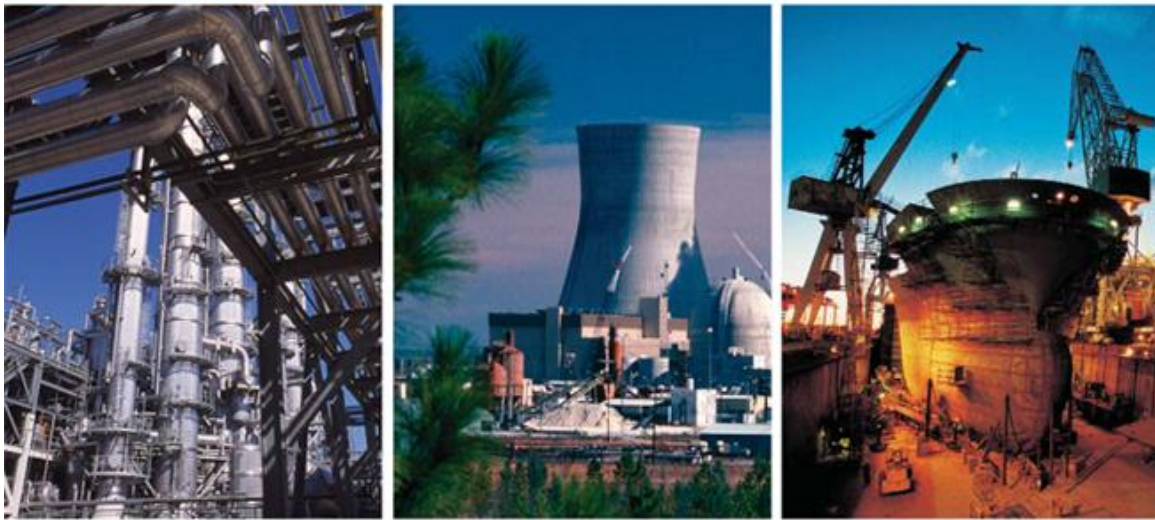


Smart 3D

Tutorials for Hangers and Supports



Process, Power & Marine



Version 2014

October 2013

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Session 1: S3D Hangers and Supports: An Overview

Objective:

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

- Identify the tasks that you can perform in the Hangers and Supports environment.

Prerequisite Sessions:

- S3D Overview

Overview:

The Hangers and Supports environment is used to model supports for piping, HVAC ducts, and cable trays shown in Figure 1. A support is an assembly of parts, also called components, which connect together to the supported features, and to the supporting structure. The supports and support parts you can use are defined in the S3D Catalog.

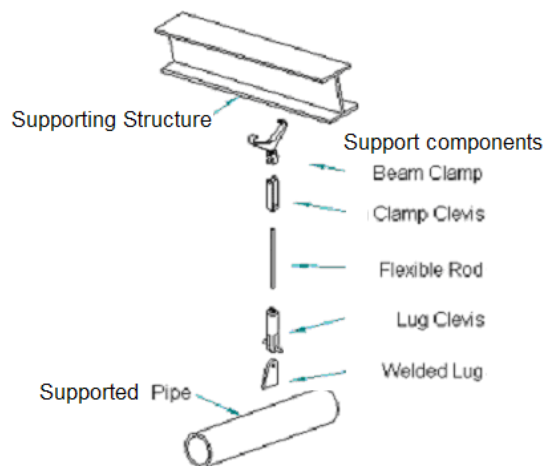


Figure 1: Standard Hanger

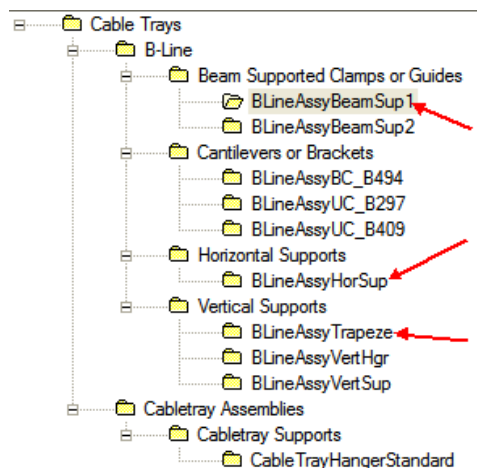


Figure 2: Support Parts in the S3D Catalog

Note:

- Throughout this section, the word *Support* refers to both supports and hangers. The word *Feature* refers to pipe, HVAC duct, and cableway routing design features.

Hangers and supports are dependent on both the supporting object and the supported object. Place the supporting objects before placing any hangers or supports.

Tasks Performed in the Hangers and Supports Environment:

Figure 3 shows the vertical toolbar with all the command buttons labeled. Using these buttons, you can perform various tasks in Hangers and Supports environment.

