# Electrical Equipment

## Placing Electrical Equipment


**Version 2014**

PART OF HEXAGON

INTERGRAPH®

## Copyright



## Restricted Rights Legend



## Terms of Use



## Warranties and Disclaimers



## Trademarks

SESSION 2

# Placing Electrical Equipment

## Objective

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

- Place electrical equipment in a model.

## Prerequisite Sessions

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

## Overview

Smart 3D enables you to place an occurrence of any electrical equipment from the catalog in a model. Use the **Place Equipment**  command on the vertical toolbar to place equipment.

## Catalog Equipment

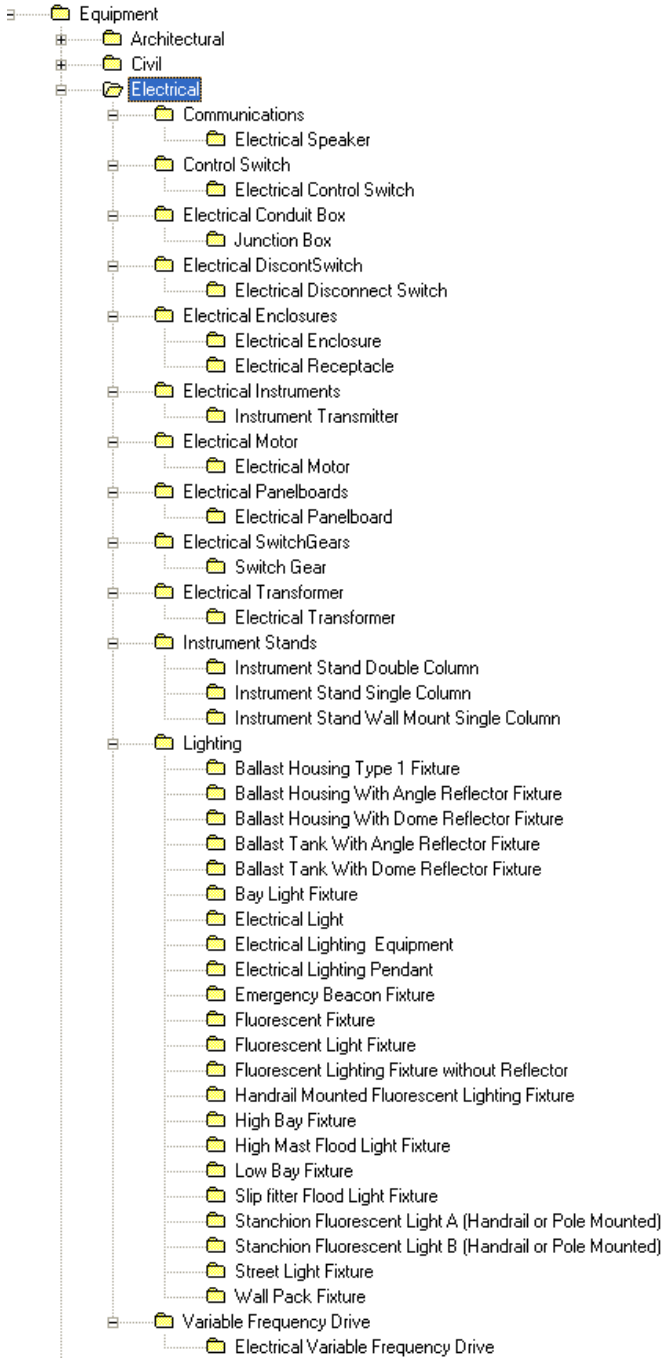
Electrical equipment is a custom assembly that consists of members such as conduit ports, cable ports, geometric shapes, equipment components, etc. You can select electrical equipment from the Smart 3D catalog and position them in 3D model. These equipment are referred as catalog equipment. Catalog equipment are typically driven by properties. The properties can either be fixed to specific values in the catalog, called Definition Properties or may be changed after placement in the model, called Occurrence Properties. However, the catalog administrator can setup these catalog equipment such that their properties, and dimensions cannot be modify by the user. For example, lighting fixtures are standardized based on the project specification set.

## Designed Equipment

Electrical equipment can also be designed directly in the model. In this case you select a type definition from the catalog for the electrical equipment. Type definition determines a set of properties associated with the electrical equipment. Graphical representation of this electrical equipment is built using primitive shapes defined in the catalog or can also be imported from SAT files or MicroStation files. These equipments are called Designed Equipment.

## Equipment Catalog Hierarchy

The figure below shows all the electrical equipment nodes of the equipment catalog hierarchy. All these nodes define all the electrical equipment that you can place with the **Place Equipment** command in the **Electrical** task. You need to switch to the **Equipment and Furnishings** task to model designed equipment.



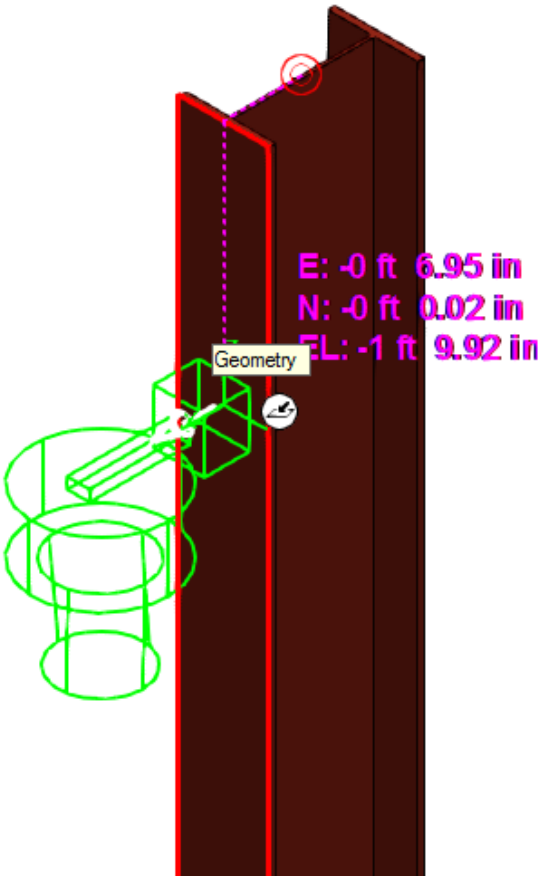
## Place Equipment

The **Place Equipment** ribbon has options to help you graphically position the equipment relative to any other object in the model. When you select equipment object from the catalog, you can identify the geometry of an object in the model so that the software automatically creates a positioning relationship to the geometry of the object that you select. This relationship is called a positioning relationship. If the geometry of an object is not identified by the user during placement then the equipment is placed in free space. Positioning relationships can be created manually by selecting geometry or point on the equipment and other design objects. The **Place Equipment** command has controls for manipulating positioning relationships.

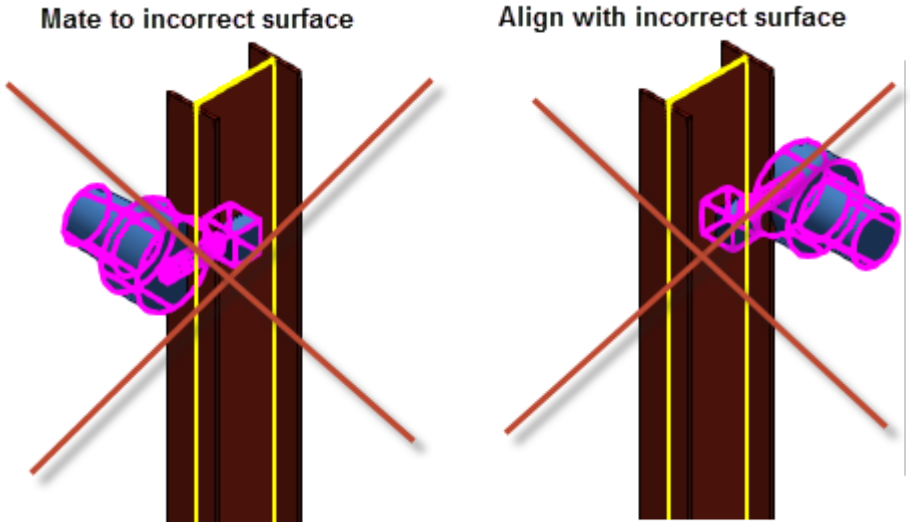

For example the Connect positioning relationship can be used to precisely locate equipment at certain distance from a steel column surface. The connect relationship forces the origin of the equipment, lighting fixture to be coincident with a point on structure column. Basically, the Connect positioning relationship is an implicit move command.

**NOTES**

- You can press the left and right arrow keys to rotate the equipment by 90-degree increments at any time during the placement of the equipment. Press the up arrow key to scroll through the three possible axes of rotation.

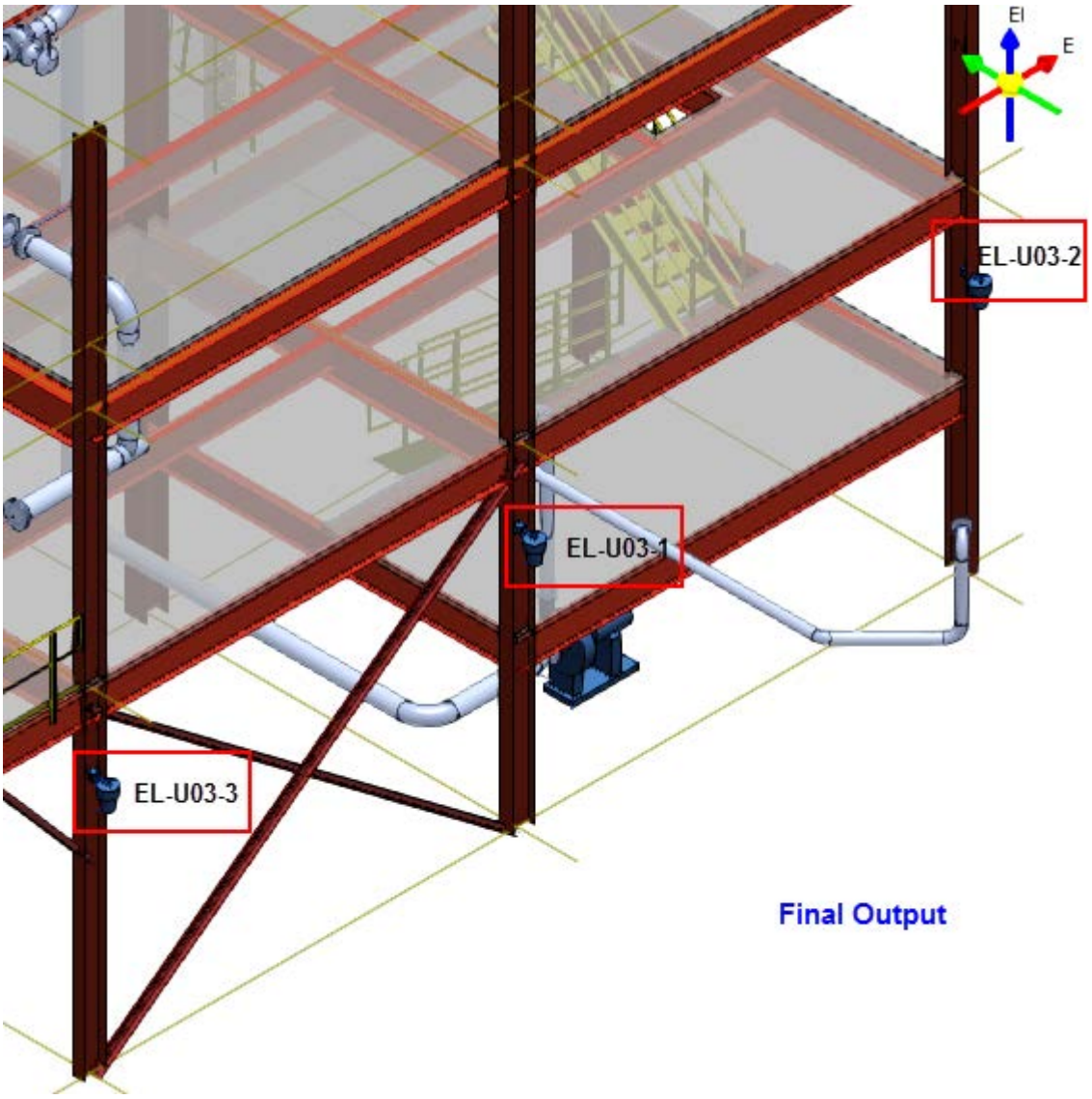


- If you are planning to create positioning relationships among the electrical equipment and design objects in the model, ensure you select the appropriate positioning relationship and the appropriate surface on the design object. You might end up positioning the electrical equipment, as shown below.



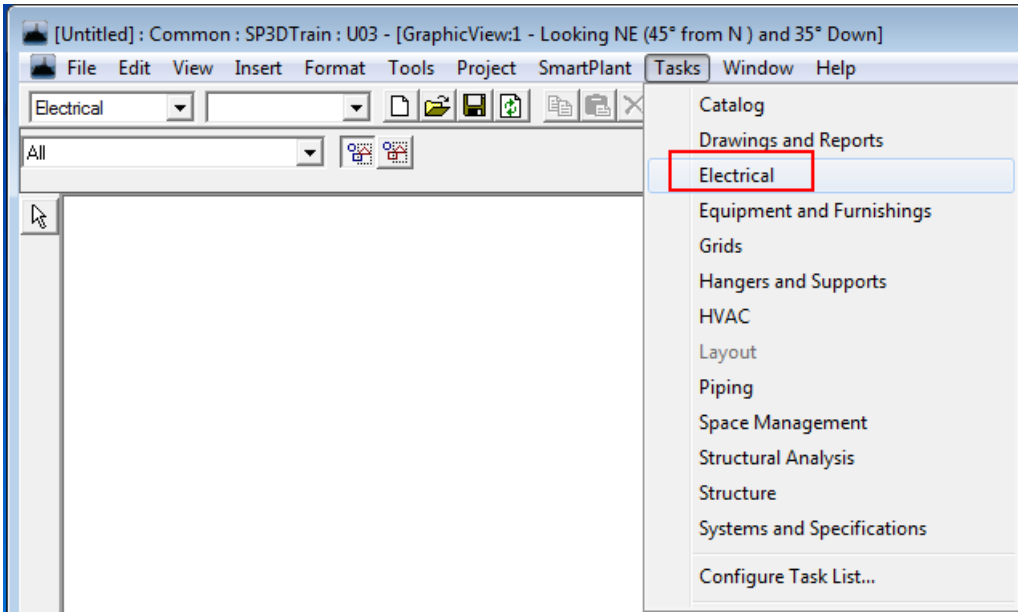
# Placing Electrical Equipment using Coordinates

Place three wall mounted electrical lights, **EL-U03-1**, **EL-U03-2**, and **EL-U03-3** from the Smart 3D catalog in **Area A2**, **Unit U03** by using **Place Equipment** on the vertical toolbar. Position and orient these catalog equipment in the model by using the **Position** and **Orientation** properties. The placed wall mounted electrical lights will look like the highlighted area below.

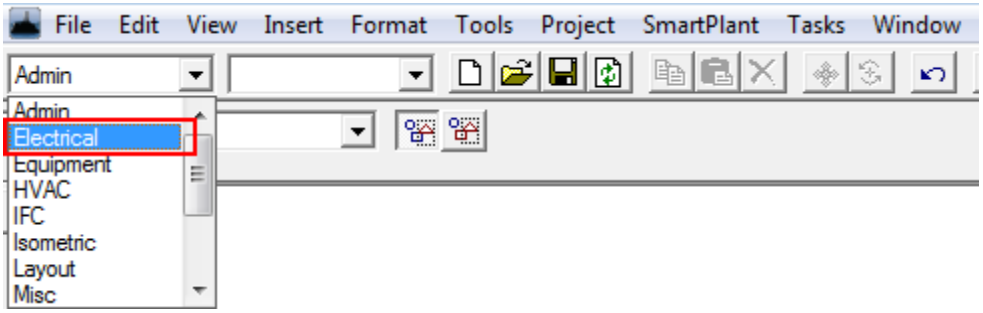



Define your workspace to show Unit U03 and coordinate system U03 CS.

