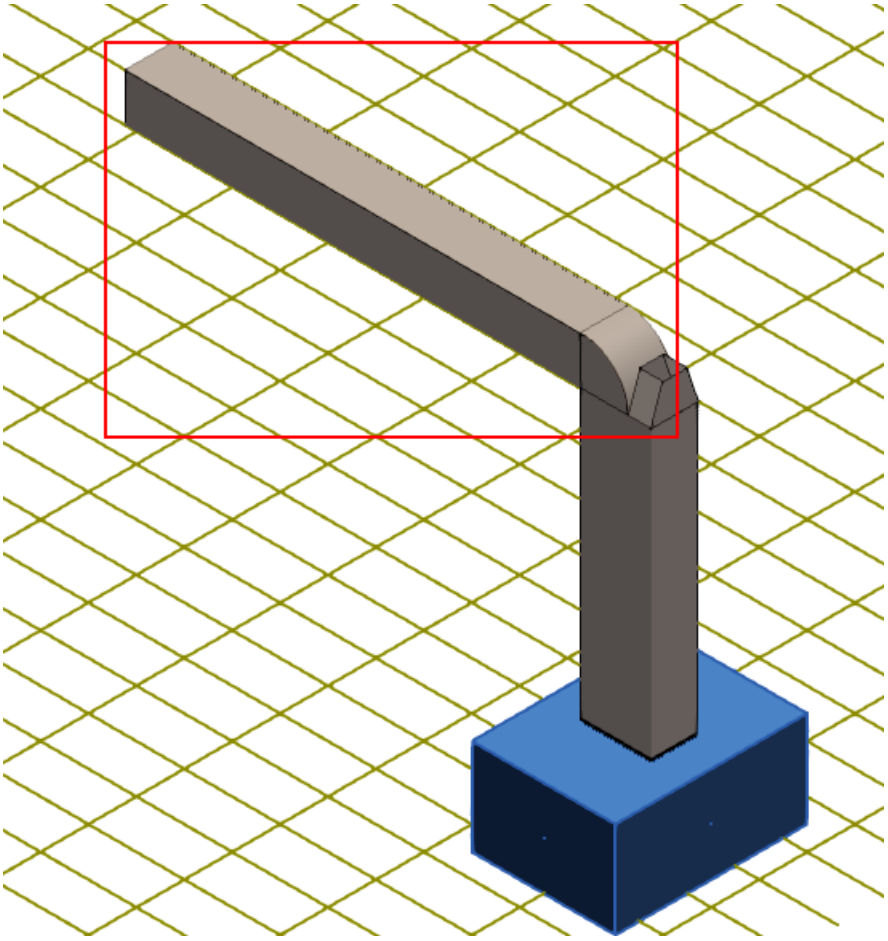
*The **New Duct Run** dialog box displays.*

3. Retain the properties in this dialog box, and click **OK**.
4. Specify the following settings on the **Route Duct** ribbon:
   - **Angle: 90.00 deg**
   - **Length: 20 ft**

5. Route the duct in the North direction.

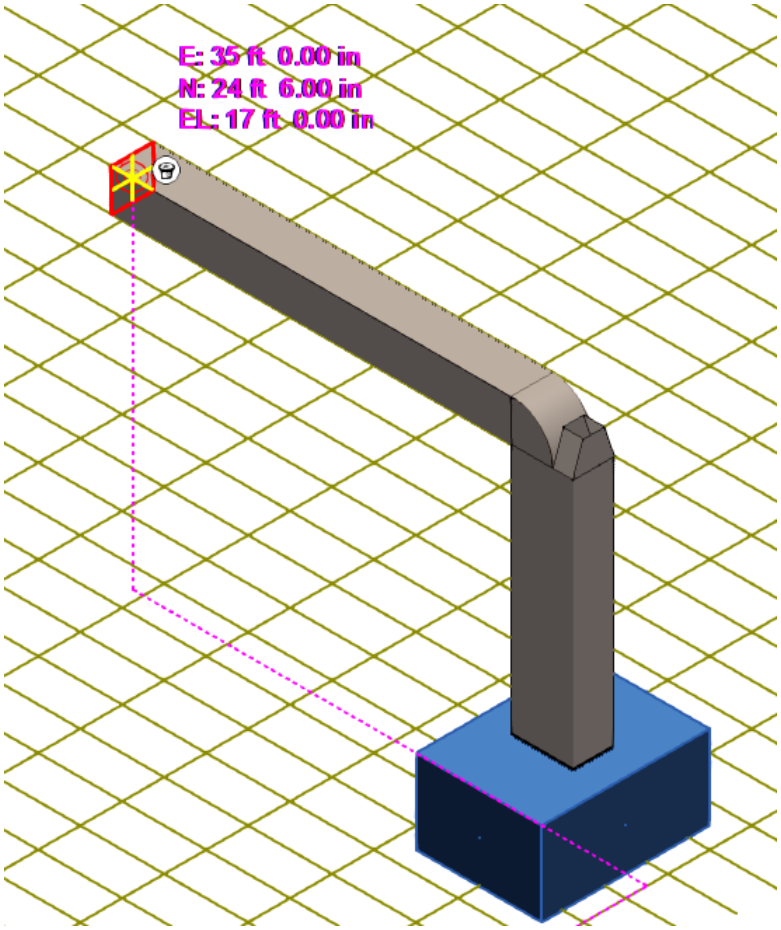


The duct with the bend should resemble the highlighted section in the following figure:



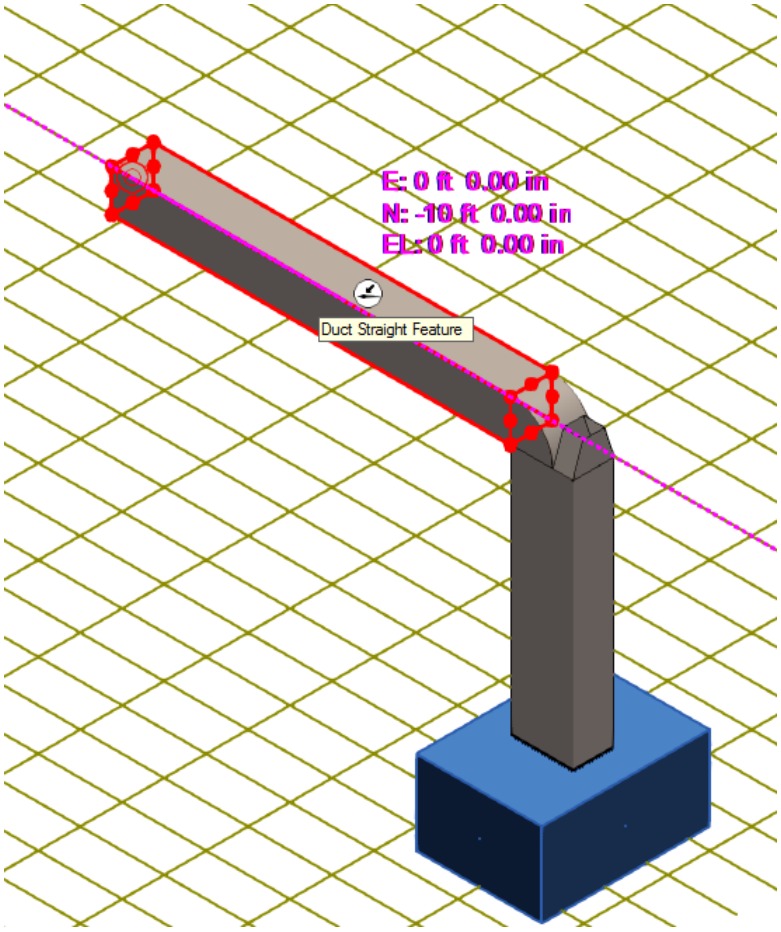
Now, create a duct with a branch at a distance of -10 ft from the header of this duct. Route this duct using the **Offset** option on the **Route Duct** ribbon. The **Offset** option allows you to specify a particular distance as a reference point to route the duct. You do not need to manually route the duct using this option. If you want to route your duct from an identified reference point in a specified direction along with the specified distance, you can use the **Set Offset Reference** option from the **Offset** list on the **Route Duct** ribbon. The SmartSketch relationship indicators can find this reference point automatically.