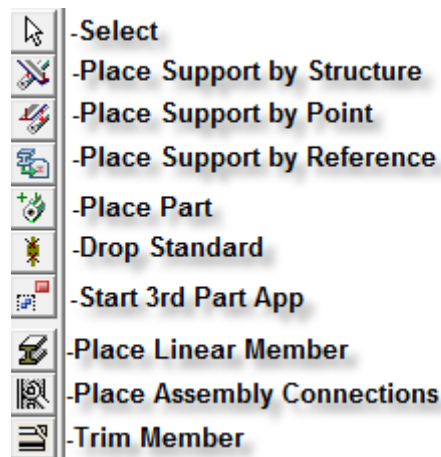


Figure 3: The Command Buttons in the Vertical Toolbar

You can perform the following tasks in the Hangers and Supports environment:

- Placing Supports:**

In the Hangers and Supports environment, you can place two types of supports, the Standard Support and the Designed Support. The Standard Support automatically selects the individual parts from the Catalog and positions them based on the supported parts, the supporting structure, and the position of the support. If the supported parts or the supporting structure are modified, the Standard Support adjusts the design of the individual parts according to the rules of the Standard Support. You can only modify the parts of the Standard Support by changing the properties of the controlling Standard Support. The Standard Supports you can use are defined in the Catalog and can be customized by your system administrator.

You position supports along the path of one or more route features (pipe, duct, cableway/cable tray, and conduit). Use the **Place Support by Structure** command to position the support where the selected supporting structure crosses the selected feature. Use the **Place Support by Point** command to manually identify the point. You use this command when the supporting structure is a plane or runs parallel to the route path.

Figure 4 shows a support positioned by using the **Place Support by Structure** command. Figure 5 shows a support positioned by using the **Place Support by Point** command.

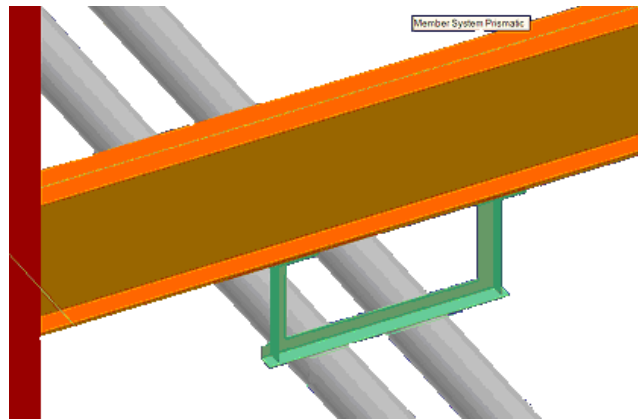


Figure 4: Support Positioned by Supporting Structure

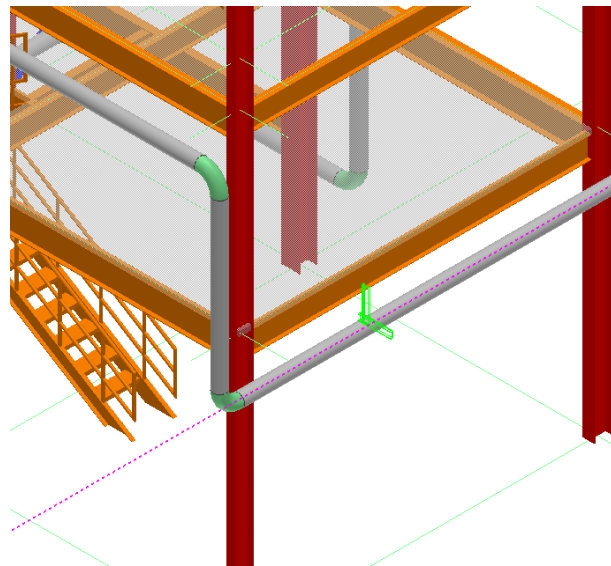


Figure 5: Support Positioned by Point Along Feature

When you modify the supported feature or the supporting structure, the supports related to these objects are notified to update. The supports update automatically if the user editing the supported or supporting objects has Write access to the support. If the user does not have Write access, the supports are reported on the **To Do List** as **Out of date**. If the supported objects or the supporting structure is deleted, the support appears on the **To Do List** as **In error**. In that case, you need to either delete the support or select new inputs for the support.

Unlike Standard Supports, the Designed Support is a custom configuration of parts. You create the Designed Support by selecting the option to place a Designed Support instead of a Standard Support on the **Support Placement** ribbon. The Designed Support option creates reference graphics at the identified support location instead of placing parts. You then manually place support parts in the Designed Support using the **Place Part** command. You can use the reference graphics to help position the support parts. In Figure 6, the reference graphics enclose the two pipes that are selected when the Designed Support is placed using the **Place by Structure** command.

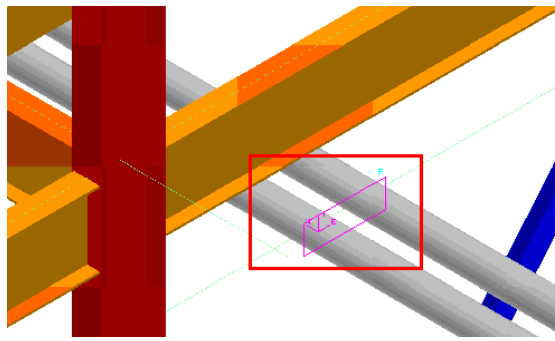


Figure 6: Designed Support with No Parts Added

You can place a Standard Support within a Designed Support by simply selecting the Designed Support as the system parent of the Standard Support. This enables you to use the automation of the Standard Support for selecting and positioning some of the parts while you manually place and position other parts needed for your custom Designed Support. You can optionally report the nested Standard Support identity in the material reports or report on just the individual support parts by setting the reporting properties. The Designed Support with Standard Supports and support parts appear in the **Workspace Explorer** as shown in Figure 7.