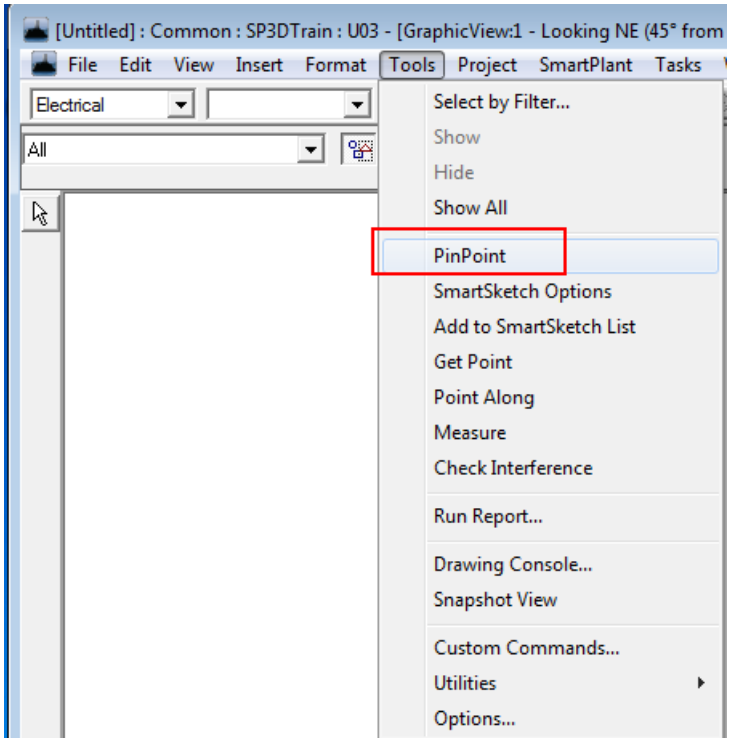
1. If you are not in the Electrical task, then select the **Tasks > Electrical** command.




2. In the **Active Permission Group** drop-down list, select the **Electrical** option.



3. Activate the **PinPoint** ribbon by using the **Tools > PinPoint** command.




4. Set the active coordinate system to **U03 CS** in the **Coordinate** system drop-down list on the **PinPoint** ribbon.

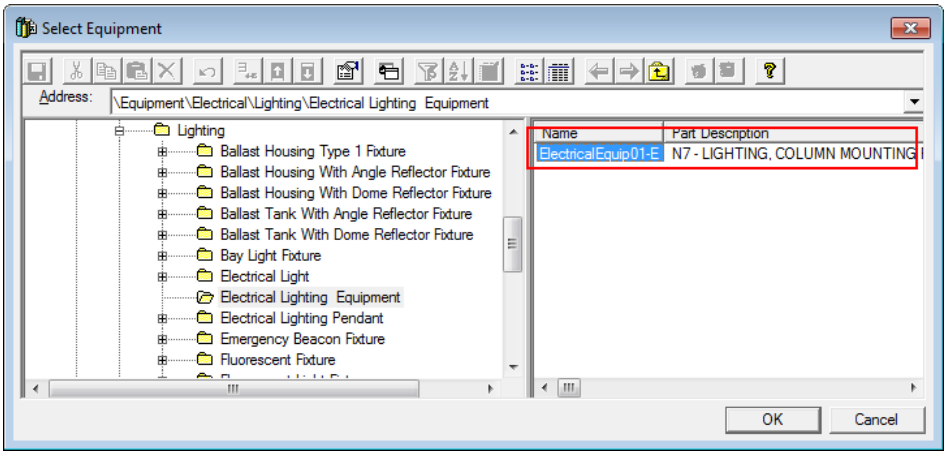

5. To move the target to the origin of the current coordinate system, select the **Set target to Origin** button on the **PinPoint** ribbon.

   NOTE Selecting the **Set target to Origin** option on the **PinPoint** ribbon changes the 0 target basis for the PinPoint command.

6. Click **Place Equipment** on the vertical toolbar.

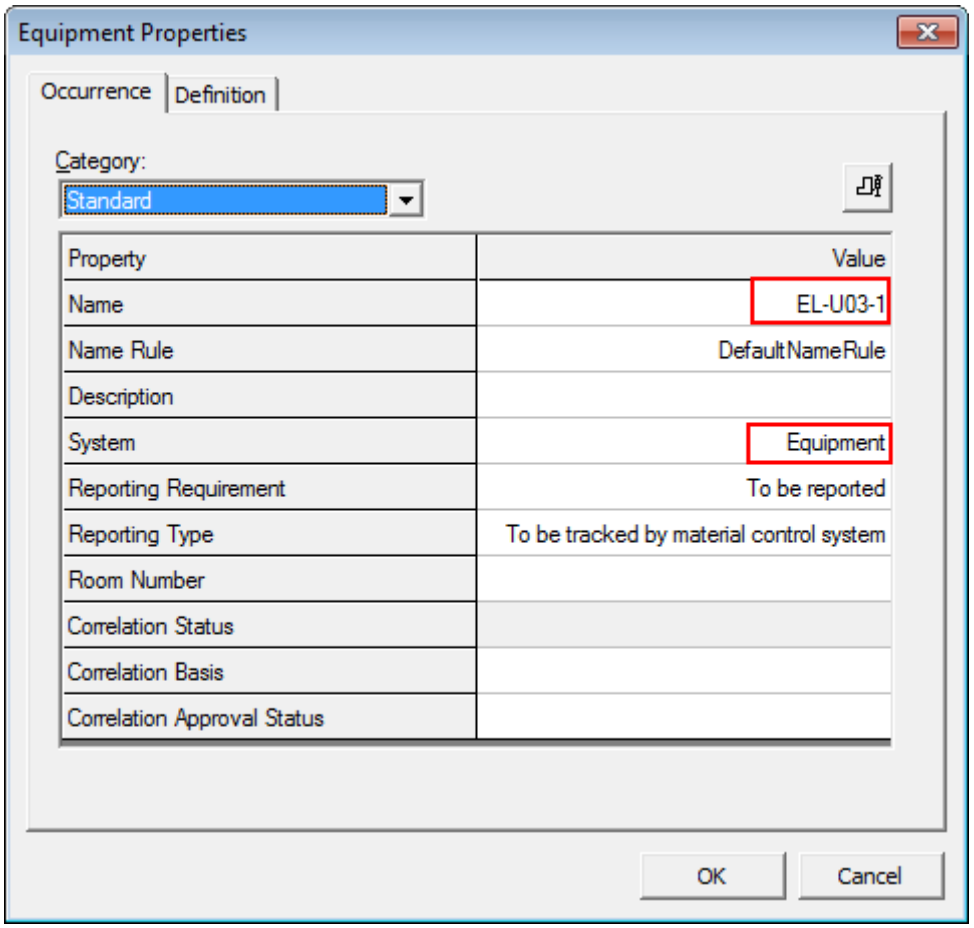
   *The **Select Equipment** dialog box displays.*

7. In the **Select Equipment** dialog box, expand the folder \Equipment\Electrical\Lighting\Electrical Lighting Equipment until you see the part ElectricalEquip01-E. Select **ElectricalEquip01-E**, and click **OK**.



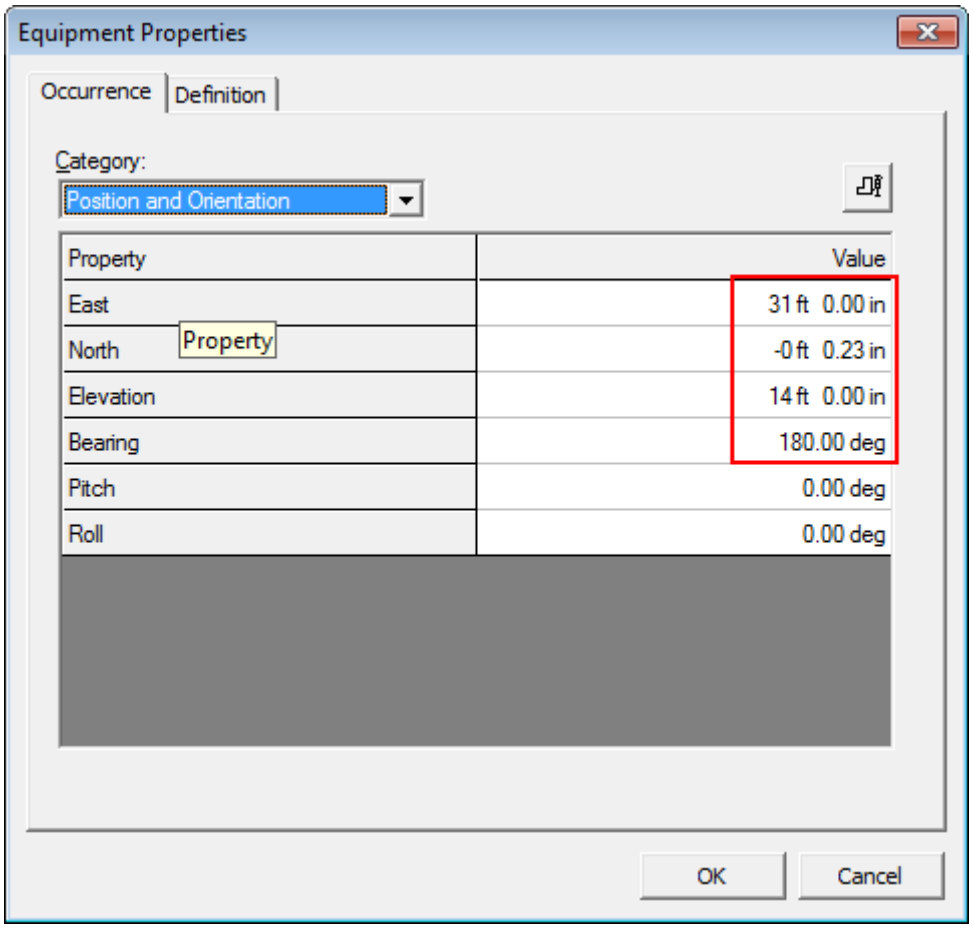

*The **Equipment Properties** dialog box appears.*

8. In the dialog box, change the name of the equipment by typing **EL-U03-1** in the **Name** field.
9. Change the system to Equipment by clicking the **More…** option and selecting **A2 > U03 > Equipment**.

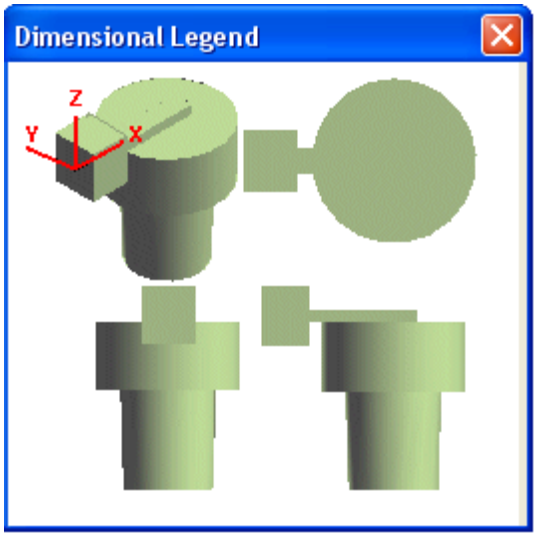



10. In the **Category** drop-down list on the **Occurrence** tab, switch to the **Position and Orientation** category and key in the following properties:

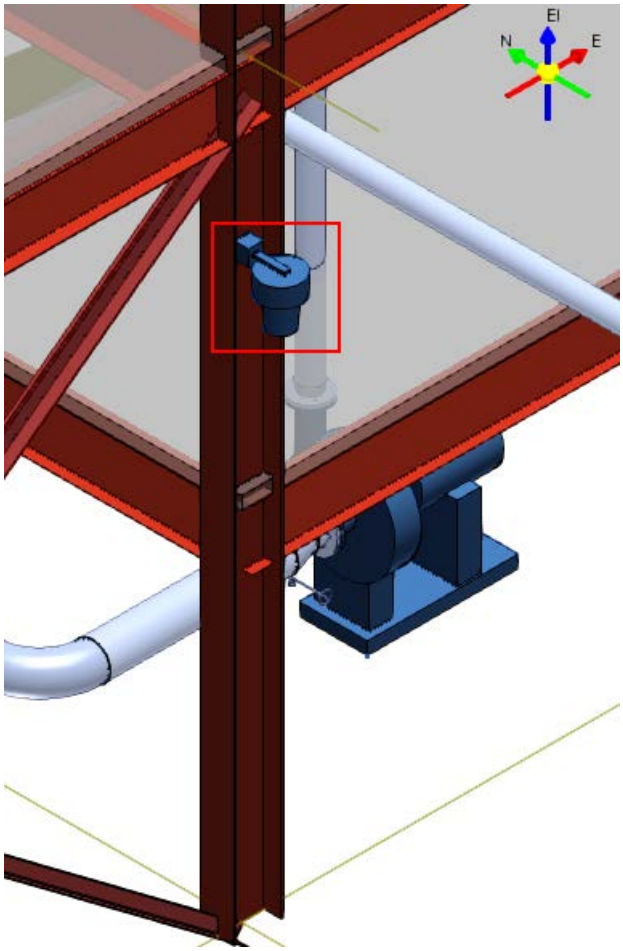
East: 31 ft
North: -0ft 0.23in
Elevation: 14 ft
Bearing: 180 deg



TIP You can click **Preview** to view an image of the selected part. To view the image, the image file must be assigned to the part in the reference data. You can also see the dimensional characteristics of the parametric symbol by clicking this button after you key in the specifications.



11. Click **OK** to place the electrical light EL-U03-1. The output should now resemble this.




Similarly, you can the place the other electrical lights EL-U03-2 and EL-U03-3 by using the following specifications:

EL-U03-2:

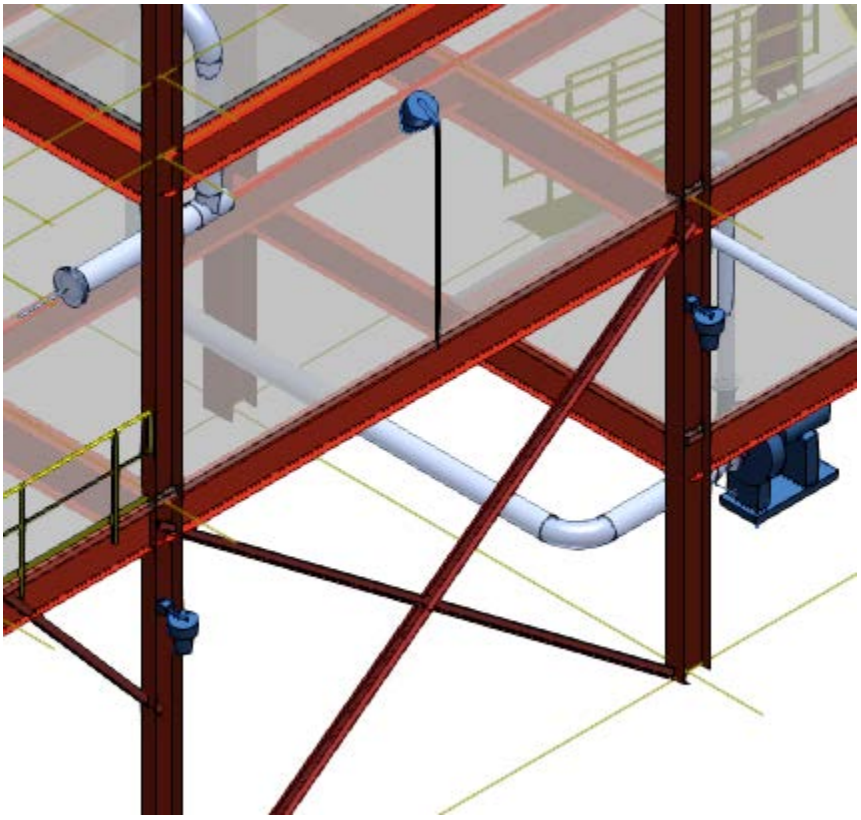
- Position and Orientation:
  - East: 55 ft
  - North: -0 ft 0.23 in
  - Elevation: 14 ft
  - Bearing: 180 deg

EL-U03-3:

- Position and Orientation:
  - East: 8 ft
  - North: -0 ft 0.23 in
  - Elevation: 14 ft
  - Bearing: 180 deg

# Placing Electrical Equipment by Positioning Relationships

Place a stanchion mounting electrical light, ESML-U03-1 from the Smart 3D catalog in Area A2, Unit U03 by using Place Equipment on the vertical toolbar. Position and orient the stanchion mounting electrical light in the model by using Mate Positioning Relationship and the SmartSketch service. The placed stanchion mounting electrical light will look like this.