1. Click **Reposition Target** on the **PinPoint** ribbon and place the target at the end of the duct with the bend.



2. Click **Route Duct** on the vertical toolbar. You can view your origin at the new location.
3. Type **-10 ft** for the north coordinate on the **PinPoint** ribbon.

4. Highlight the centerline of the duct by hovering the cursor over it. Click the centerline.



*The **New Duct Run** dialog box displays.*

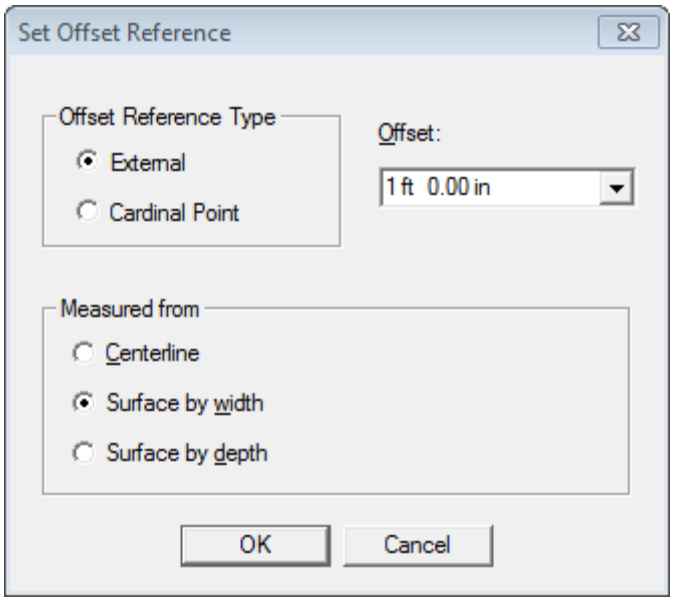
5. Retain the same values as specified for the other ducts, and click **OK**.
6. Change your active view to **Looking Plan** and route in the West direction.
7. Specify **Plane** as **Plan Plane** on the **Route Duct** ribbon.
8. Select **Set Offset Reference** from the **Offset** list.

   *The **Set Offset Reference** dialog box displays.*

   The **Set Offset Reference** dialog box defines three options for offset reference:

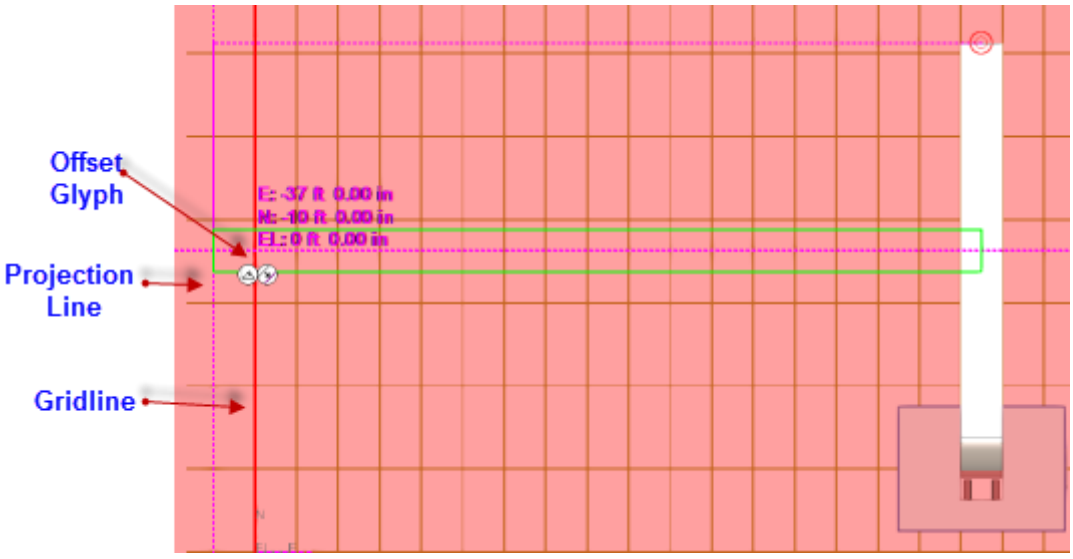
   - **Centerline** - Selects the centerline of the duct as the reference point.
   - **Surface by width** - Selects the width surface of the duct as the reference point.
   - **Surface by depth** - Selects the depth surface of the duct as the reference point.

9. Type **1 ft** in the **Offset** box. Make sure that the offset reference is set to **Surface by width**, and click **OK**.