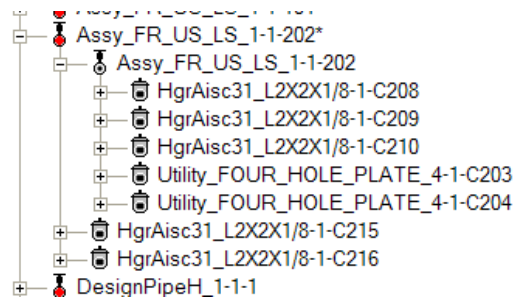




Figure 7: Designed Support with Standard Supports and Support Parts in the Workspace Explorer

Notes:

-  Icon for Designed Support
-  Icon for Standard Support
-  Icon for Support Part

At times you need to convert one kind of support to another. For example, to modify the individual parts of a Standard Support you must convert the Standard Support to a Designed Support by using the **Drop** command. This removes the control of the Standard Support over the part selection and positioning and leaves all parts in their current location. It is as if you had started with a Designed Support and placed the parts manually in the Designed Support.

• Changing Structure and Feature Connections of Supports:

You can select the connection type by clicking on the **Toggle Connection to Structure/Feature** buttons as shown in Figure 7 on the **Support Placement** ribbon until the connection that you want to use appears. The software limits the available connections based on the supporting structure/feature and the type of support.



- Toggle Connection to Structure



- Toggle Connection to Feature

Figure 8: The Toggle Connection Buttons on the Ribbon

- **Editing Supports**

Edit the position and properties of a support: You can change the position of a support by selecting the **Positioning** smartstep on the **Edit** ribbon. You can edit the properties by using the **Edit > Properties** command. The support has properties related to the whole assembly such as its maximum load rating, type, or its name can be edited. The Standard Support will also have properties that control the selection and positioning of the individual parts. You can display a picture that illustrates the meaning of the geometric properties.

- **Editing Support Parts**

You place support parts manually by using the **Place Part** command. The command prompts you to select the parent support. If you want to add support parts to a Standard Support, you can just pick the Standard Support as the system parent of the support part. The software automatically converts the Standard Support to a Designed Support when the part is placed.

Support parts have pre-defined positioning locations called ports. The user can view the part ports by selecting the part and clicking (Ctrl+Shift+P). These ports carry information about how they assemble relative to supported features, other support part ports, and the supporting structure. This information makes it easy to assemble parts that must connect. The **Place Part** command has a toggle that changes the port being used during placement. Figure 9 shows the output ports for a pipe clamp part symbol. Figure 10 shows a series of parts connected at their ports to supported pipe, other support parts, and to structure.

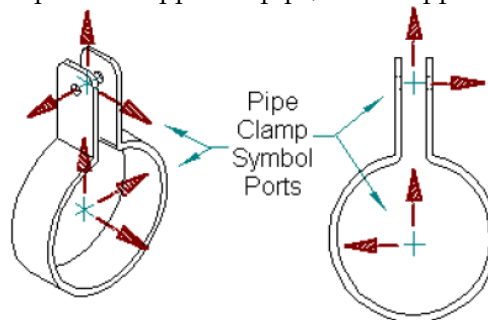


Figure 9: Output Ports for a Pipe Clamp Part Symbol

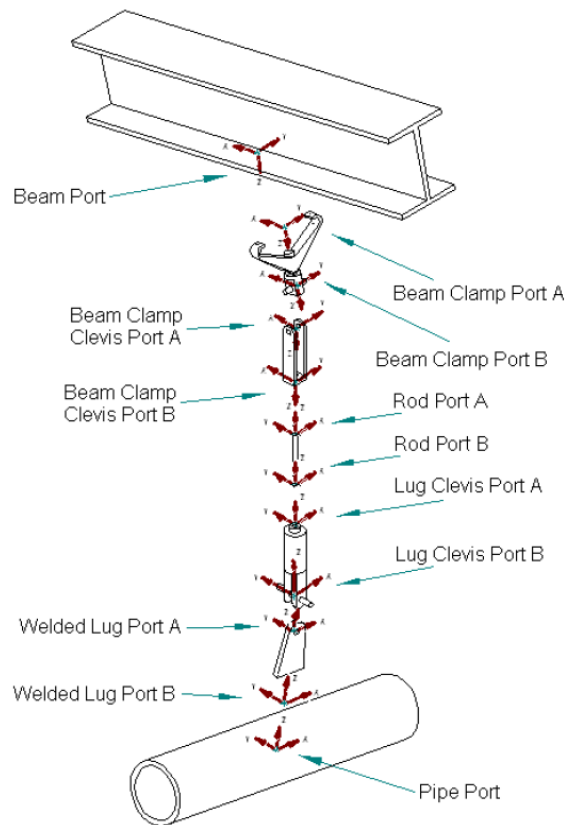


Figure 10: Part Symbols and Their Ports

Edit the position and properties of a support part: You can edit all details of the individual parts you have placed manually in an existing Designed Support. To modify the individual parts of a Standard Support, you must convert it to a Designed Support using the **Drop Standard** command.