Before beginning the procedure for placing electrical equipment by positioning relationships:

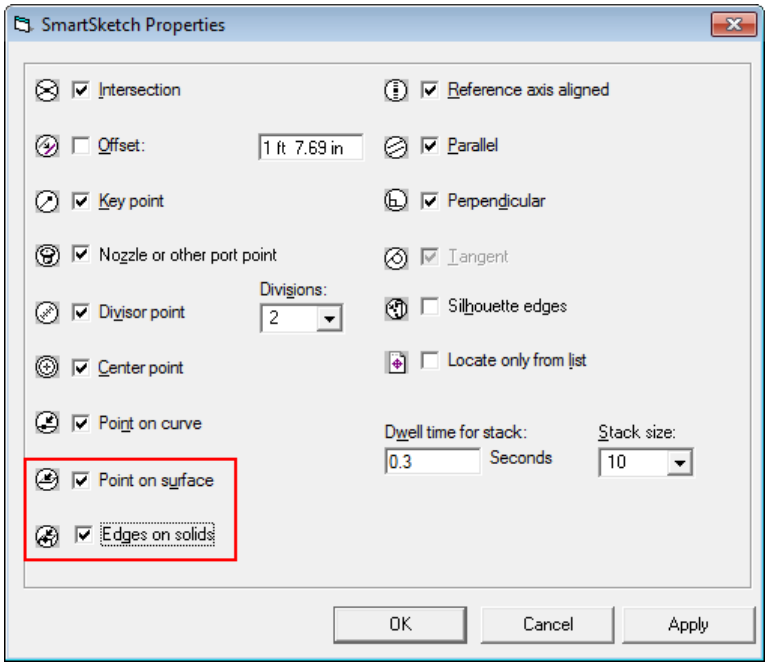
1. Define your workspace to include all objects located in **Unit U03** system and the coordinate system **U03 CS**. Also select the **Tasks > Electrical** command if you are not in the **Electrical** environment. Familiarize with the objects in the **Unit U03** system by using the **Workspace Explorer**.
2. Make sure the **Active Permission Group** is set to **Electrical**.
3. Activate the **PinPoint** command by clicking the **PinPoint** button on the **Common** toolbar and set the active coordinate system to **U03 CS** in the **Coordinate** system drop-down list.


4. To move the target to the origin of the current coordinate system, select the **Set target to Origin** button on the **PinPoint** ribbon.

5. Select the **Add to SmartSketch List** button on the **Common** toolbar. This ribbon has **SmartSketch** options that help you locate precision points of design interest on geometry in the model.

   *The Add to SmartSketch List ribbon appears.*


6. Select **SmartSketch** option icon on **Add to SmartSketch List** ribbon to display the **SmartSketch Properties** dialog box.

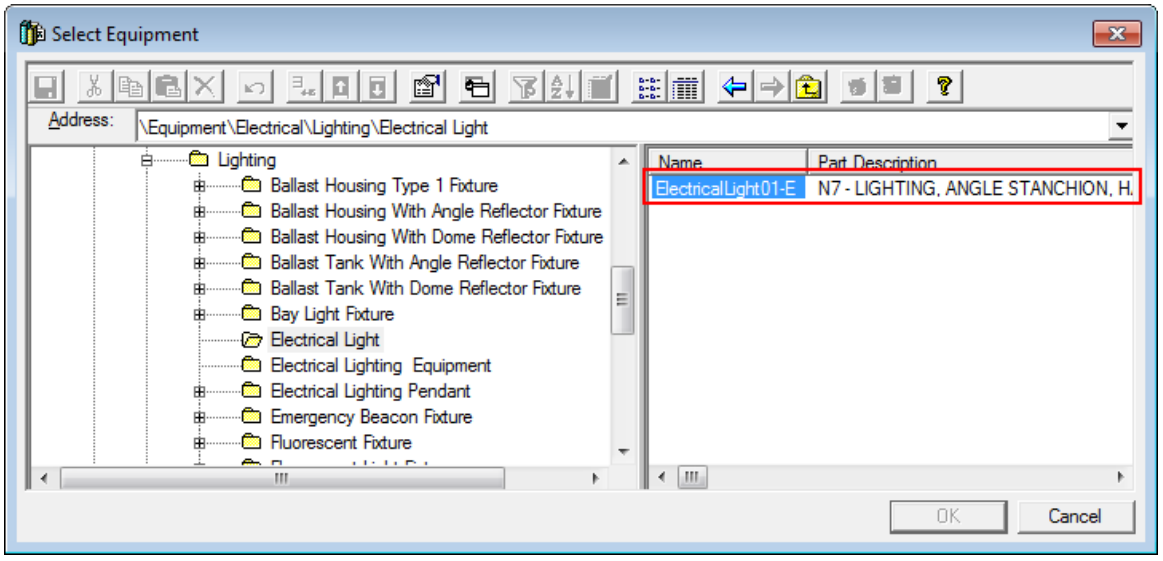



7. Check the **Edges on solids** and **Point on surface** options in the **SmartSketch Properties** dialog box.
8. Click **OK** so that you can locate edges on a solid object such as structure members, walls, and slabs.
9. Click **Finish** to close the **Add to SmartSketch List** ribbon.
10. Click the **Place Equipment** button on the vertical toolbar.

    *The **Select Equipment** dialog box appears.*

11. In the **Select Equipment** dialog box, expand the folder \ Equipment \ Electrical \ Lighting \ Electrical Lighting until you see the part Electrical01-E.

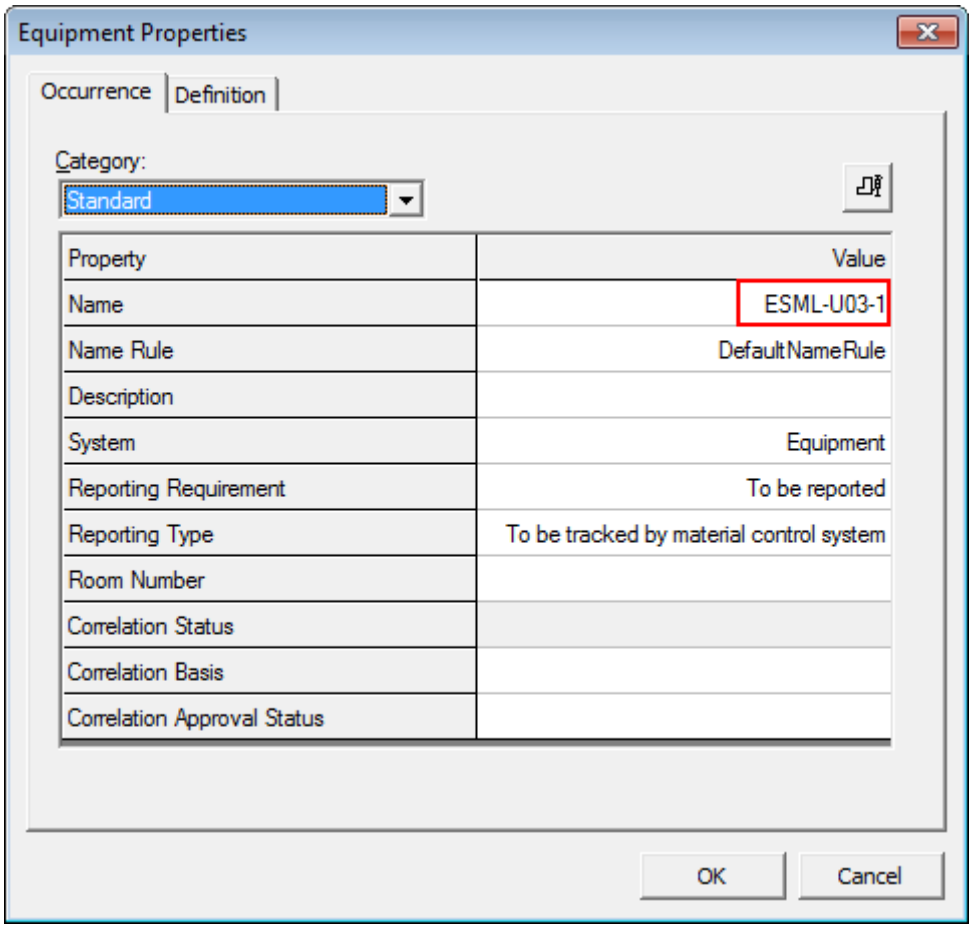
12. Select **Electrical01-E** and click **OK**.



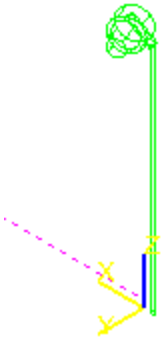

*The Equipment Properties dialog box appears.*

13. In the dialog box, change the name of the equipment by typing ESML-U03-1 in the **Name** field.

14. Change the system to Equipment by clicking the **More…** option and selecting **A2 > U03 > Equipment**.

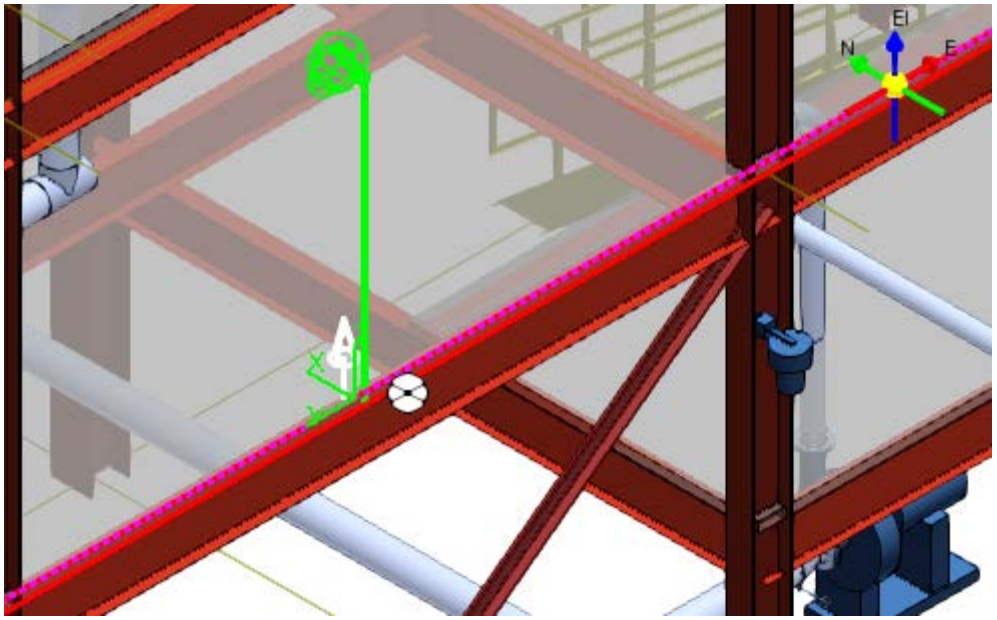



15. Click **OK** to close the **Equipment Properties** dialog box.
16. By default the relationship type is **Mate**, however, the ribbon will show last relationship type used in that session.
17. If the relationship type is not **Mate**, click the drop down list to select **Mate**.
18. Use the arrow key to rotate the equipment so that the light is facing North.

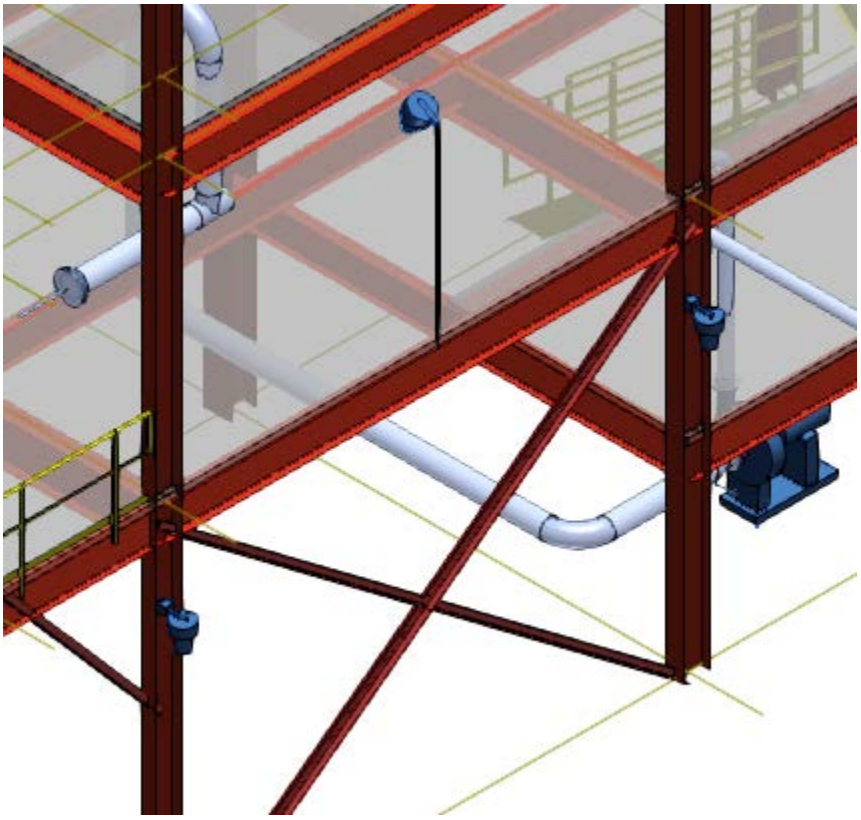


NOTE Any equipment can be rotated dynamically during placement. When in the dynamic mode, select the edge of the active window and press the left or the right arrow keys to rotate it towards a desired direction. You can also switch the axis of rotation by pressing the UP or the DOWN arrow keys.

19. Locate the edge and the top surface of the slab so that the software finds the intersection points between the two planes.
20. On the **PinPoint** ribbon, key in 19 ft 6 in in the E drop-down list to define the placement point, as shown.

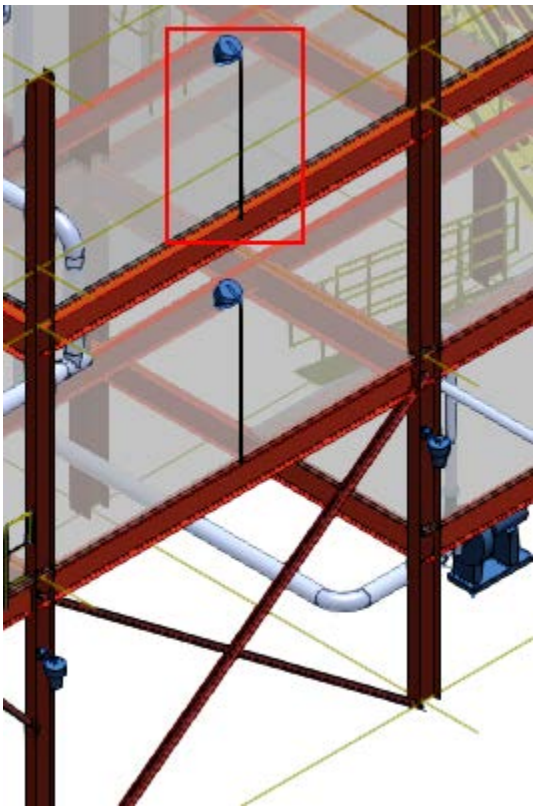


21. Click in the graphic view to place the stanchion mounting electrical light, as shown.



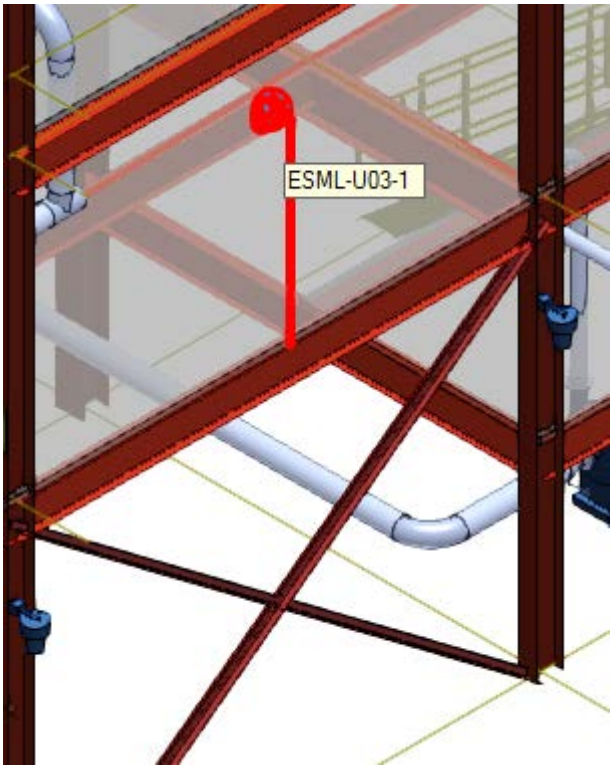
# Copying and Pasting Catalog Equipment

Copy the Stanchion Mounting Electrical Light from Unit **U03** of your workspace and paste it on top of the steel located on the second floor of the building. The view of the Stanchion Mounting Electrical Light after pasting it should resemble this.