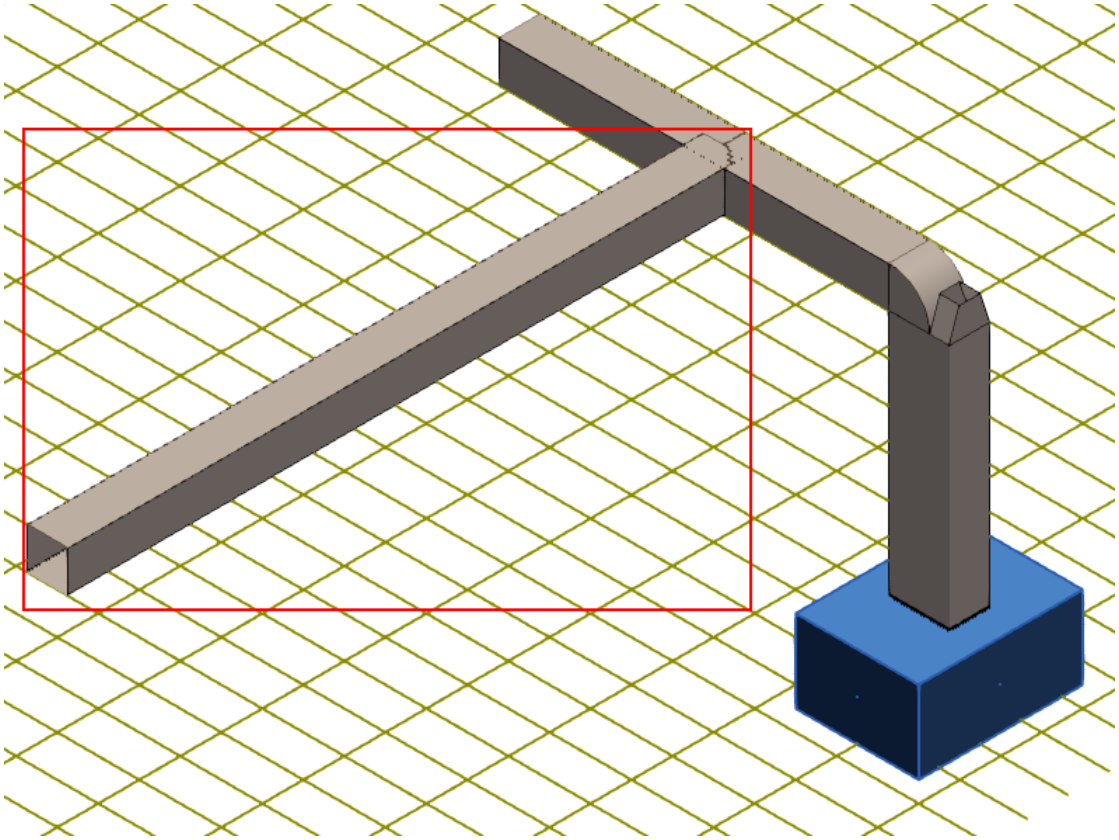
10. Move the cursor to the left most grid line to add it to the SmartSketch list.
11. To understand what the offset glyphs looks like, move the cursor away from the grid line to the left of the left most gridline.

    *Smart 3D displays a projection line at 1 ft distance as specified in the **Offset** box*



12. Move the cursor back to the second gridline from the left. The offset distance results in the same location as an existing gridline, as a result, the offset glyph is not displayed.

13. Click in the graphic view to finish routing so we are on top of the second gridline.



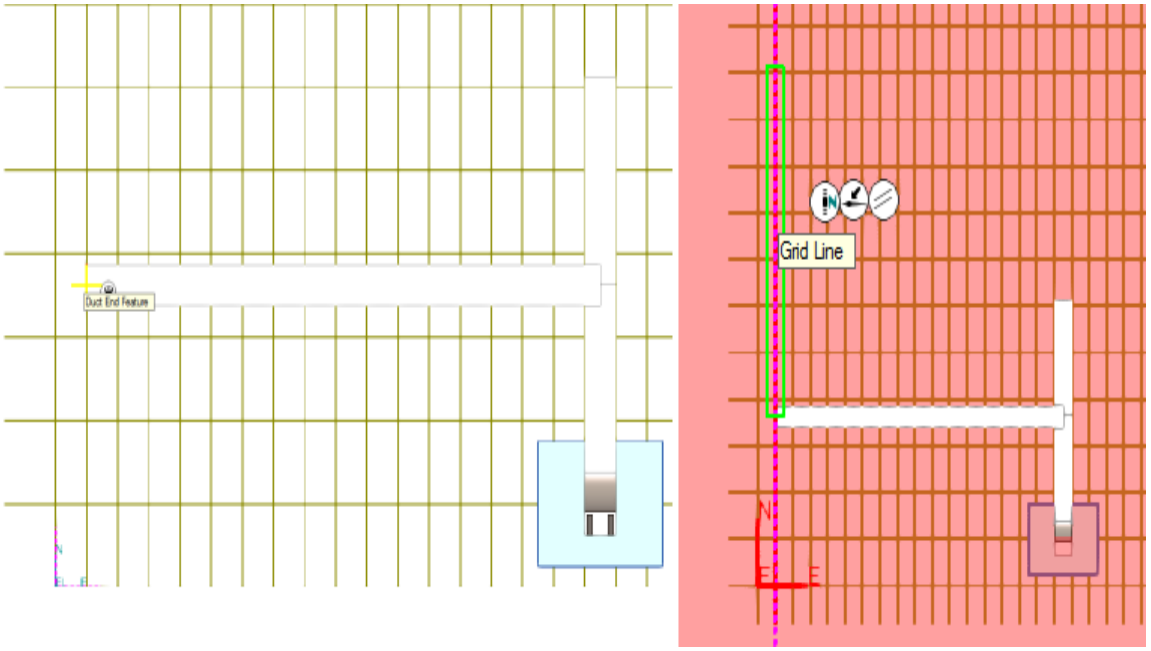
Route by Offset

After you have routed the duct with bends and branches, you can route more ducts using the offset routing. In the following procedure, expand your duct system by routing ducts from various points in the model. You will route these ducts by performing basic duct routing and by offset routing.

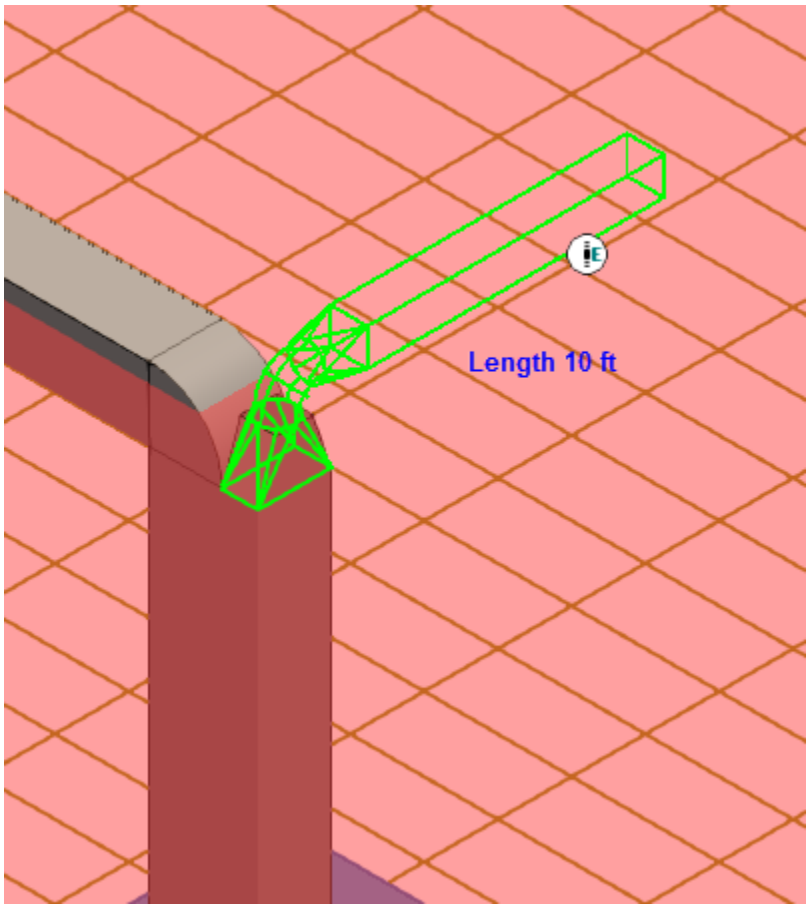
Route the first two ducts by following the steps to perform basic duct routing. For more information, see *Basic Duct Routing* (on page 6).