- **Structural Members as Support Parts**

The place member structure modeling command is included in the Hangers and Supports environment so that the members can be easily used in the design of custom supports. Select the Designed Support as the parent system of the structural member when you place it. The **Place Assembly Connection** command details the connections between the members by trimming the members and adding connection parts as defined by the assembly connection type chosen. See the *Structural Modeling* tutorials for details. Members that have the Designed Support as the parent system can be included in the automatic drawing and material report for the support.

Place a linear member using **Place Linear Member** command and trim with the **Place Assembly Connections** command. You can place support parts that model structural steel shapes from the Support Catalog. These are placed like any other support part. These parts cannot be trimmed or detailed. They show only a single extruded shape. You can design fully detailed custom structural supports using structural members. The **Place Linear Member** command positions the structure and the **Place Assembly Connection** command defines the necessary trimming between member parts and the generation of parts such as base plates, gusset plates, and clip angles. Assembly connections also control member features including cutbacks, copes, notches, bolt holes, and slots. For more information refer to the *Structural Task* tutorials.

Note:

- When you have design responsibility for both the supported parts and the supports, it is a good idea to avoid recalculation of the supports when you are making frequent edits to the supported parts or supporting structure. You can do this by putting the supports in a separate permission group of their own and then restricting the automatic recalculation to the permission groups of the objects you are working with.

For more information related to the Hangers and Supports task, refer to the *Understanding the Hangers and Supports Workflow: An Overview* topic in the *Hangers and Supports User's Guide.pdf* and *Hangers and Supports Reference Data Guide.pdf*.

Quiz:

1. What are the different commands that can be used to place a support?
2. Can you edit an individual part of a Standard Support?
3. How do you place a Designed Support?
4. How do you convert a Standard Support to a Designed support?
5. When will supports go on the To Do List?
6. When do you use the Place Support by Structure command?
7. What would happen if you selected a structure that was parallel to the feature you selected?
8. What does the Toggle Connection to Feature do?
9. What does the Toggle Connection to Structure do?
10. What determines if the toggles are active?

Session 2: Placing Supports Positioned by Structure

Objective:

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

- Place a support on a feature based on the position of the supporting structure using the **Place Support by Structure** command.

Prerequisite Sessions:

- S3D Overview
- S3D Common Sessions
- Hangers and Supports: An Overview

Overview:

The **Place Support by Structure** command places a support at the intersection of the selected supported feature (or features) and a vertical plane passing through the selected supporting structure. For example, in Figure 1, a support is placed between the pipe straight feature and the beam. If you select a supporting structure that is parallel to the selected feature, the **Place Support by Structure** command will prompt you to select a different structure. Use the **Place Support by Point** command if the supporting structure cannot be used to define a location on the feature.

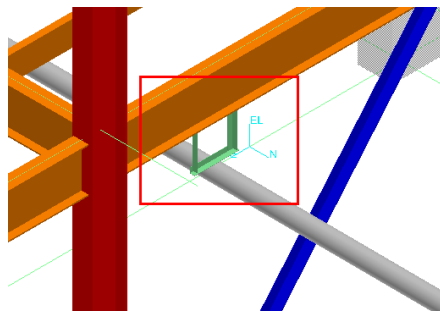


Figure 1: An Example of When to Use the Place Support by Structure Command

The **Place Support by Structure** command is also used to place supports for piping, ducting, and cable tray. You just select a different support from the Catalog. You can review the available Catalog supports by browsing in the **Select Support** dialog box. Select the **Preview** button, as highlighted in Figure 2, on the **Select Support** dialog box for an illustration of the support.

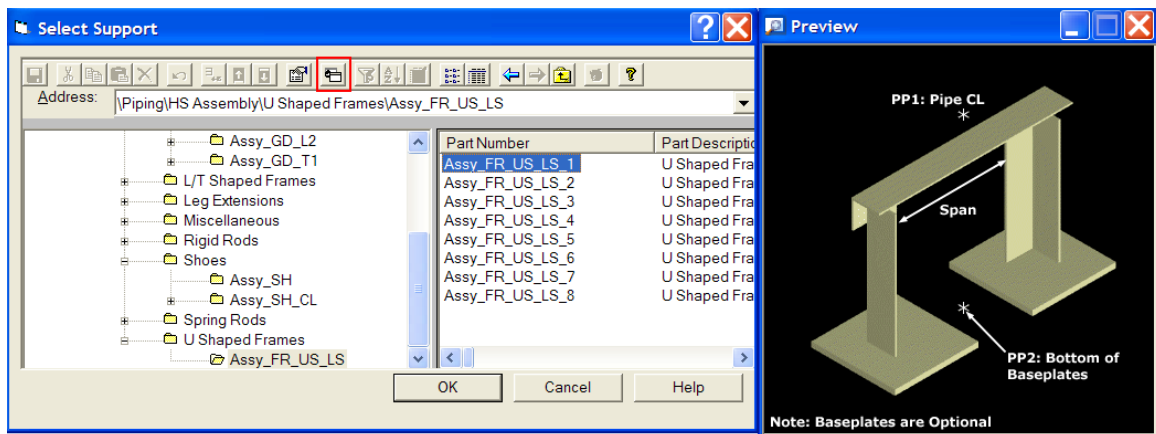


Figure 2: Select Support Dialog with Preview Displayed

Steps for Placing a Support by Structure:

Exercise Objective: In this exercise you will be placing standard support by structure **U Shaped Frame L2x2x1/8 w/o Base plate**, using the pipe straight feature **2001-P** and the beam on the steel structure that crosses the pipe straight feature **2001-P**. Using **Toggle Connection to Structure**, attach the structure to the bottom surface of the beam. The support should resemble the support in Figure 1.