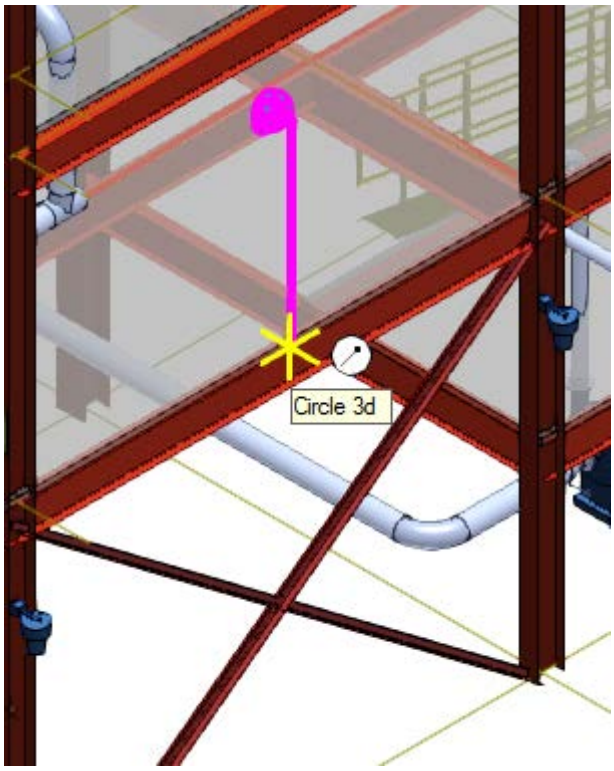
1. Select **Equipment** from the **Locate Filter** drop-down list to select only the equipment in the graphic view that you need to copy and paste.

2. Select **ESML-U03-1** from the graphic view that you need to copy, as shown.




1. Click **Copy** on the Common toolbar.

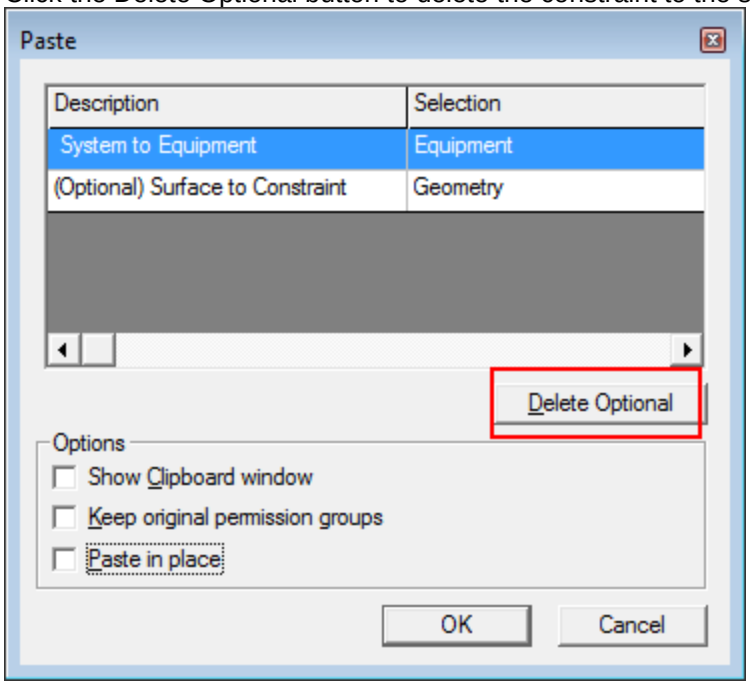
2. Select the end of **Stanchion Mounting Electrical Light** from the graphic view to define the position from where to copy the **Stanchion Mounting Electrical Light**.



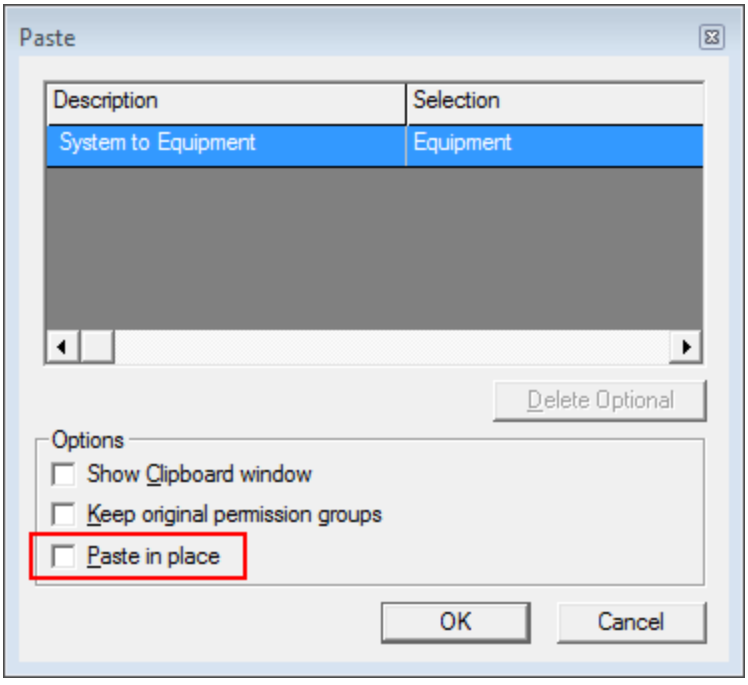

3. Click Paste on the Common toolbar.

*The **Paste** dialog box appears.*

4. Click the Delete Optional button to delete the constraint to the surface



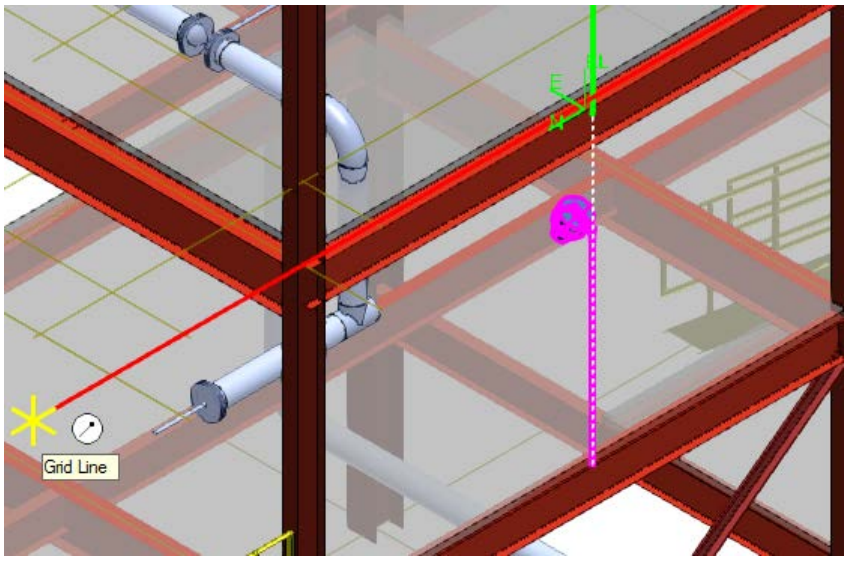

5. Keep the default parent system for the new objects to be pasted on the model and clear the Paste in place check box, as shown. Click **OK** in the dialog box.



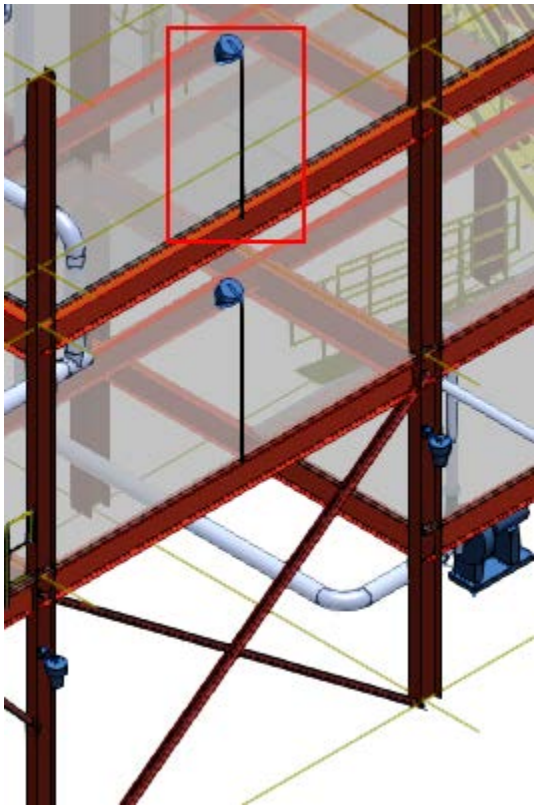

NOTES

- The **Paste** dialog box shows relationships that can be established between the objects you are pasting and objects in the model. These are the relationships that existed between the objects you copied and design objects that were not in your copy set. There are two categories of such relationships, those required by the objects being pasted and those that are optional. The system parent is an example of a required relationship. All design objects must have a system parent.
- If you are pasting the objects into the same model they were copied from, the **Paste** dialog box will offer the original objects as the defaults for the relationships that will be created on the **Paste** dialog box. In this example, Smart 3D keeps the original parent system of the copied objects. You can keep the default objects or select the row and identify a different object. When you select the row, the original parent object is highlighted so you can graphically see what type of input is needed in context of the objects you copied. If you decide to place the copied objects on different parent system in the system hierarchy, you must select it in the Workspace Explorer under the system hierarchy.
- The **Keep original permission groups** option will assign objects created by the **Paste** command to the same permission group the original object had (mapping by name). However, if the person doing the paste does not have write access to that permission group, then the object will be assigned to the active permission group. If the **Keep in original permission groups** option is not selected, all newly created objects will be assigned to the active permission group.
- The **Paste in place** option will paste the copied objects in exactly the same position as the originals. This option is most often used when pasting objects in a different model from the original.

6. Position the cursor until you get the **Up SmartSketch** glyph which indicates you are aligned to the major Z axis. Click the middle mouse button to constraint the cursor movement along this axis. Then position the cursor to identify the gridline to get the correct elevation coordinate, as shown.



7. Click in the graphic view to place the copied Stanchion Mounting Electrical Light.



For more information related to manipulating equipment(s) refer to Copy/Paste, Delete and Edit topics in the user guide.

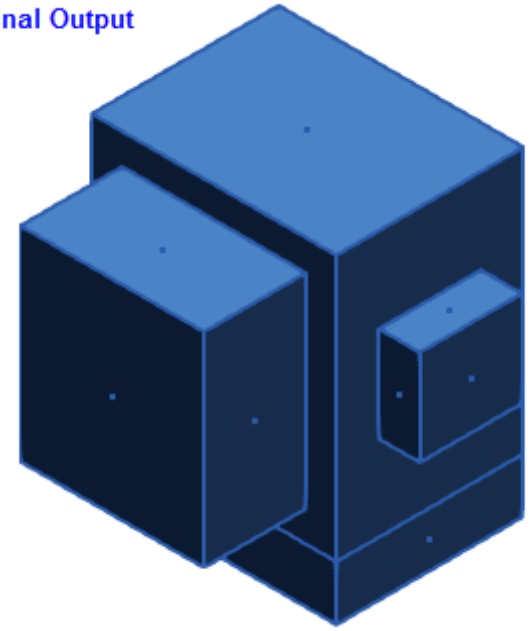
# Designing a Medium Voltage Transformer

Design a Medium Voltage Transformer, MVT-01 under the A2 > U03 > Equipment by using the following specifications:

| **Type** | **Specifications** | **Values** |
|---|---|---|
| Design Equipment | Name | MVT-01 |
| | Equipment type | Electrical Transformer |
| | Equipment Classification 0 | Electrical equipment |
| | Equipment Classification 1 | Electrical equipment |
| | Equipment Classification 2 | Transformer component |

Place the Medium Voltage Transformer in Unit U03, as shown below.

Final Output

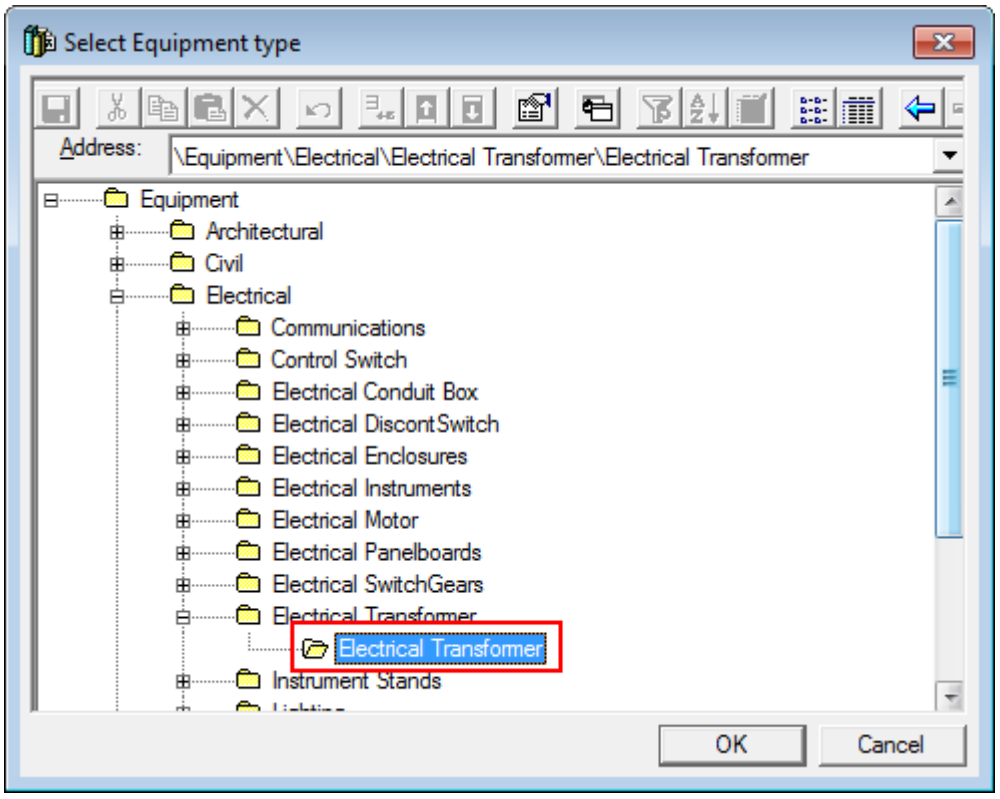


Before designing the Electrical equipment, define the workspace to show Unit **U03**. Activate the **Equipment and Furnishings** task by clicking **Tasks > Equipment and Furnishings** on the Common toolbar. Set the **Active Permissions Group** to **Electrical** and activate **Pinpoint** under the **Tools** menu.

1. Select the **Coordinate system** as **U03 CS**.
2. Click **Set Target to Origin** on the **Pinpoint** ribbon.
3. Click **Place Designed Equipment** on the vertical toolbar.

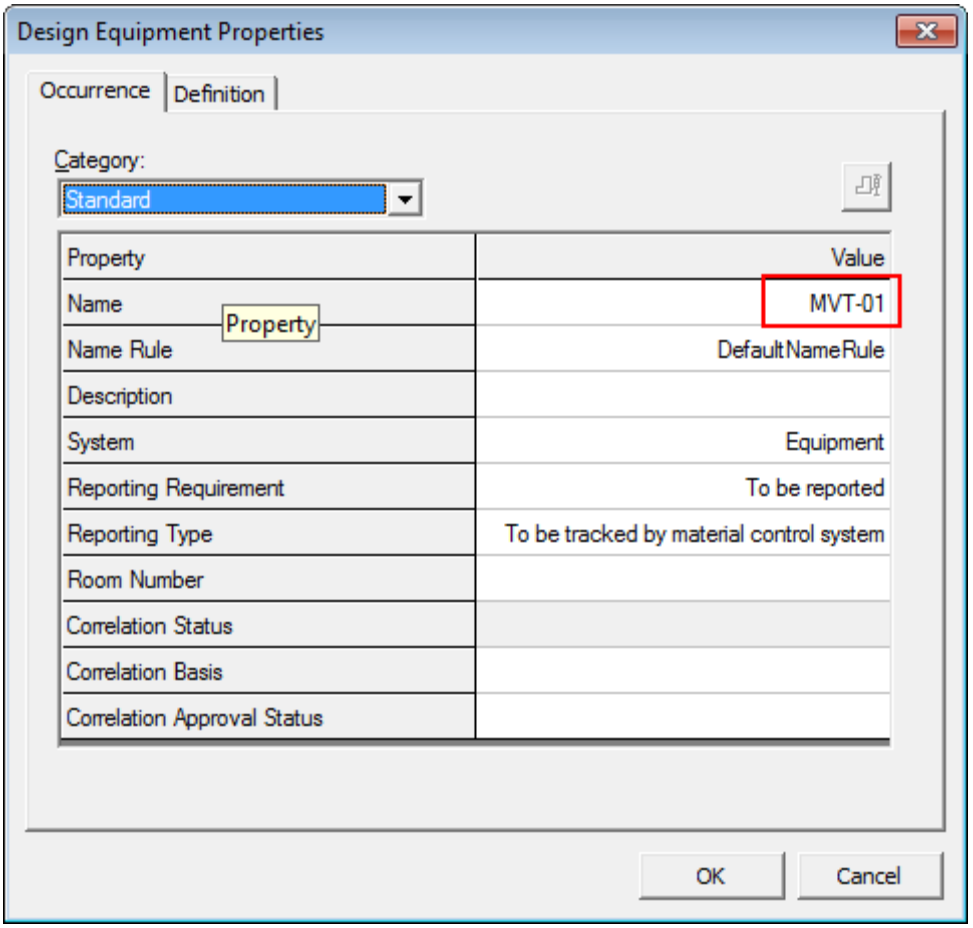
   *The Select Equipment Type dialog box opens.*

4. In the dialog box, expand **Equipment > Electrical > Electrical Transformer > Electrical Transformer** to select the required design equipment.