1. Continue routing a 30 ft long duct to the duct system in the North direction. The specifications on the **Route Duct** ribbon are as follows:
   - **Length: 30 ft**

- **Angle: 90 deg**

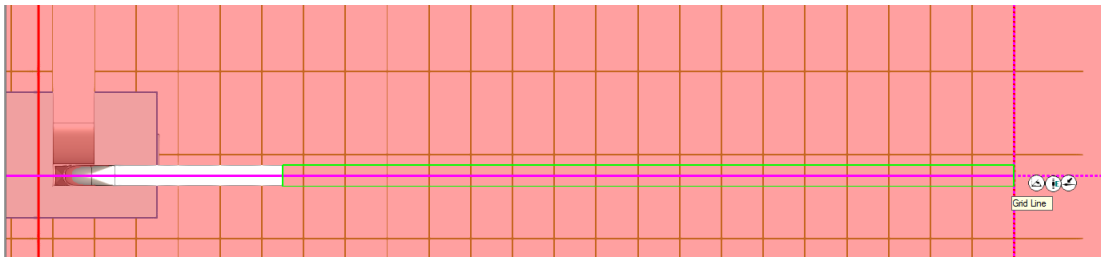


2. Route the next duct by selecting the end feature of the transition as the starting point. Specify **Angle** as **90.00 deg** and **Length** as **10 ft** on the **Route Duct** ribbon.



Continue routing from the last duct by using offset routing.

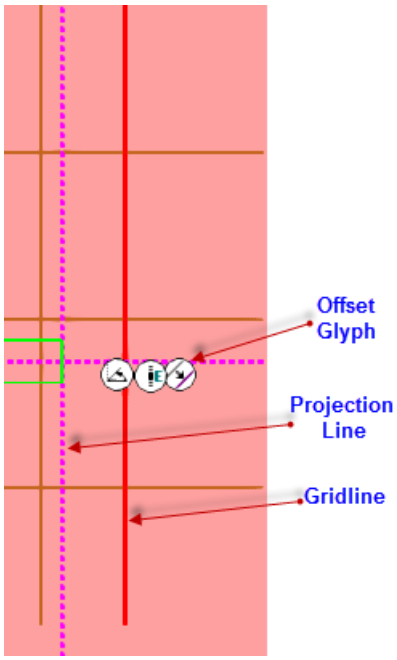
3. Click in the active view to place the duct. Continue routing the duct in the East direction. Specify the following settings on the **Route Duc**t ribbon:
   - **Plane: Plan Plane**
   - **Angle: 0.00 deg**
4. Retain the settings in the **Set Offset Reference** dialog box as specified for the duct with a branch that you routed in the procedure to route the duct with bends and branches. Identify the grid line highlighted in the following figure to route the duct at a distance of 1 ft from it.



5. Select the grid line you identified to add it to the SmartSketch list. Then, move away from the grid line.

   *Smart 3D generates the vertical projection line at a distance of 1 ft as specified in the **Offset** list in the **Set Offset Reference** dialog box.*