Before beginning the procedure:

- Define your workspace to display Unit **U02** and coordinate system **U02 CS**.
 - Make sure you are in the **Hangers and Supports** task and the Active Permission Group is set to **Piping**.
1. Click the **Place Support by Structure** button on the vertical toolbar. The **Place Support by Structure** ribbon is displayed.



Figure 3: Place Support by Structure Button

Notes:

- Select the **Design** checkbox on the **Place Support by Structure** ribbon if you want to create a designed support at the location you specify. This is covered in the *Building Designed Supports* session.

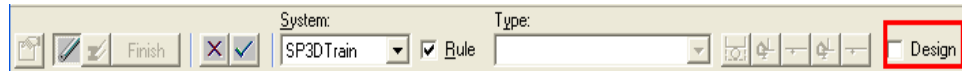


Figure 4: The Design Option on the Place Support by Structure Ribbon

- If the **Design** checkbox is selected, the **Rule** check box and the **Type** box are disabled because the designed support does not have a type.
2. In the select straight feature smartstep, select the pipe straight feature **2001-P** that will be supported. The selected pipe straight feature should resemble Figure 5.

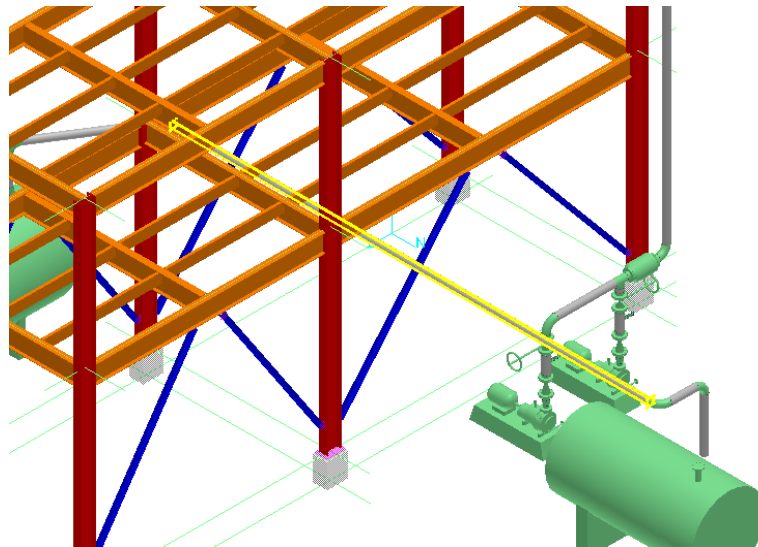


Figure 5: The Pipe Straight Feature 2001-P

3. Click the **Accept** button on the ribbon to accept the selection and indicate that you are finished selecting the features to be supported.

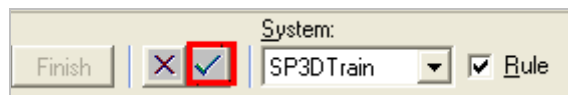


Figure 6: The Accept Button on the Support Placement Ribbon

4. In the select structure smartstep, select the beam that crosses the pipe straight feature **2001-P**, as highlighted in Figure 7.

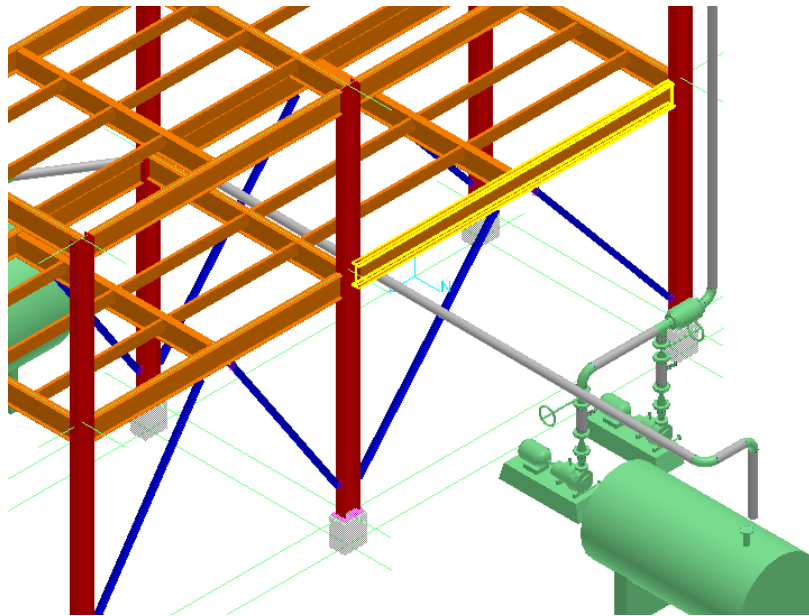


Figure 7: The Supporting Structure

5. Click the **Accept** button on the ribbon to accept the selection and indicate that you have no more supporting structure for the support being placed.