5. Click **OK**.

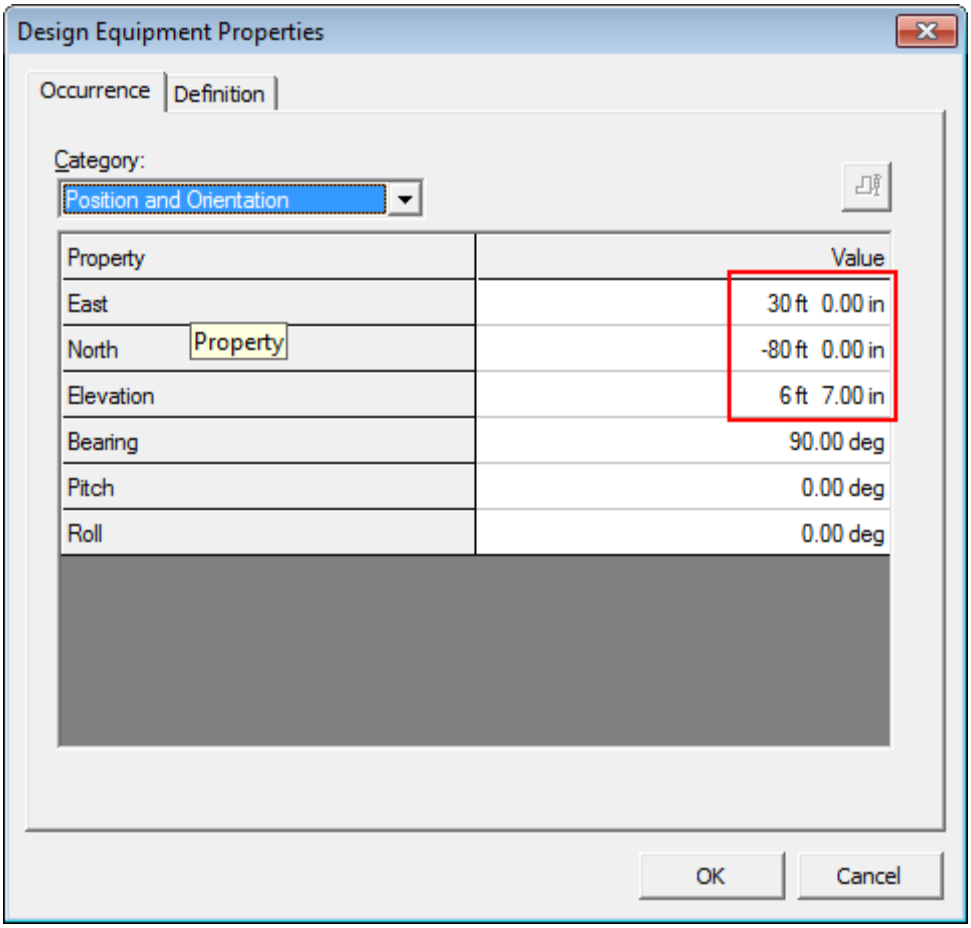
*The Design Equipment Properties dialog box opens.*




6. Key in MVT-01 in the **Name** field to name this equipment.
7. Click the drop-down list in the **System** field and select the **More** option.

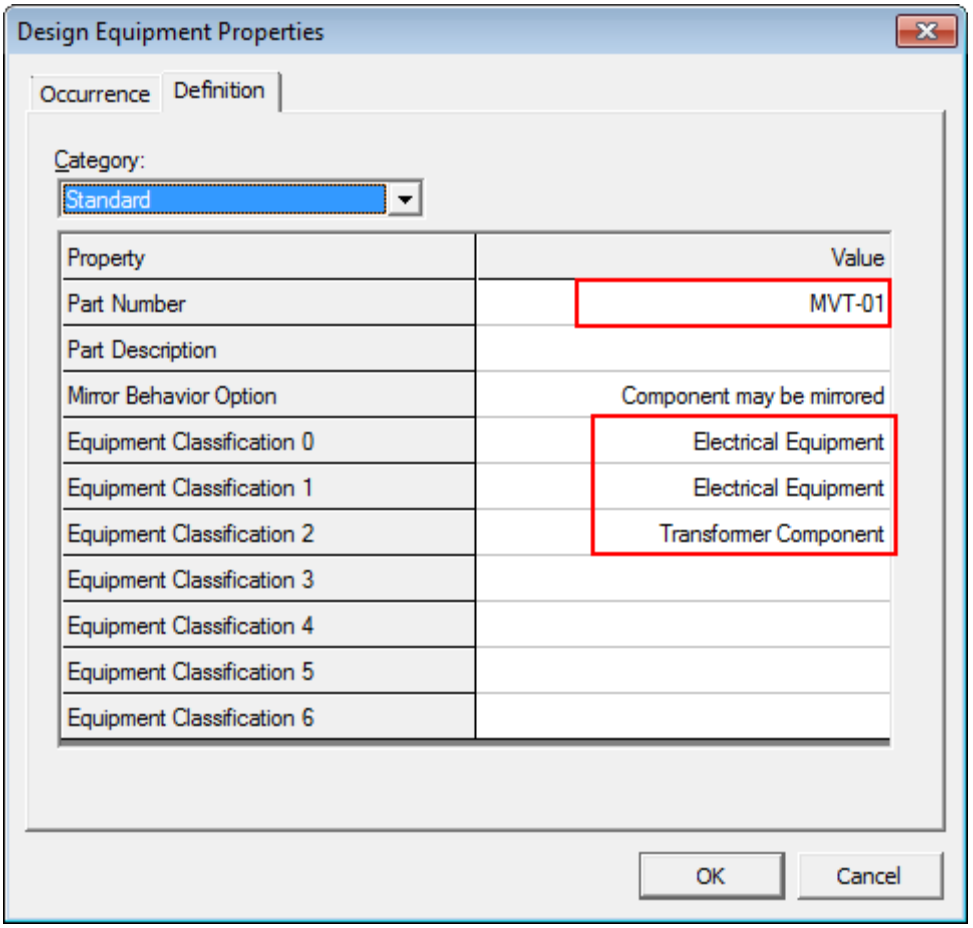
   *The Select System dialog box opens.*
8. In the dialog box, expand **A2 > U03 > Equipment** to select the required system and click **OK**.
9. Select the **Position and Orientation** option in the category drop-down list under the **Occurrence** tab to specify the position of the equipment.

10. Key in the values 30 ft for E, -80 ft for N and 6 ft 7in for El.



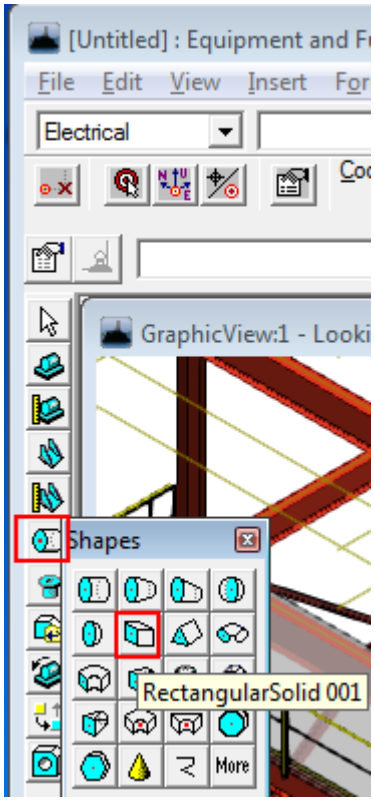

11. Switch to the Definition tab and set the following parameters to the values listed as below:
    - Part Number: MVT-01.
    - Equipment Classification 0: Electrical Equipment
    - Equipment Classification 1: Electrical Equipment

- Equipment Classification 2: Transformer Component



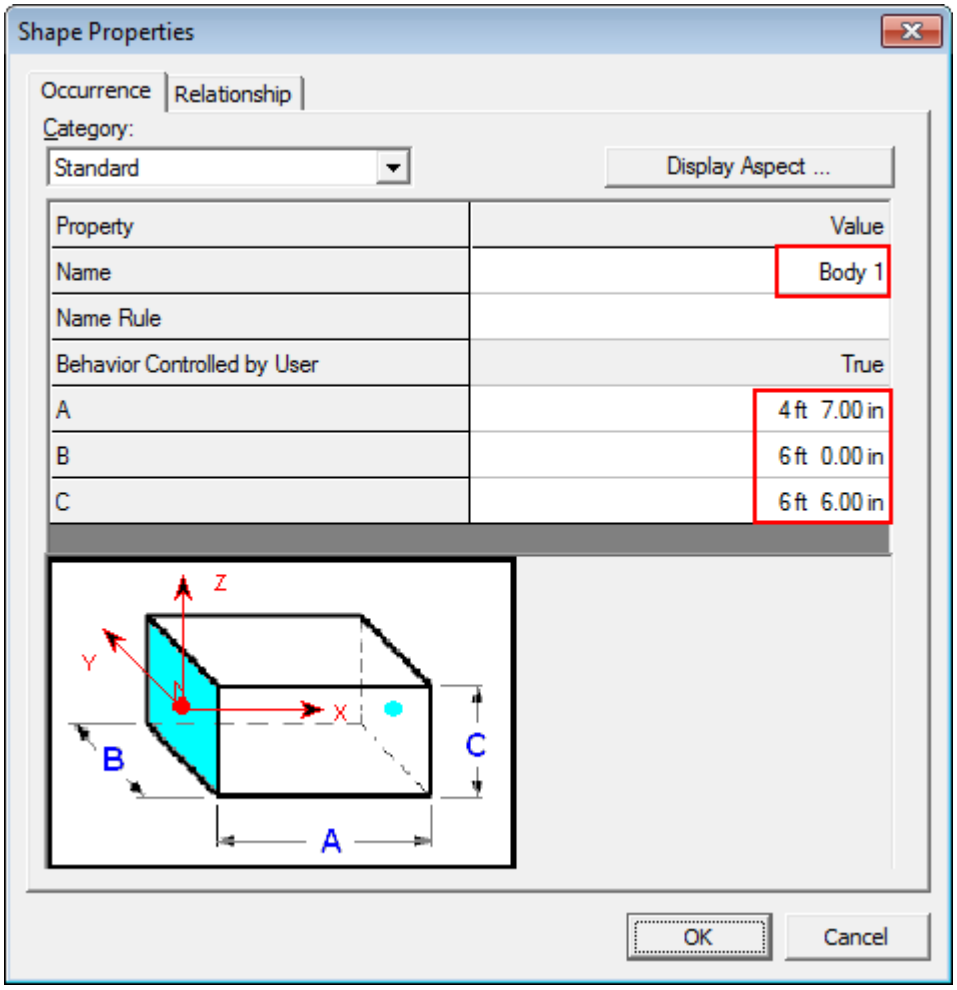

12. Click **OK**.

13. Click **Place Shape** and select the RectangularSolid 001 to specify the shape of the design equipment.



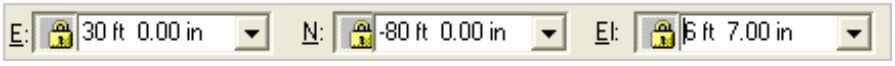

*The Shape Properties dialog box opens.*

14. Change the **Name** of the shape to Body-1 and key in the values: 4 ft 7 in for A, 6 ft for B and 6 ft 6 in for C.

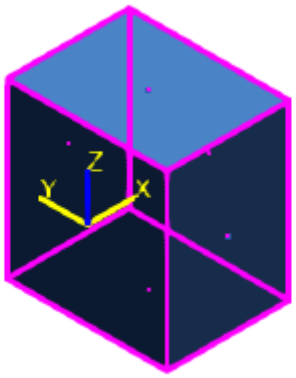



15. Click **OK** to close the **Shape Properties** dialog box.

16. Key in **30 ft** for E, **-80 ft** for N and **6 ft 7 in** for El on the pinpoint ribbon and click in the graphic view to place the shape.



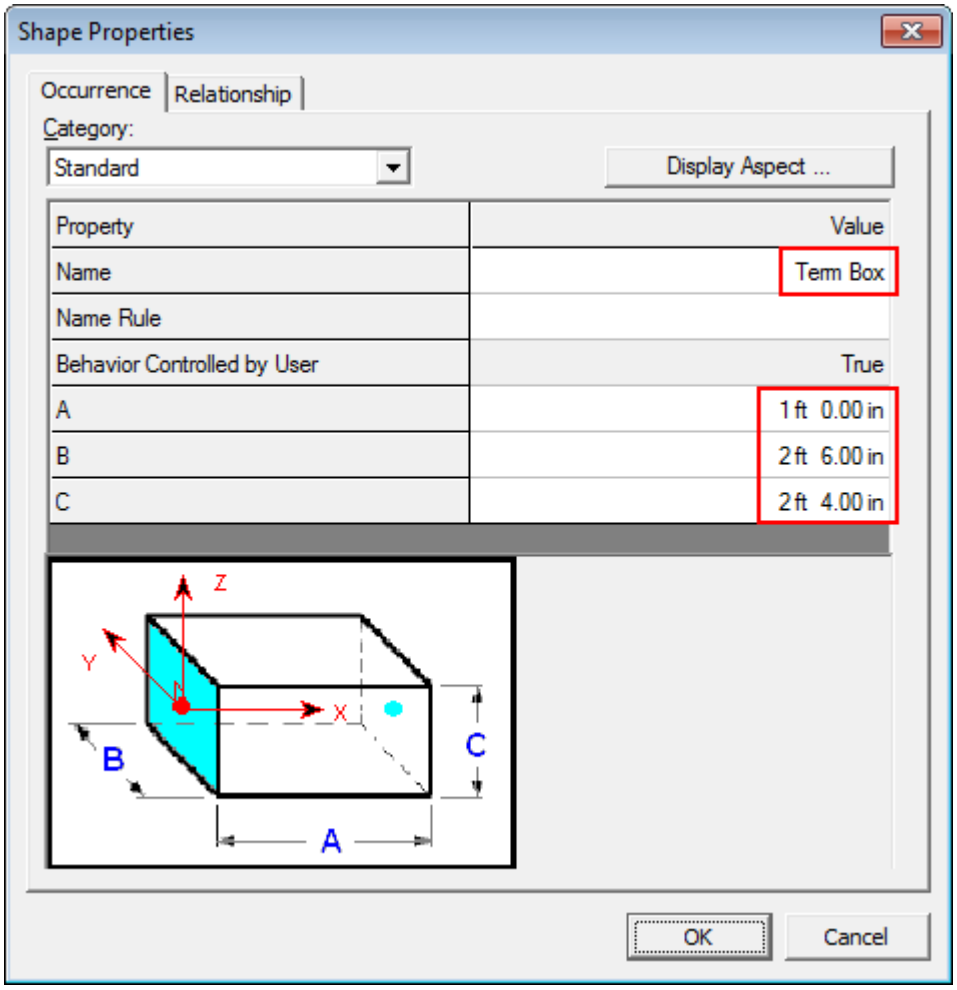
*The designed equipment is shown.*




17. Click **Place Shape** and select the RectangularSolid 001 on the shape palette.

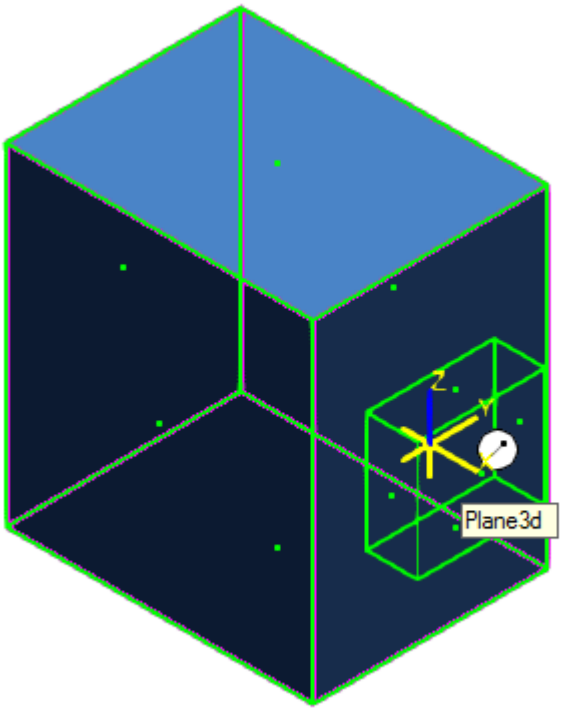
    *The Shape Properties dialog box opens.*