6. Click to place the duct part.

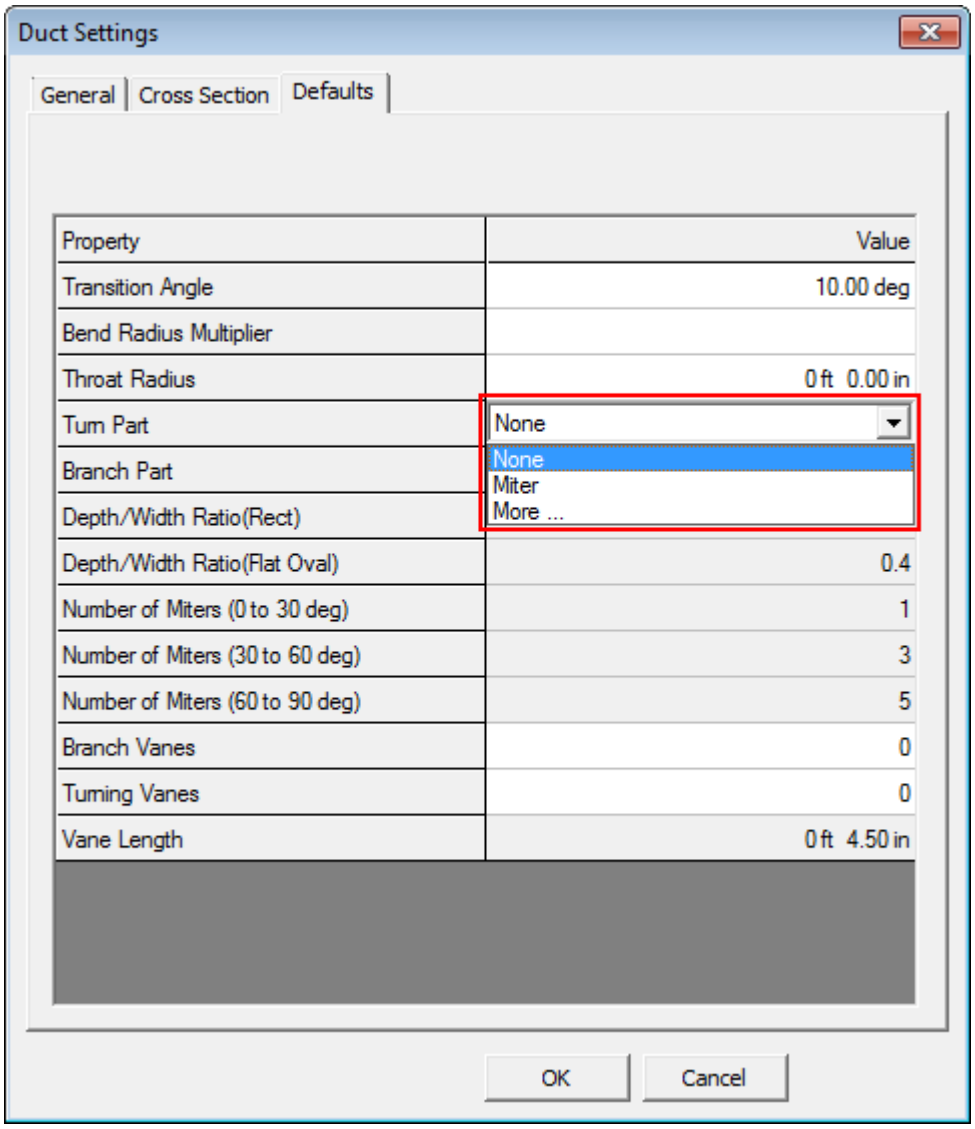


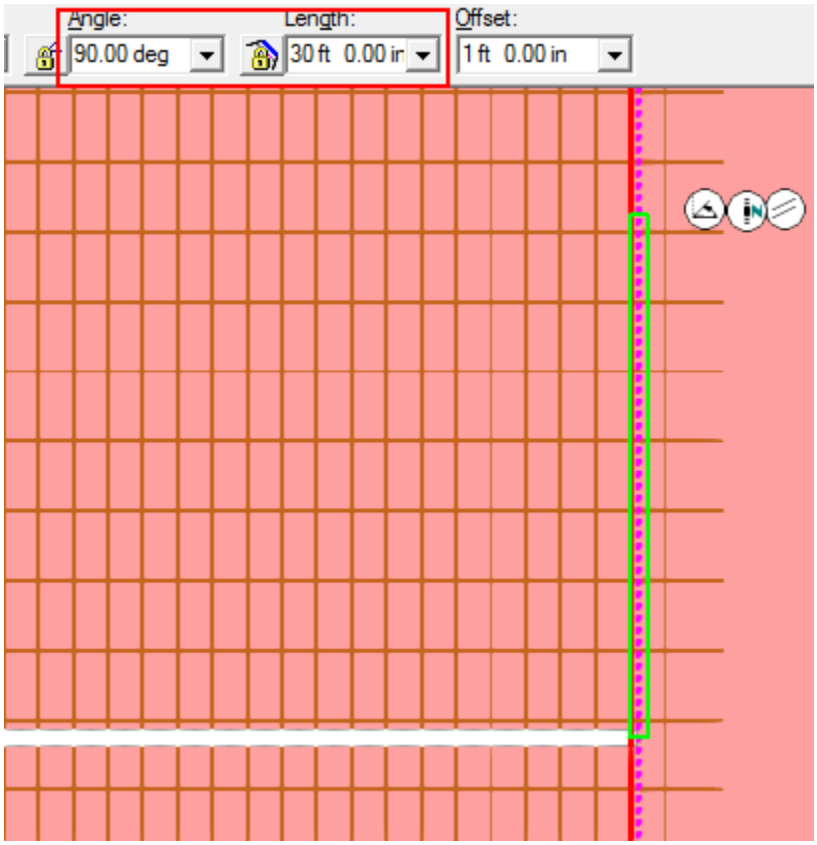
   Route the next two ducts by using basic duct routing. For more information, see *Basic Duct Routing* (on page 6).

7. Continue routing from the last duct in the North direction by specifying the following settings on the **Route Duct** ribbon:

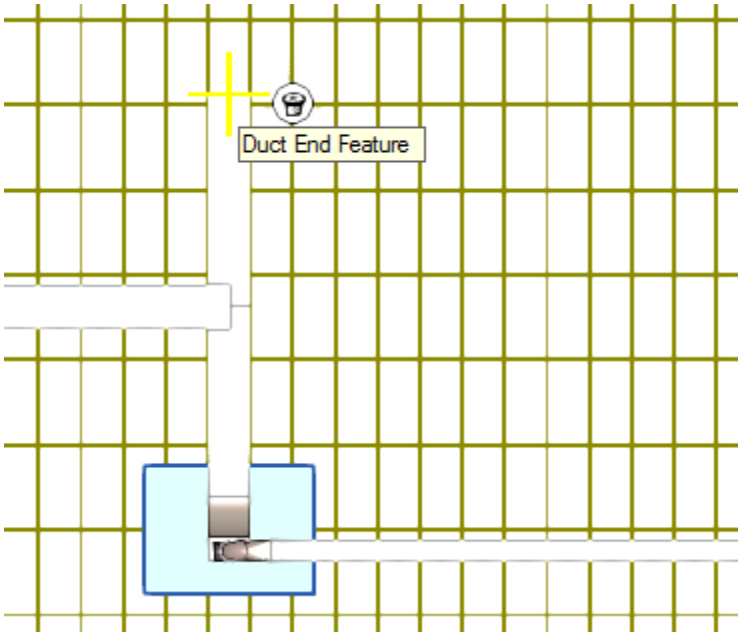
   - **Angle: 90.00 deg**
   - **Length: 30 ft**

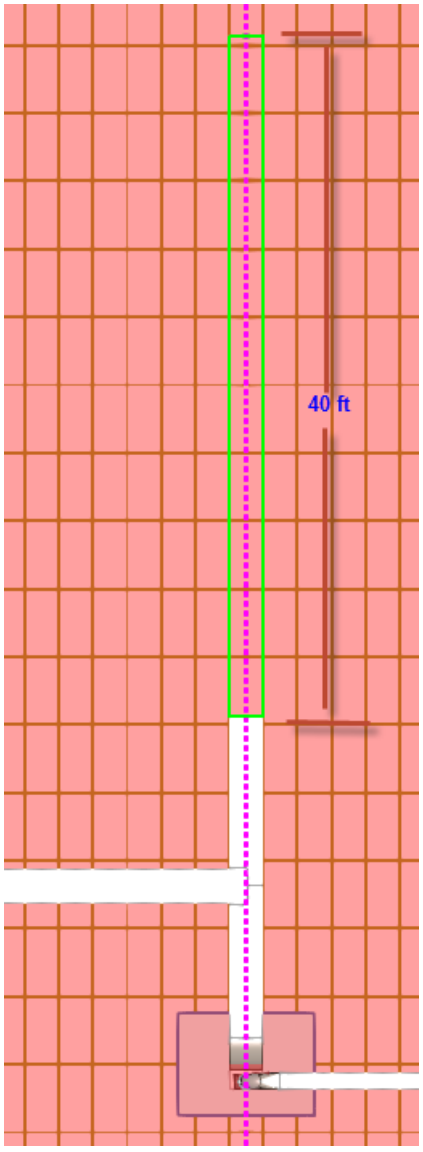
NOTE You may want to click **Properties** on the **Route Duct** ribbon, select the **Defaults** tab, and set **Turn Part** to **None**.




Angle:
90.00 deg
Length:
30 ft 0.00 in
Offset:
1 ft 0.00 in

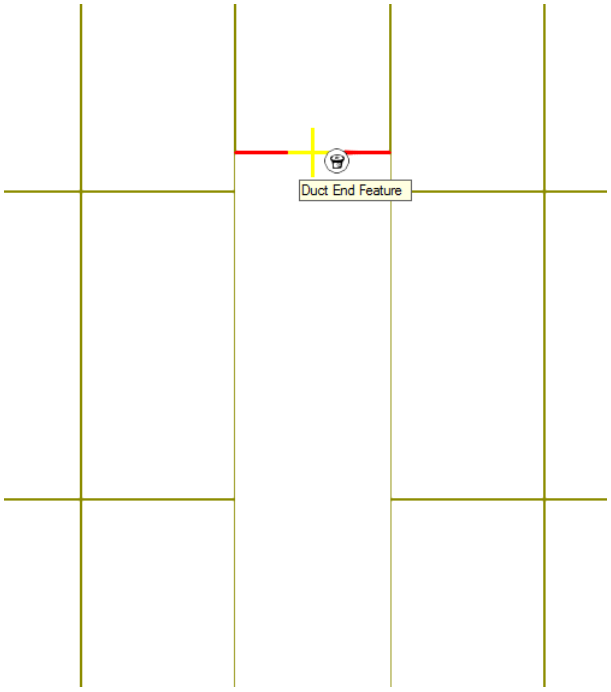
8. Route another duct with a **Length** of **40 ft** from a different point.