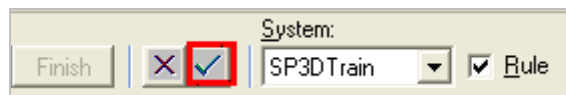


Figure 8: The Accept Button on the Support Placement Ribbon

6. From the **Type** drop-down list, select **U Shaped Frame L2x2x1/8 w/o Baseplate**.

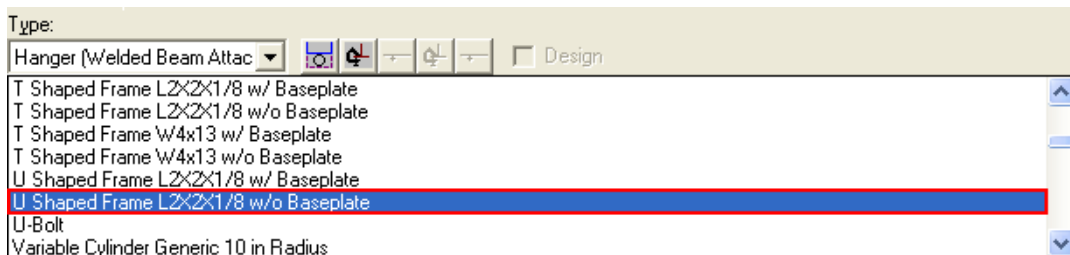


Figure 9: The Support Type: U Shaped Frame L2x2x1/8 w/o Baseplate

Notes:

- If the **Rule** option is selected, a support is automatically selected. The **Type** drop-down list will display a list of other types allowed by the rule. Your project administrator can customize the selection rules.

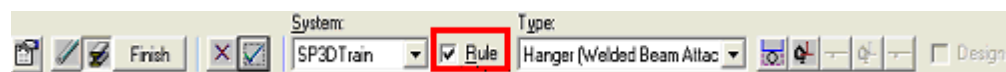


Figure 10: The Rule Option on the Support Placement Ribbon

- If you do not select the **Rule** option, the last ten types that you placed appear in the **Type** drop-down list. Select **More...** to select a different type of support.

The support will now be constructed and displayed in wireframe, as shown in Figure 11.

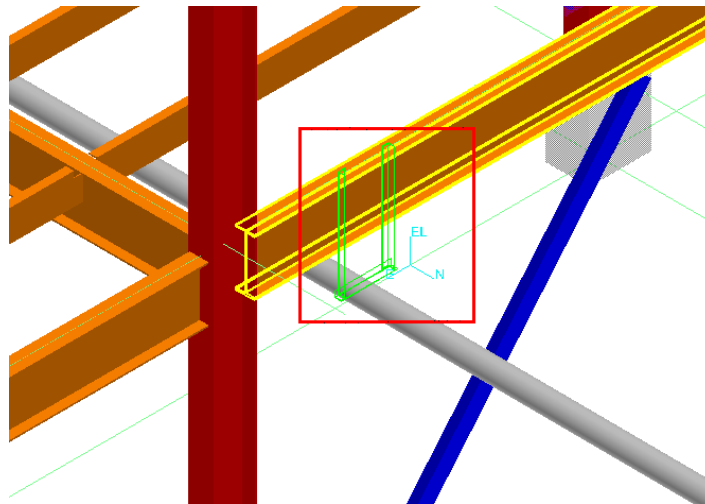





Figure 11: The Support: U Shaped Frame L2x2x1/8 w/o Baseplate Highlighted

7. Click the **Toggle Connection to Structure** button to attach the structure to the bottom surface.



Figure 12: Toggle Connection to Structure Button

Notes:

- You can experiment with the toggle options that are enabled for the specific support type you are placing. Continue clicking the toggle to cycle through all the options.
 -  **Toggle Connection to Straight Feature** - Cycles through the available attachment options based on the selected feature and the support type. This option may not be available if the type that you selected does not provide for multiple attachment options.
 -  **Toggle Connection to Structure** - Cycles through the available attachment options based on the supporting structure and the support type. If you are placing a support connecting to two structures, the ribbon displays two buttons, one for each structure. This option may not be available if the type you selected does not provide for multiple attachment ports.
 -  **Toggle Face Position** - Cycles through the available face positions for the selected port (surface) on the supporting structure. For example, you can use this option to move a U-bolt to a location on the member flange where it does not interfere with the web of a beam. If you are placing a support connecting to two structures, the ribbon displays two buttons, one for each structure. This option may not be available if there are no optional face positions defined for the selected support.

After clicking the **Toggle Connection to Structure** button your support should resemble the area highlighted in Figure 13.