18. Change the **Name** of the shape to Term Box and key in the values: 1 ft for A, 2 ft 6 in for B and 2 ft 4 in for C.



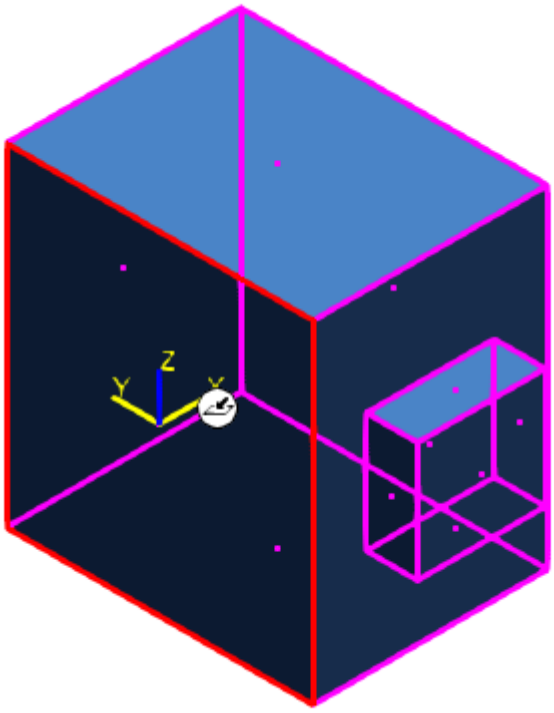

19. Click **OK** to close the Shape Properties dialog box.
20. Select **Connect** in the positioning relationships drop-down list on the shape ribbon.

21. Use the arrow key to rotate the shape so that the shape x axis is facing South. Move the cursor and locate the center point on the south face of the transformer body.




22. Click in the graphic view to place the shape in the model.

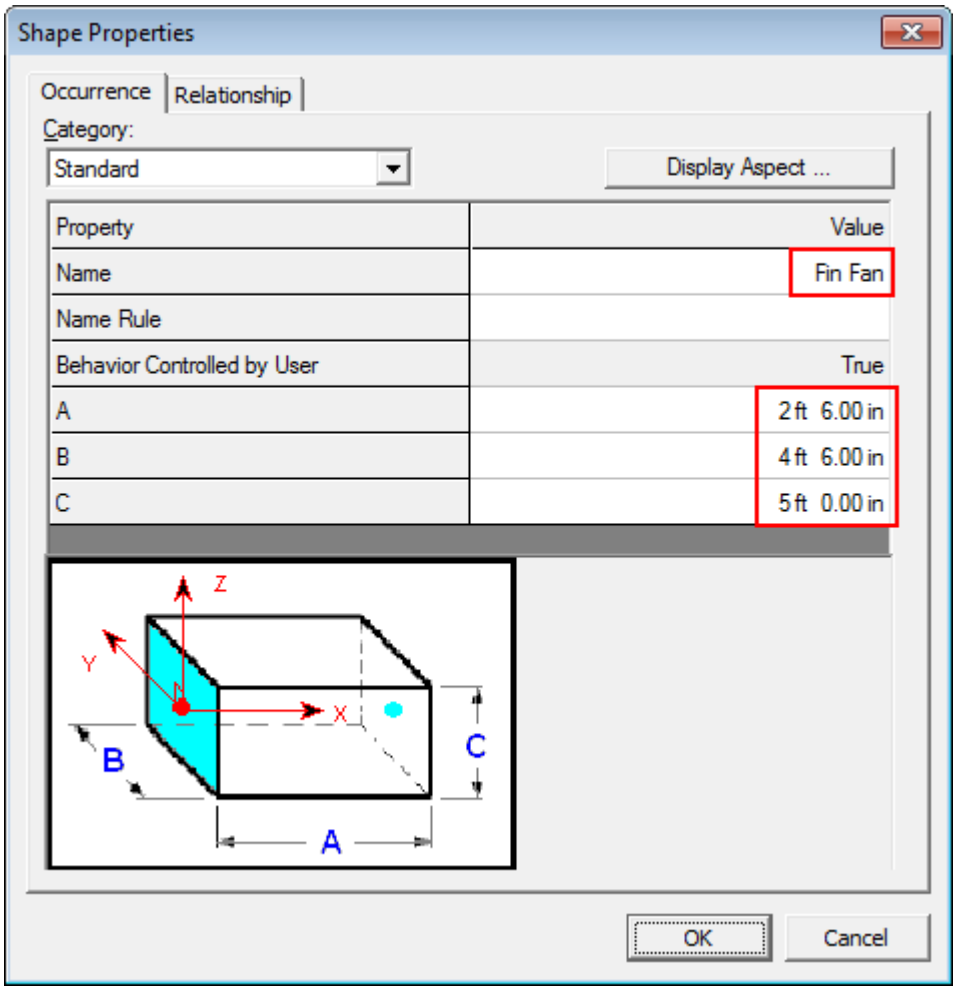
*The designed equipment is shown.*



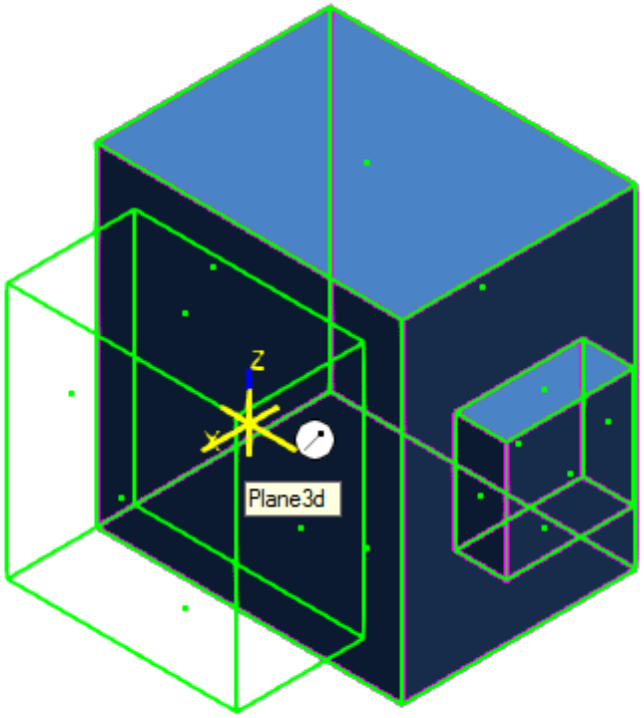

23. Click Place Shape and select the SolidRectangular 001 on the shape palette.

    *The Shape Properties dialog box opens.*

24. Change the Name of the shape to Fin Fan and key in the values: 2 ft 6 in for A, 4 ft 6 in for B and 5 ft for C.

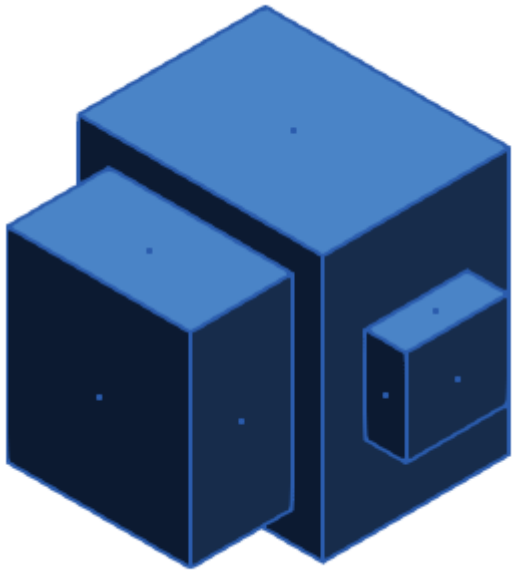


25. Use the arrow key to rotate the shape so that the shape x axis is facing West. Move the cursor and locate the center point on the west face of the transformer body.




26. Click in the graphic view to place the shape in the model.

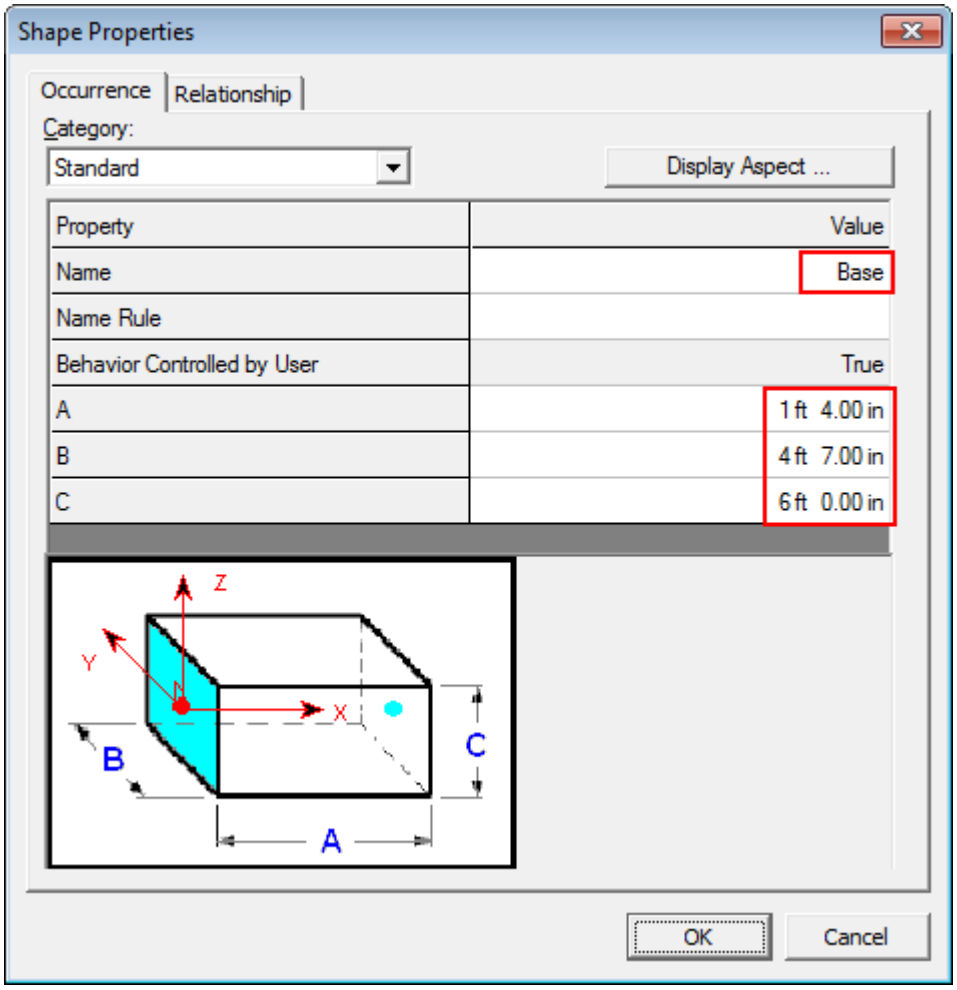
*The designed equipment is shown.*



27. Click the Place Shape button and select the RectangularSolid 001 on the shape palette.

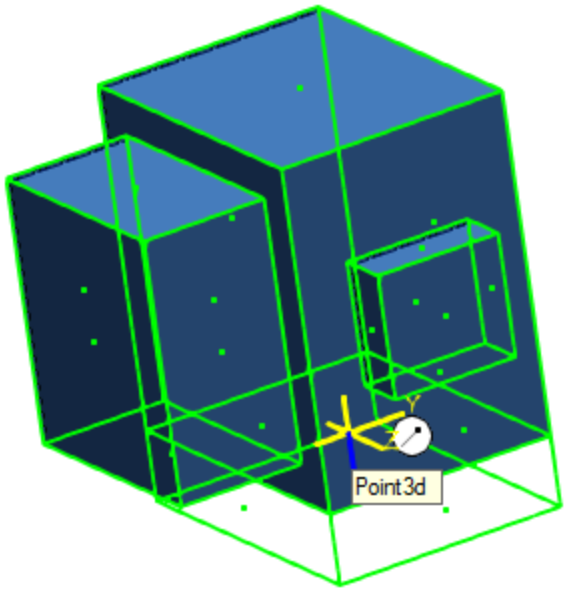
    *The Shape Properties dialog box opens.*

28. Change the Name of the shape to Base and key in the values: 1 ft 4 in for A, 4 ft 7 in for B and 6 ft for C.




29. Use the arrow key to rotate the shape so that the shape x-axis is facing down.

30. Move the cursor and locate the center point on the bottom face of the transformer body. You may have to rotate the view to clearly locate this point. Toggle the SmartSketch Surface Locate option by pressing F3 on the keyboard. F3 will toggle the Surface Locate option back on when you need to locate points on surface.

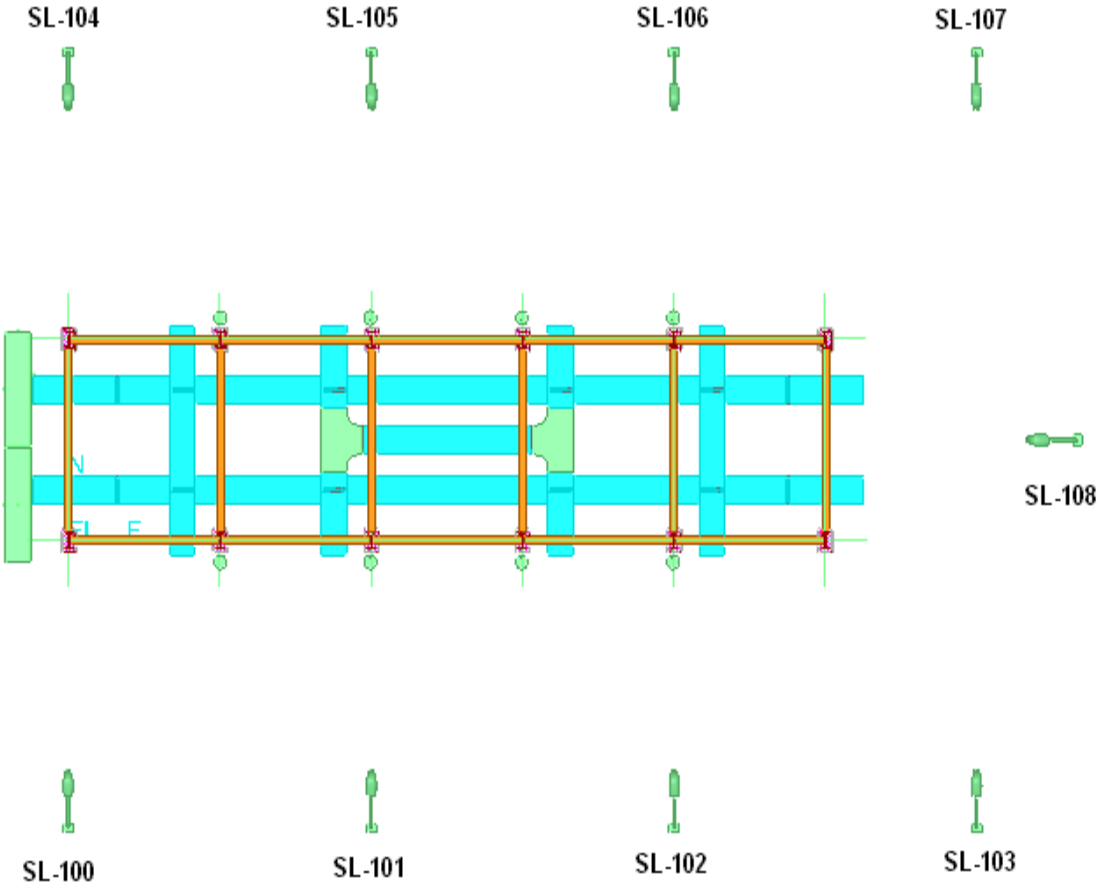



31. Click in the graphic view to place the shape in the model.

    *The designed equipment should look like this.*

# (Optional) Placing More Electrical Equipment

In this exercise you will be placing street lighting fixtures by using the **Place Equipment** command in Unit U07. The workspace will resemble as shown below.