Duct End Feature

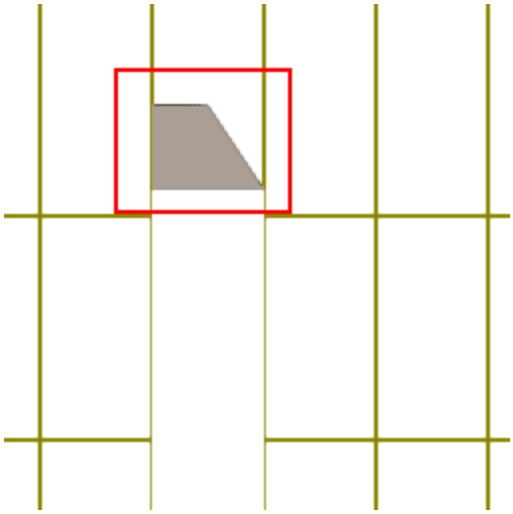


After you have placed various ducts at different points, create a transition feature by following the same procedure as the one you followed earlier to insert the transition.

9. Click **Insert Transition** on the vertical toolbar, and select the end feature of the duct routed in the previous step.

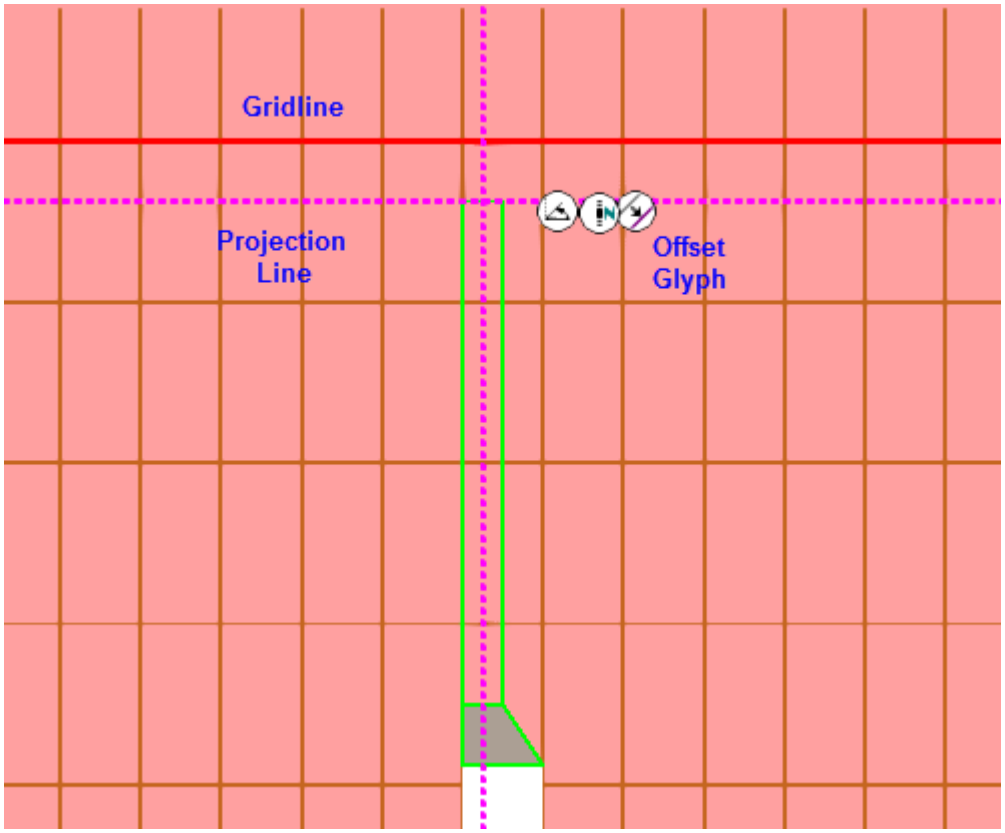


10. Specify the following settings on the **Insert Transition** ribbon, and click **Finish**:
    - **Width: 1 ft**
    - **Depth: 1 ft**
    - **Length: 1 ft 6 in**
    - **Align: Align Bottom Right**



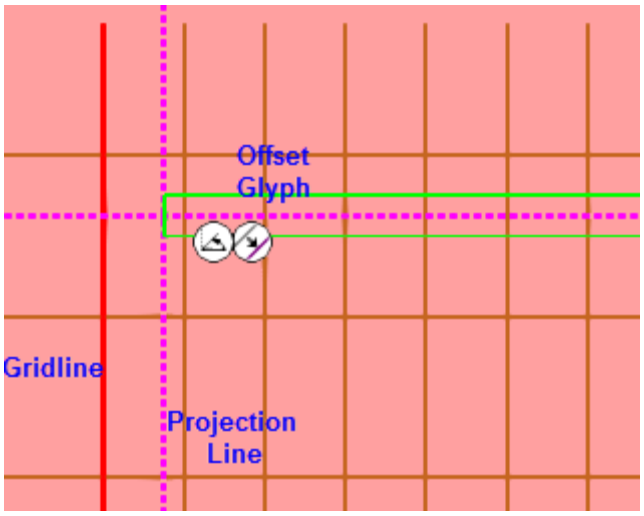
From this transition feature, route more ducts.

11. Use offset routing to place a duct from the end feature of this transition. Identify the grid line highlighted in the following figure to route the duct at a distance of 1 ft from the grid. Again, retain the settings in the **Set Offset Reference** dialog box as specified for the last duct you routed using the **Offset** option. Also, change your **Plane** to **Plan Plane** to view the projection line generated by the offset constraint.