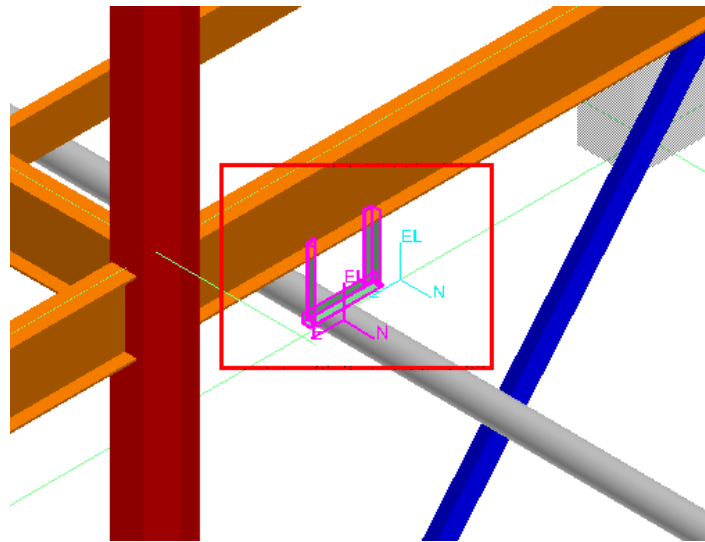


Figure 13: Toggled U Shaped Frame L2x2x1/8 w/o Baseplate

8. Click the **Finish** button on the ribbon to commit the support to the database.

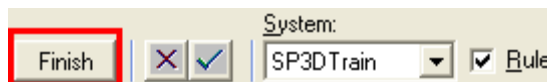


Figure 14: The Finish Button on the Support Placement Ribbon

Your support should resemble Figure 15.

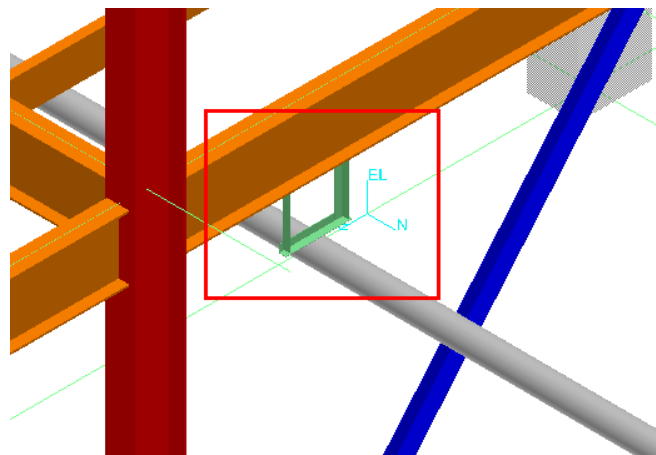


Figure 15: Placed Support by Structure: U Shaped Frame

For more information related to placing supports from a structure, refer to *Place Support by Structure*, topic in the user guide *HangersSupportUsersGuide.pdf*.

Session 3: Placing Supports Positioned by Point

Objective:

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

- Place a support at a specific point along a feature by using the **Place Support by Point** command.

Prerequisite Sessions:

- S3D Overview
- S3D Common sessions
- Hanger & Supports Overview

Overview:

Use the **Place Support by Point** command to place a support for a feature at a specific point along the feature. The command is used when the supporting structure does not imply a location for the support on the feature. For example, a support on a feature running under a slab or a plate can connect to the structure at any point along the feature. The placement by point uses a selected plane of the structure to establish the height of the support. You can select a surface of a beam to establish the plane as well. The plane selected on the supporting structure can be at any angle except perpendicular to the axis of the supported feature.

You can place a single support or you can place multiple supports at specified offset from the first support. To enable this multiple placement function, activate the **Point Along** precision point tool.

The **Place Support by Point** command is also used to place supports for piping, ducting, and cabletray. You can place all supports in the Catalog by point or by structure. Browse the **Select Support** dialog box to review the available supports.

Steps for Placing a Support by Point:

Exercise Objective: In this exercise you will be placing a standard **U Shaped Frame L3x3x1/4 w/Base plate** support supported by the slab (*shown below in Fig. 1*) at a specific point on a pipe straight feature of pipeline **300-W**. The Standard Support should resemble the highlighted support in Figure 1.

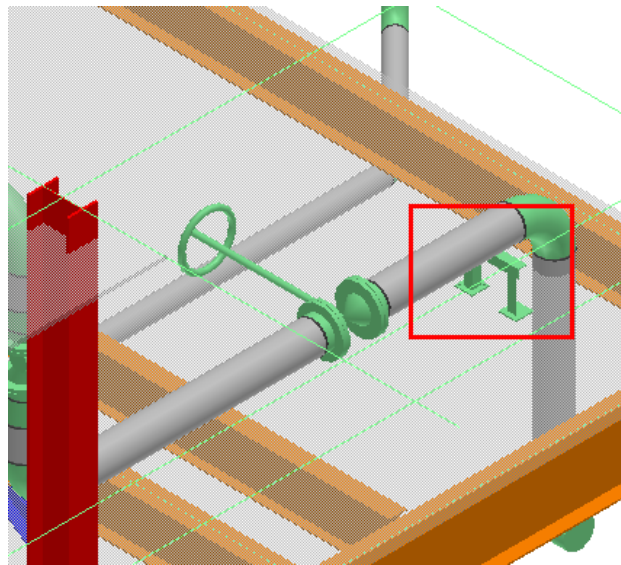


Figure 1: Final Output: Supports Placed by Point: U-Shaped Frame

Before beginning the procedure:

- Define your workspace to display Unit **U03** and coordinate system **U03 CS**.
- Make sure you are in the **Hangers and Supports** task and the Active Permission Group is set to **Piping**.

1. Click the **Place Support by Point** button on the vertical toolbar.



Figure 2: Place Support by Point Button

The **Place Support by Point** ribbon is displayed.