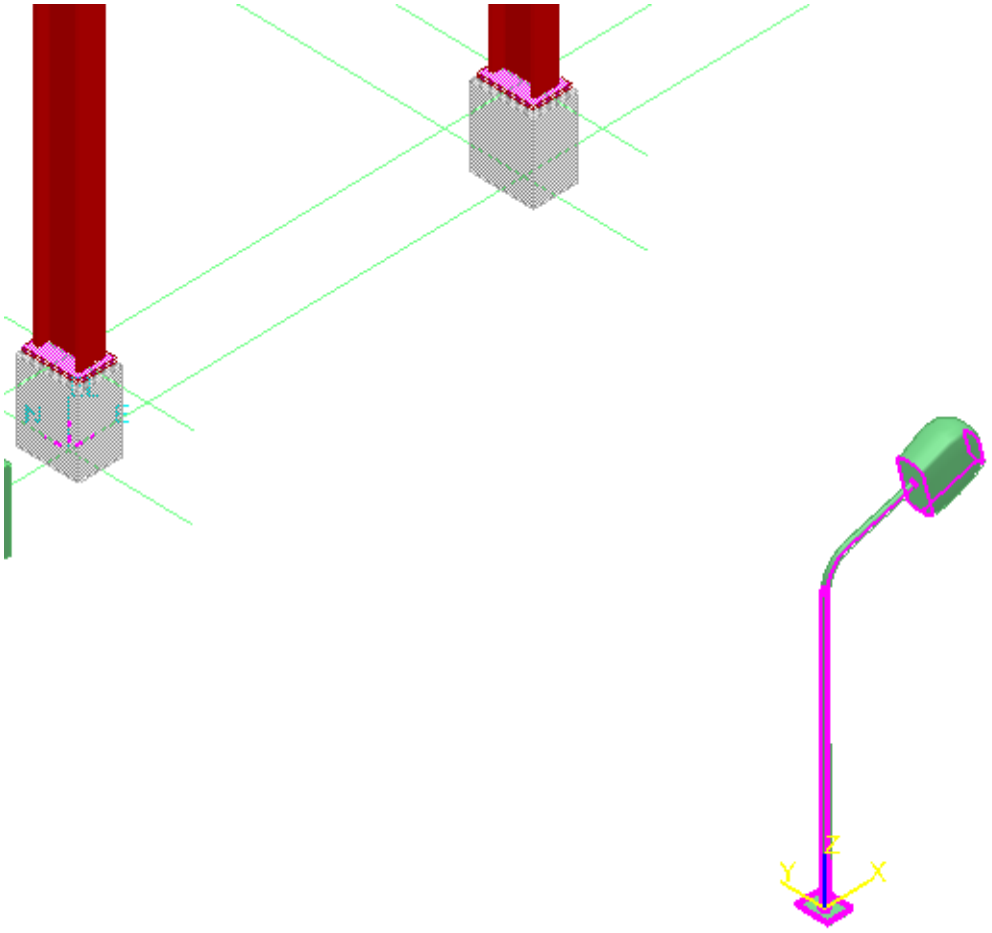



Before you start placing the equipments define your workspace to show Unit U07.

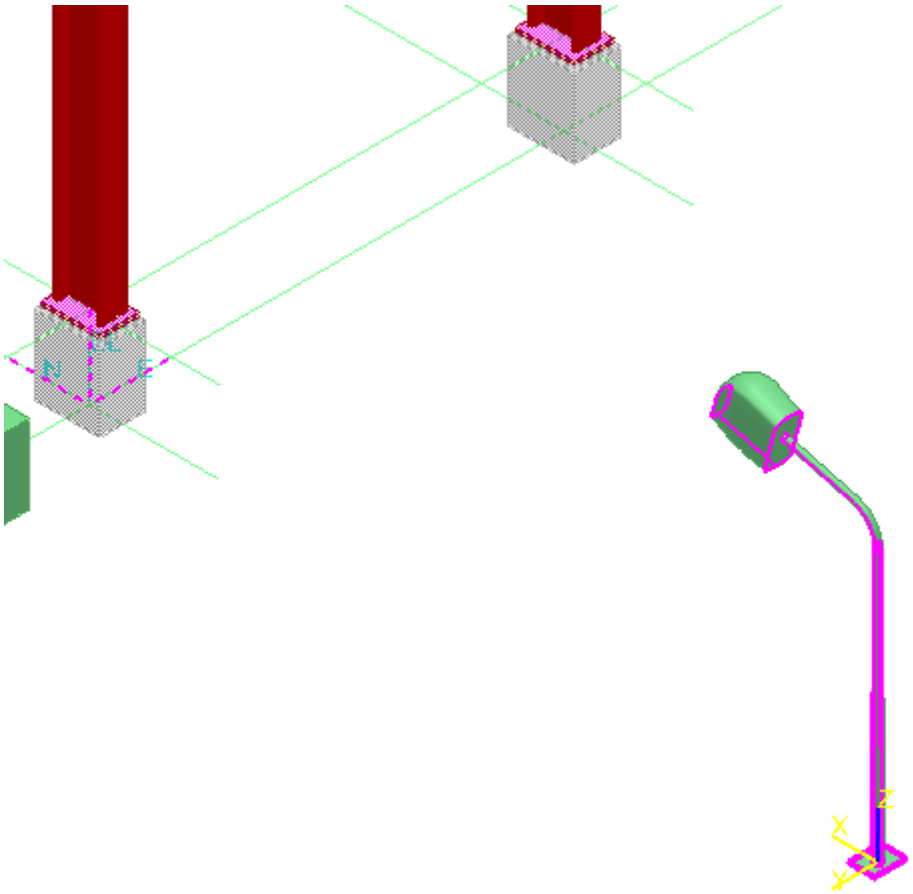
32. Select the **Tasks > Equipment** command.
33. Make sure the **Active Permission Group** is set to **Electrical**.
34. Activate the **PinPoint** ribbon and set the active coordinate system to **U07 CS** on the **PinPoint** ribbon.
35. Click **Set Target to Origin** option on the PinPoint ribbon, to move the target to the origin of the current coordinate system.
36. Click **Place Equipment** on the vertical toolbar.
37. In the **Select Equipment** dialog box, expand the folder \Equipment\Electrical\Lighting\Street Light Fixture until you see the part StreetLight-E. Select the part, and click **OK**.

    *The Equipment Properties dialog box appears.*
38. Key-in SL-100 in the **Name** field.
39. Click the **System** field and select **More..** to specify the system to which the equipment belongs.

40. Select **CT System** under **A2->U07->Electrical->Low Voltage**. Then, click **OK**.
41. To define the position of the object, select the **Position and Orientation** category in the **Category** drop-down list.
42. Key in the followings properties:
    - East: -0 ft 0.78 in
    - North: -20 ft
    - Elevation: 0 ft
43. To change the height of the light pole, select the **Equipment Dimensions** category in the **Category** drop-down list.
44. Key in a value of 26 ft 3 in for A - Pole Height.
45. Click **OK** on the **Equipment Properties** dialog to place the equipment SL-100 in the model.



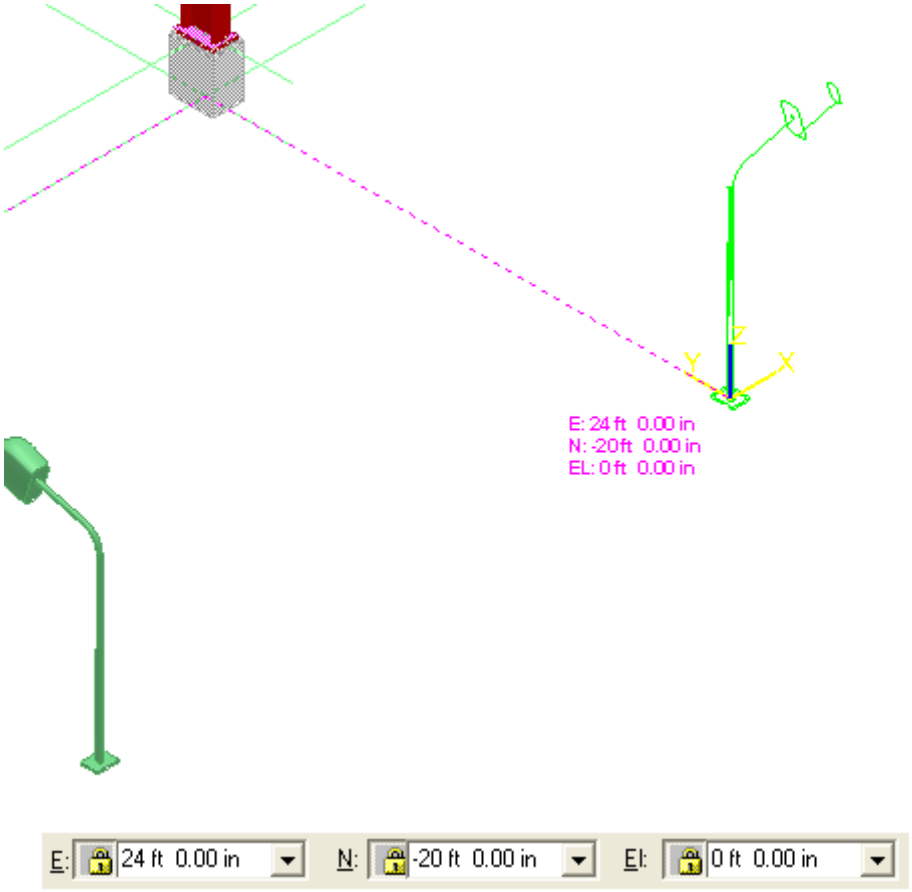
46. Rotate the equipment to the indicated orientation (street light source pointing North) by using the left/right arrow keys.



47. Click **Place Equipment** on the vertical toolbar.
48. In the Select Equipment dialog box, expand the folder **\Equipment\Electrical\Lighting\Street Light Fixture** until you see the part **StreetLight-E**. Select the part, and click **OK**.

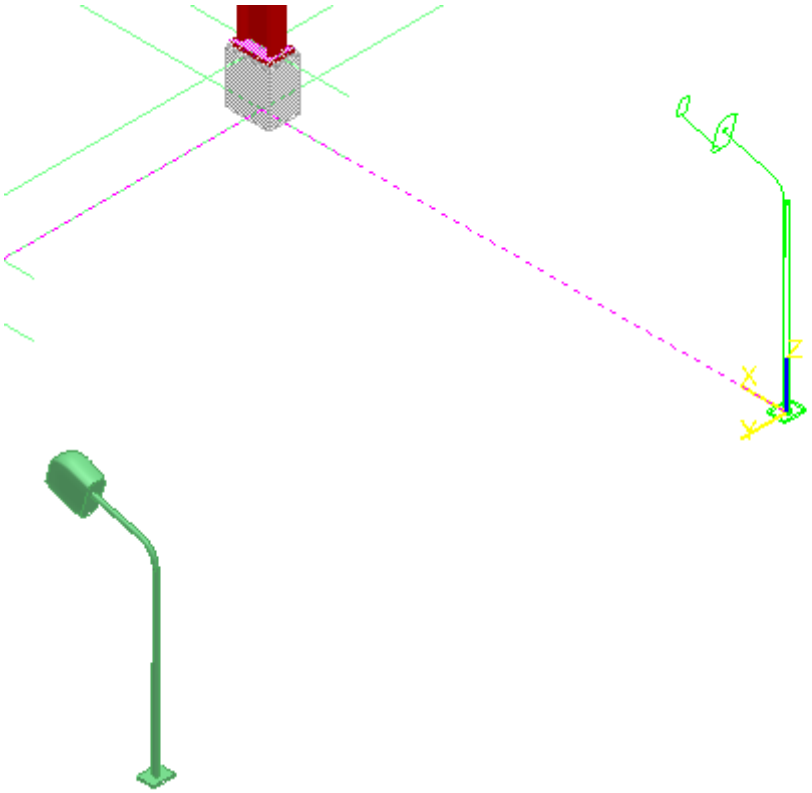
    *The Equipment Properties dialog box appears.*
49. Key-in SL-101 in the **Name** field.
50. Click the **System** field and select the **More..** option to specify the system to which the equipment belongs.
51. Select **CT System** under **A2->U07->Electrical->Low Voltage**. Then, click **OK**.
52. To change the height of the light pole, select the **Equipment Dimensions** category in the **Category** drop-down list.
53. Key in a value of 26 ft 3 in for **A - Pole Height**. Then click **OK**.
54. Key in the following coordinates on the **PinPoint** ribbon.
    - E: 24 ft

- N: -20 ft
- EL: 0 ft

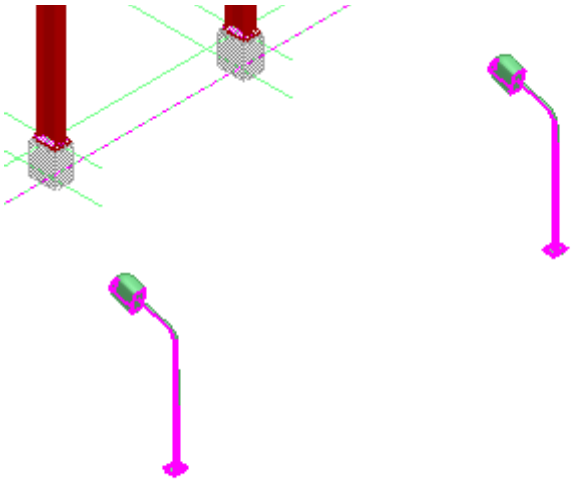

Z
Y
X
E: 24 ft 0.00 in
N: -20 ft 0.00 in
EL: 0 ft 0.00 in


E: 24 ft 0.00 in
N: -20 ft 0.00 in
El: 0 ft 0.00 in

55. Equipment can be rotated while still in the dynamic mode by using the keyboard LEFT and RIGHT arrow keys. Rotate the equipment to the indicated orientation (street light source pointing North) by using the left/right arrow keys.



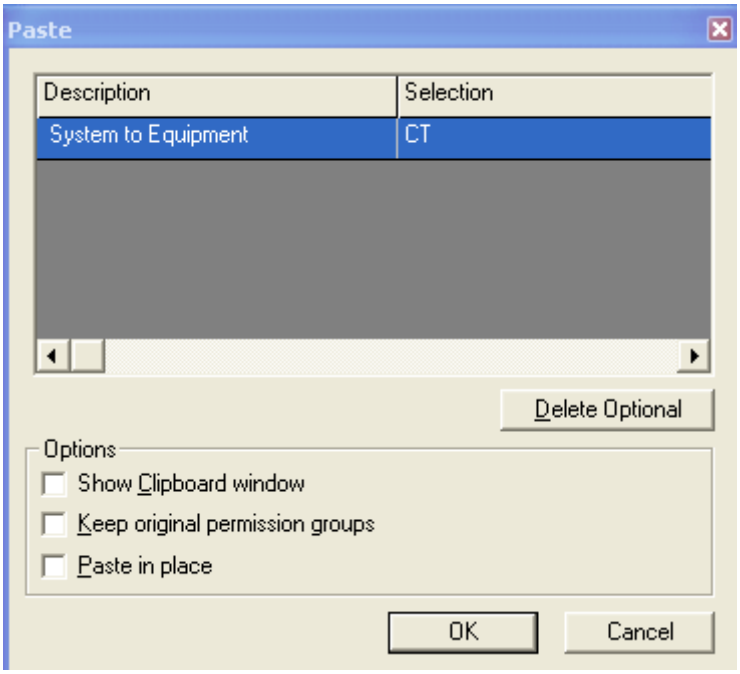

56. Click in the active view to place the street lighting fixture.
57. Select the two street lighting fixtures from the graphic view that you need to copy.