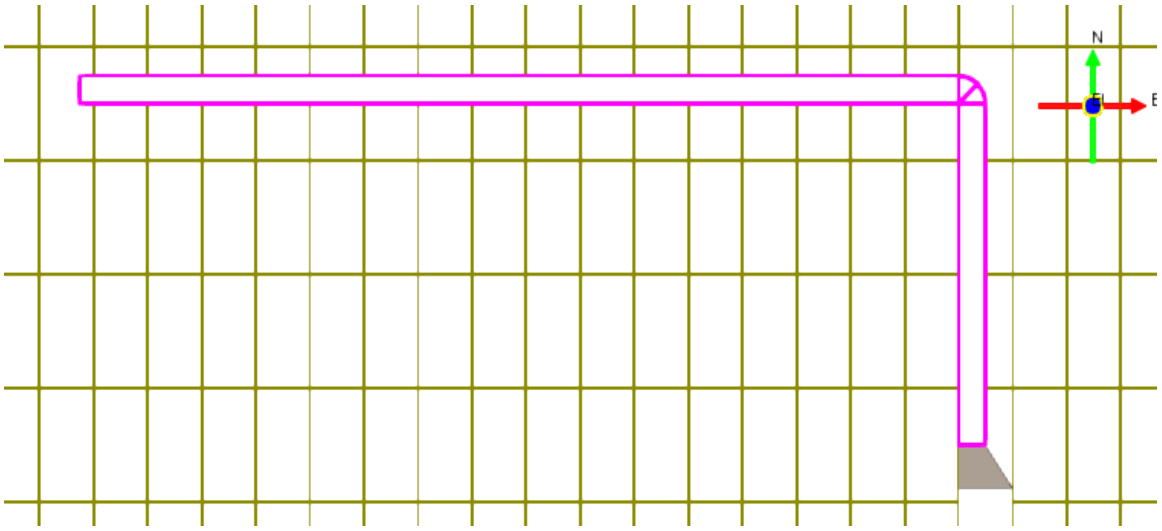


12. Click in the active view to place the duct part.

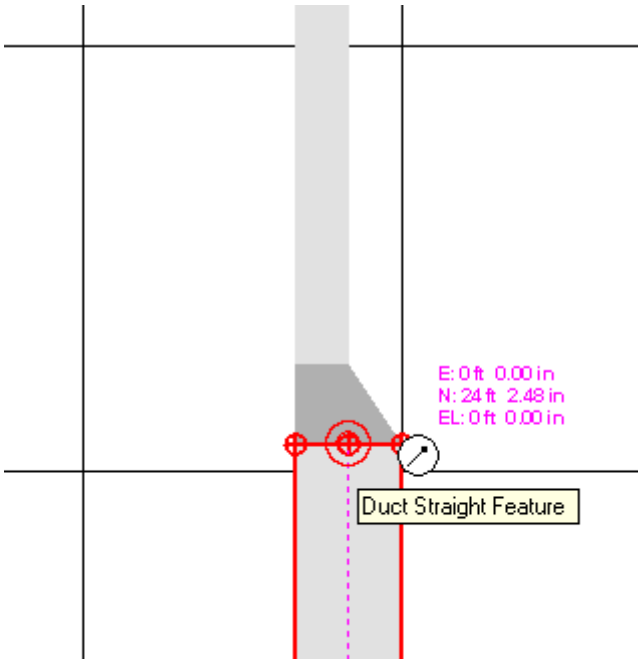
13. Continue routing this duct in the West direction by a 1 ft offset from the grid line as highlighted in the following figure. The only change you make at this point is to set the offset reference as centerline of the duct. Select **Centerline** under the **Measured from** option in the **Set Offset Reference** dialog box.



14. Click in the active view to place the duct part.



15. Place a new duct branch from the transition by relocating the target to the start point of the transition.

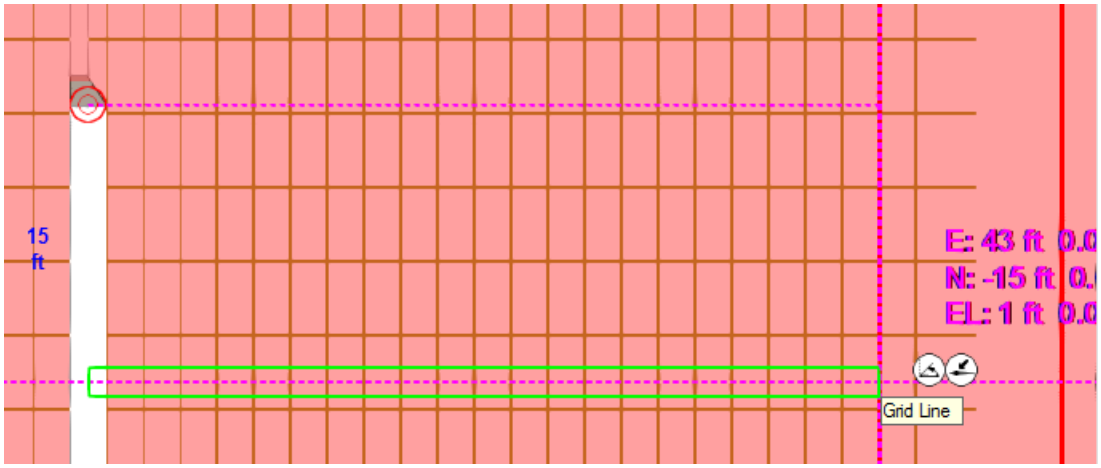


16. Use the **Route Duct** command to place a new duct branch at 15 ft from the start point of the transition by specifying the value for the north coordinate as **-15 ft**. The steps to place this branch are the same as the steps in *Route a Duct with Bends and Branches* (on page 19), except here you need to define the offset using **Set Offset Reference** from the **Offset** list. Specifications to create this branch are listed below:

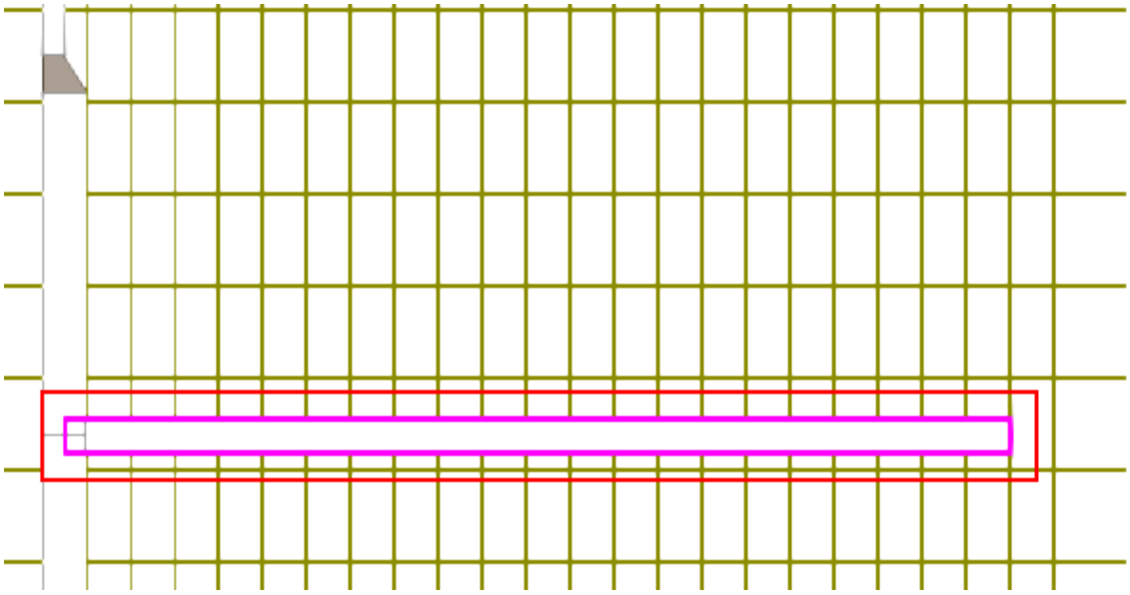
    - **Width: 1 ft 6 in**
    - **Depth: 1 ft 6 in**
    - **Measured from: Centerline**
    - **Offset: 2 ft**

    As before, because there is a gridline present where the offset from the other gridline would be, offset line is now shown.