58. Click **Copy** on the Common toolbar.

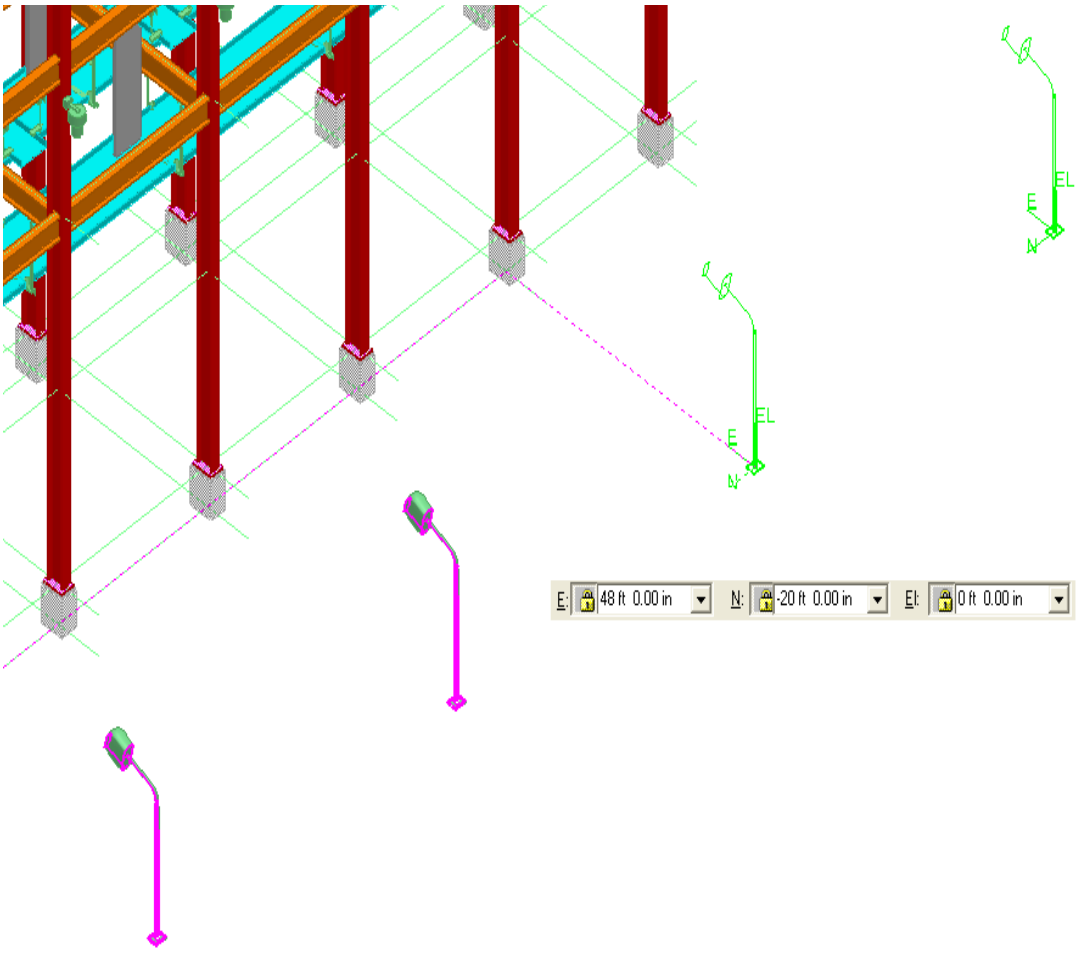
59. Select the origin of the fist street lighting fixture from the graphic view to define the position from where to copy the street lighting fixtures.
60. Click **Paste** on the Common toolbar.

    *The Paste dialog box appears.*
61. Keep the default parent system for the new objects to be pasted on the model. Clear the **Paste in place** check box in the **Paste** dialog box and click **OK**.



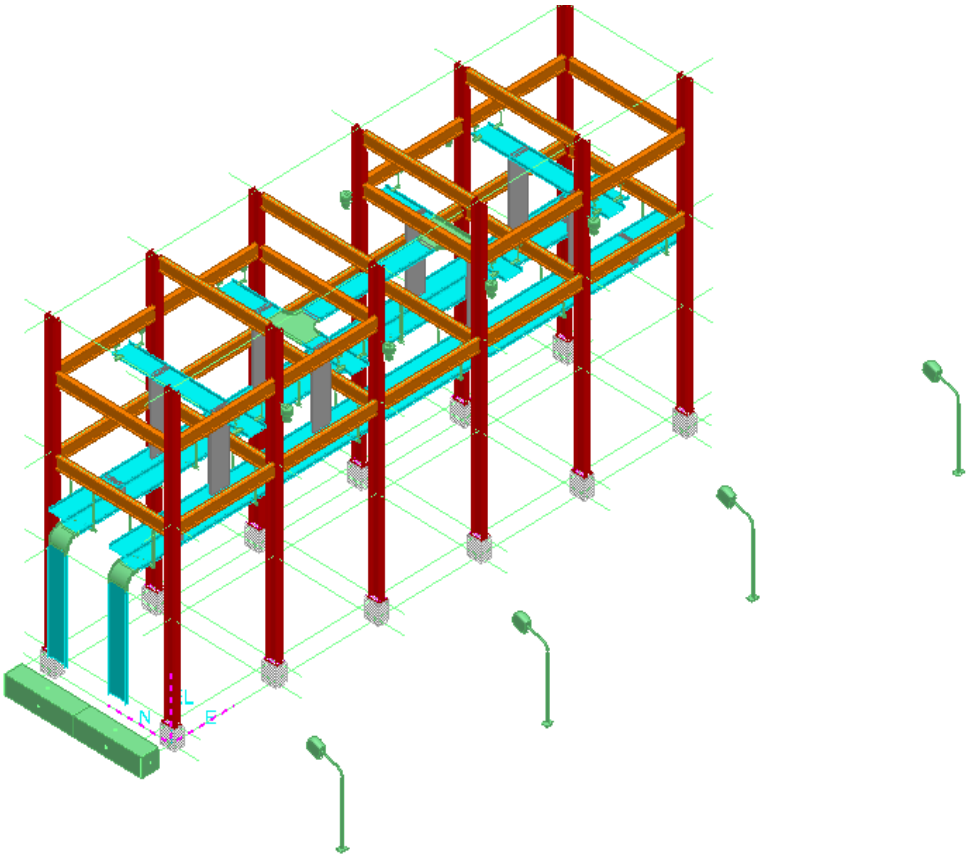

62. Key in the following coordinates on the **PinPoint** ribbon.
    - E: 48 ft
    - N: -20 ft

- El: 0 ft

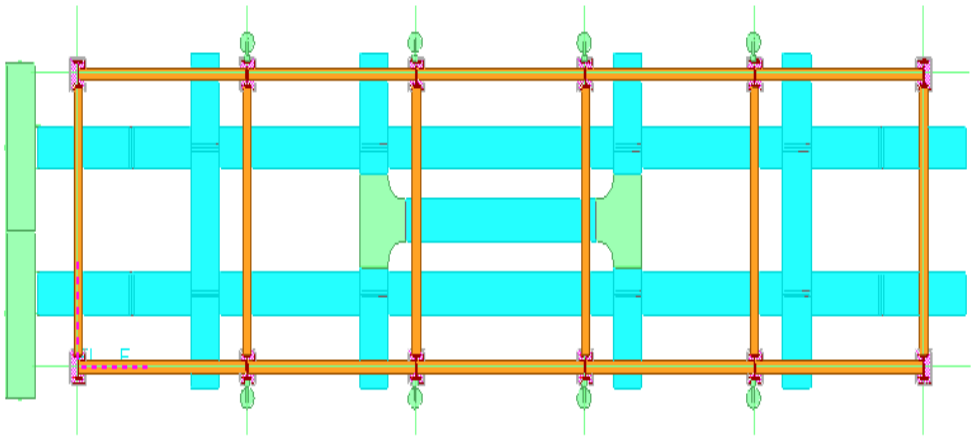



63. Click in the active view to place these street lighting fixtures.

64. Name these street lighting fixtures as SL-102 and SL-103 respectively.



65. Select the four street lighting fixtures from the graphic view that you need to mirror copy.



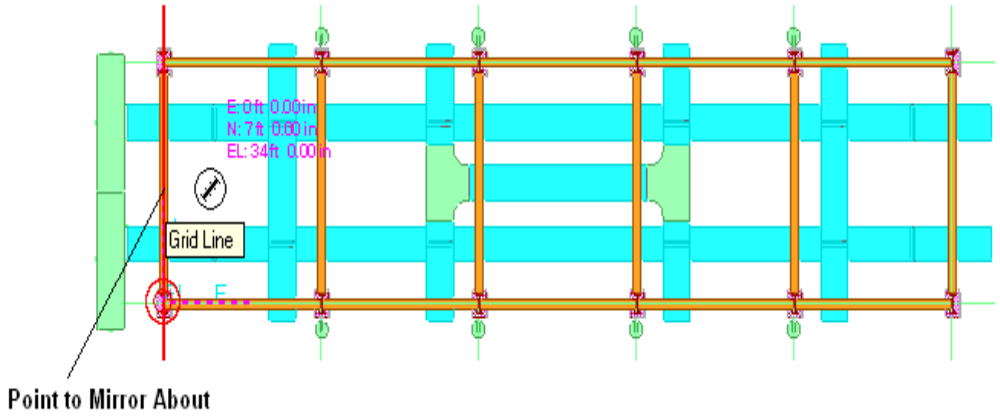
66. Select **Edit > Mirror Copy** to mirror copy the selected objects from the graphic view.

    *The Mirror Copy ribbon appears.*

67. In this ribbon define the mirror plane and the **Point to Mirror About** in which the selected objects are mirrored.

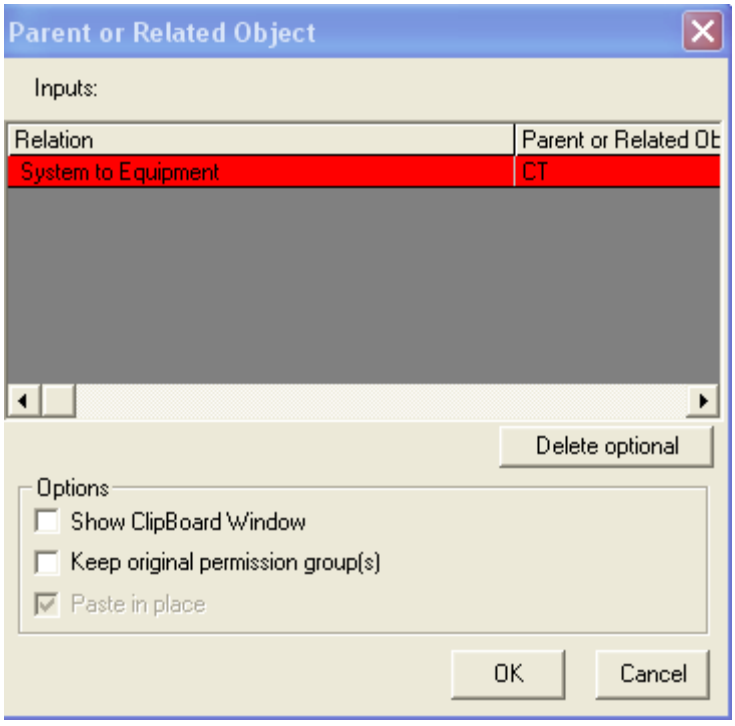
68. Select the **East-West** option in the **Direction** drop-down list and **Point to Mirror About** as the Destination mode.

69. Select the midpoint of the beam as the **Point to Mirror About**.




*The Parent or Related Object dialog box appears.*

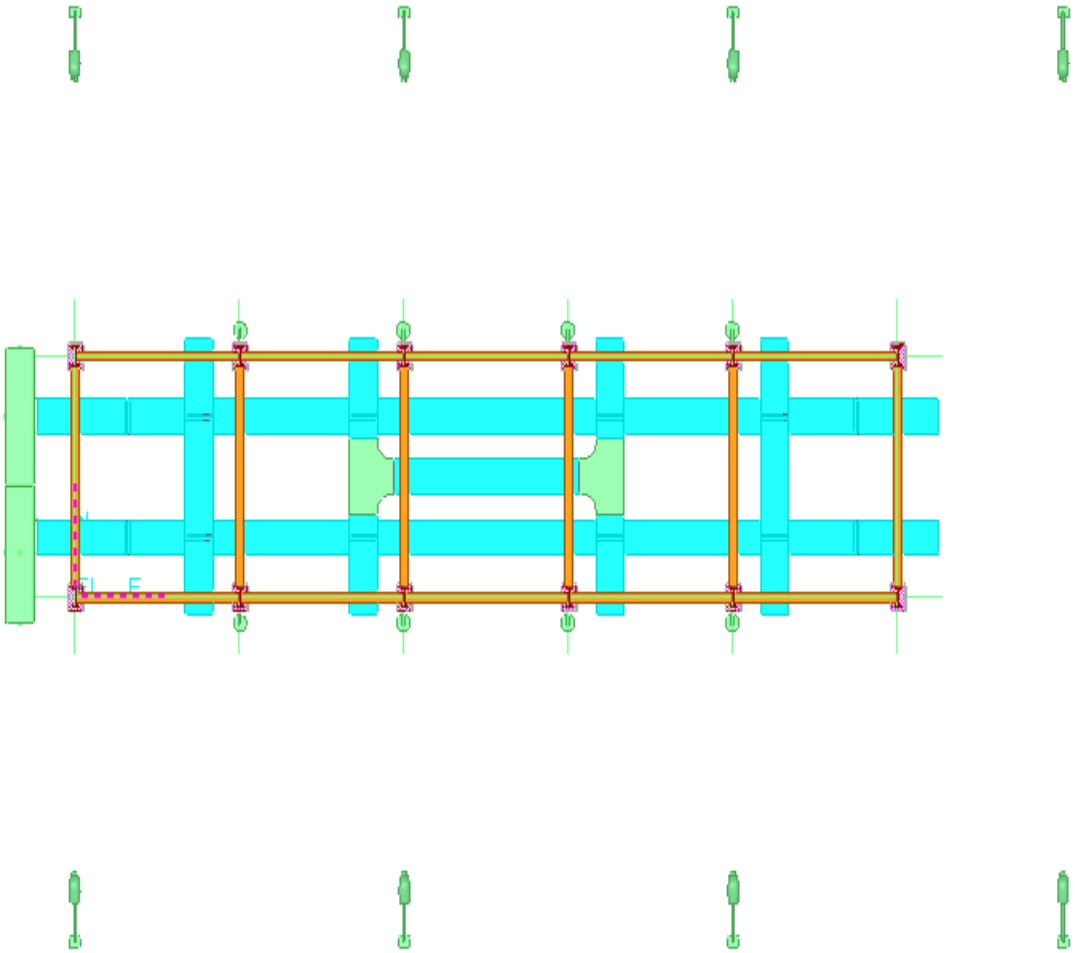
70. Keep the parent system for the equipments from where they have been copied, and click **OK**.



*The mirrored objects appear in dynamic mode in the graphic view.*

71. Click **Finish** on the **Mirror Copy** ribbon.

    *The mirrored objects will appear in the graphic view.*

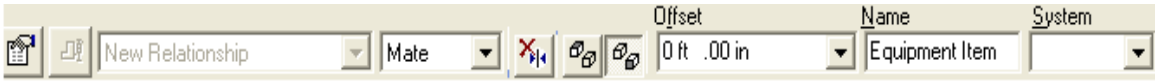


72. Name these street lighting fixtures as SL-104, SL-105, SL-106 and SL-107 respectively.
73. Click **Place Equipment** on the vertical toolbar.
74. In the **Select Equipment** dialog box, expand the folder **\Equipment\Electrical\Lighting\Street Light Fixture** until you see the part **StreetLight-E**. Select the part, and click **OK**.

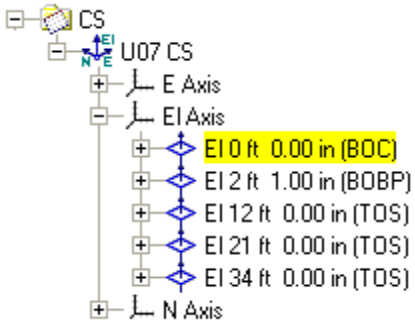
    *The Equipment Properties dialog box appears.*

75. Key-in SL-108 in the **Name** field.
76. Click the **System** field and select the **More..** option to specify the system to which the equipment belongs.
77. Select **CT System** under **A2->U07->Electrical->Low Voltage**. Then, click **OK**.

78. On the PinPoint ribbon, key-in 80 ft for East and 7 ft for North.
79. On the **Equipment** ribbon, make sure the positional relation is set to **Mate**.




80. In the **Workspace Explorer**, expand **Coordinate System** and select **U07 CS -> EL Axis**.
81. Click EL-0'-0" to mate the street lighting fixture with elevation 0 ft.




82. Click in the graphic view to place the equipment.
83. Rotate the equipment to the indicated orientation (street light source pointing West) by using the left/right arrow keys.