Route the duct to the second gridline from the right as shown below.



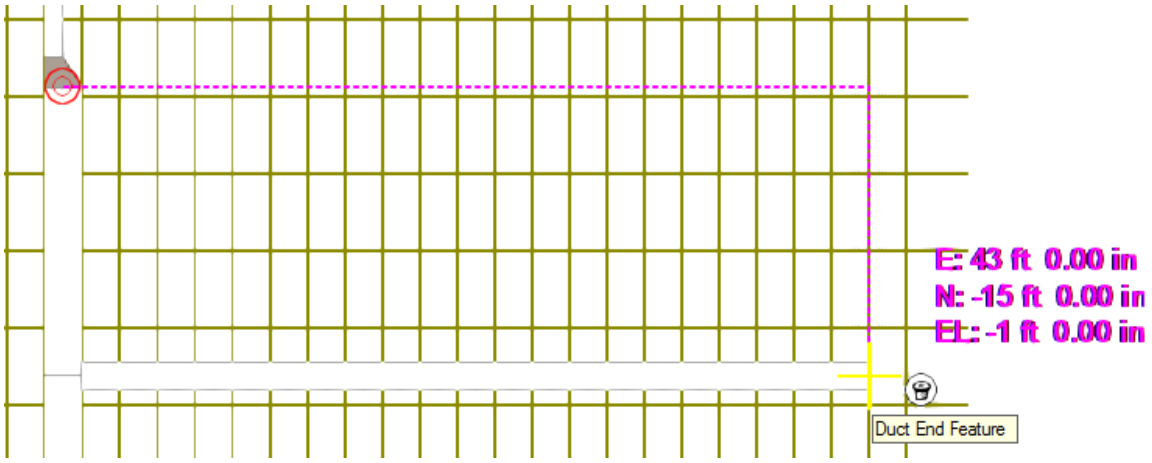
The duct should resemble the highlighted section in the following figure:



Place Reducing Elbows

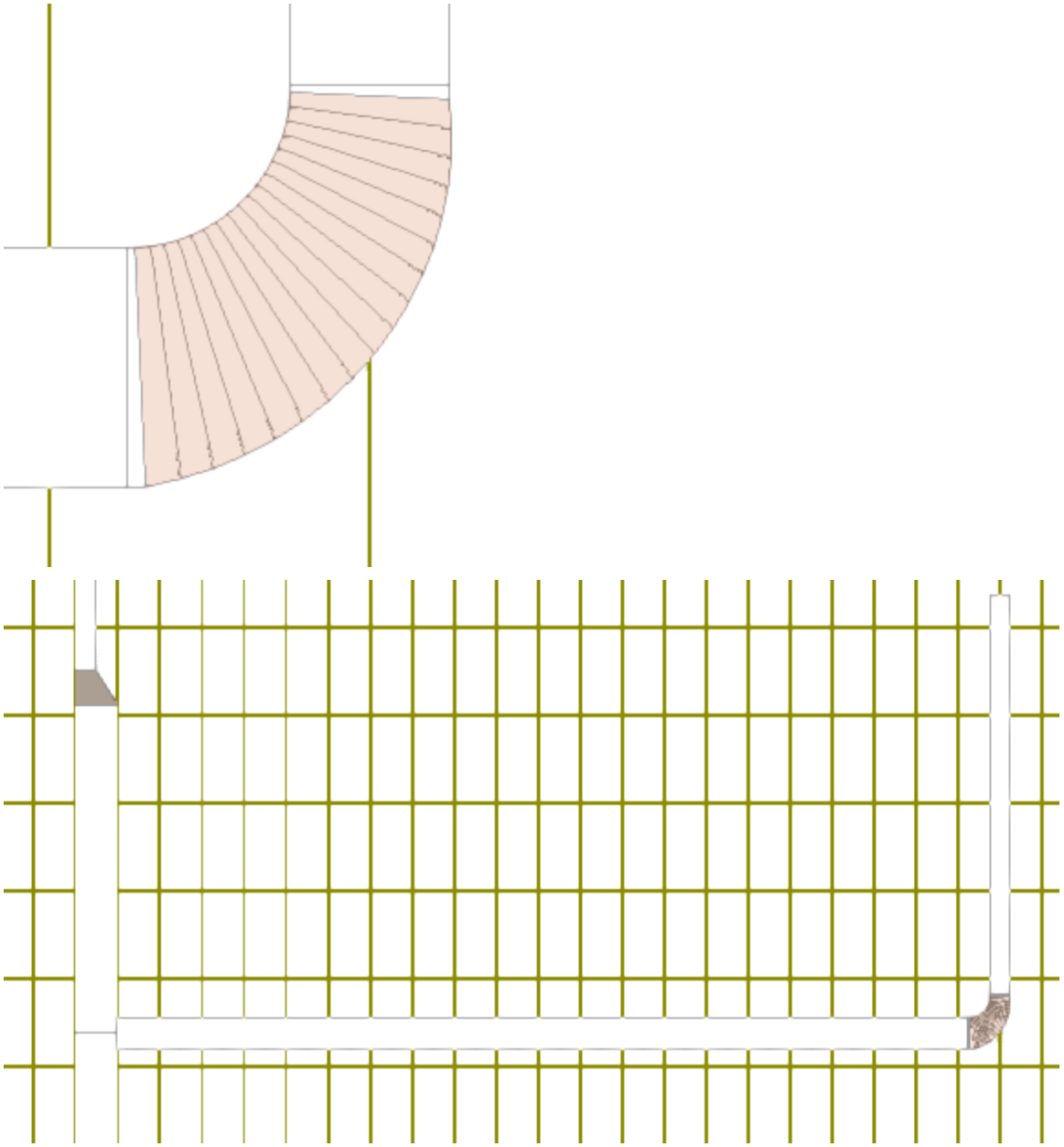
A reducing elbow is a transition feature. Place a transition feature of turn type by following the same procedure as *Insert Transition Features* (on page 16) with the following deviations:

1. Click **Insert Transition** on the vertical toolbar.
2. Select the end feature of the duct as the starting point.



3. Specify the following settings on the **Insert Transition** ribbon:
   - **Type: Turn**
   - **Width: 1 ft**
   - **Depth: 1 ft**
   - **Throat Radius: 1 ft**
   - **Angle: 90.00 deg**

4. Position the cursor at 5 ft N using pin point ribbon. Click in the active view to set the position, and click **Finish** to place the elbow.



For more information related to routing a duct, refer to the following topics in the **HVACUsersGuide.pdf** file:

- *Routing To or From Features: An Overview*
- *Adding Features to a Duct Run: An Overview*