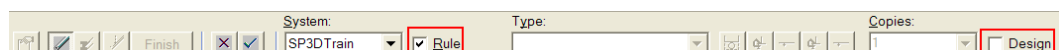


Figure 3: Rule and Design Check Box on the Place Support by Point Ribbon

Note:

- Select the **Design** checkbox on the ribbon if you want to create a designed support at the location you specify.
- If the **Design** checkbox is selected, the **Rule** check box and the **Type** box are disabled because designed support does not have a type.
- The toggle options on the placement ribbon are exactly the same as described for the support positioned by structure.

2. In the select feature smartstep, select the pipe straight feature in pipeline **300-W** that will be supported in an isometric view looking South-East, as shown in Figure 4.

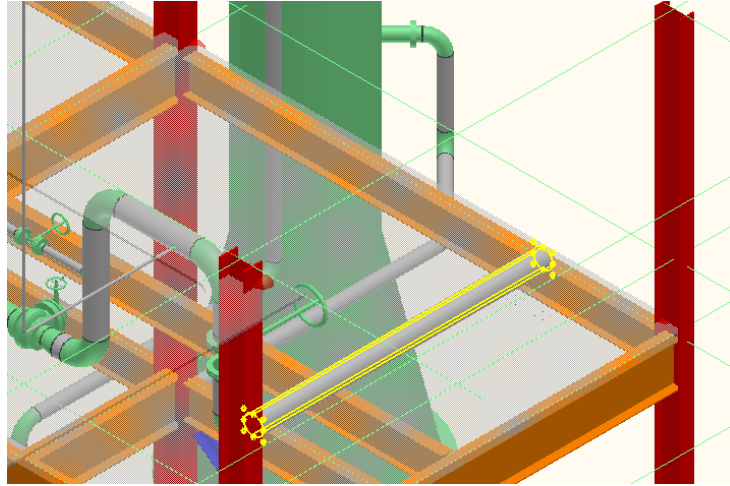


Figure 4: Select Pipe Straight Feature

3. Click the **Accept** option on the ribbon to accept the selection and indicate that you have selected the features to be supported.

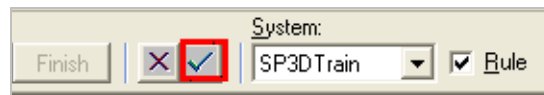


Figure 5: Accept Option on the Place Support by Point Ribbon

4. In the select structure smartstep, select the indicated slab *shown highlighted below in Figure 6* under the pipe straight feature of **300-W**, as shown in Figure 6.

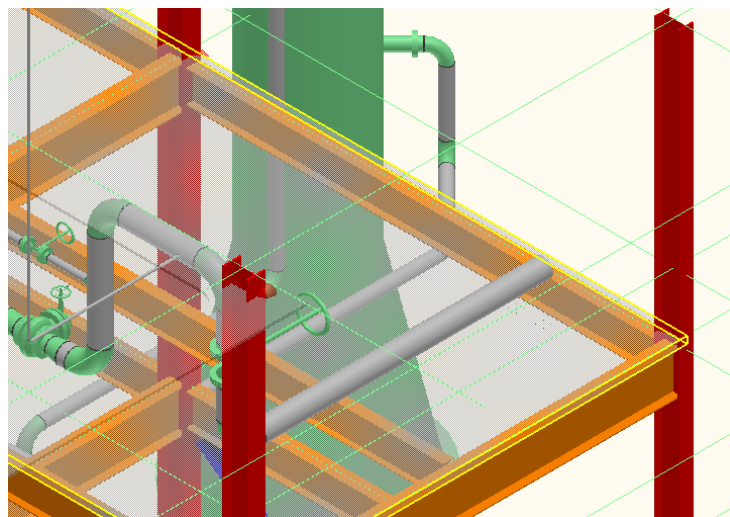


Figure 6: Supporting Slab

5. Click the **Accept** option on the ribbon to accept the selection of the slab and indicate that you have no more supporting structure for the support being placed.

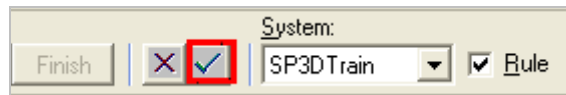


Figure 7: Accept Option on the Place Support by Point Ribbon

6. From the **Type** drop-down list, select the **More...** option to select the support to be placed from the Catalog.

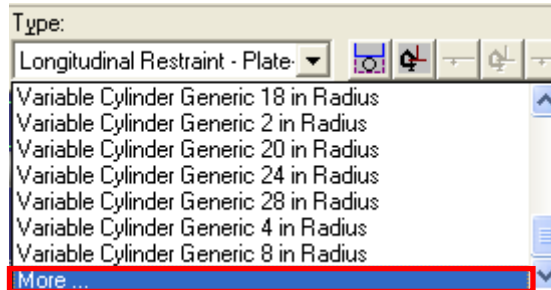


Figure 8: More... Option in the Type Drop-Down List

Notes:

- If the **Rule** option is selected, a support is automatically selected. The **Type** combo list will display a list of other types allowed by the rule. Your project administrator can customize the selection rules.
 - If you do not select the **Rule** option, the last ten types that you placed appear in the combo box select list. Select **More...** to select a different type of support.
7. The **Select Support** dialog box appears. In this dialog box, expand the folder **\Piping\HS Assembly\U Shaped Frames\Assy_FR_US_LS** until you see the part **Assy_FR_US_LS_3**. Select the support part with the part description **U Shaped Frame L3x3x1/4 w/Baseplate** and click **OK**.

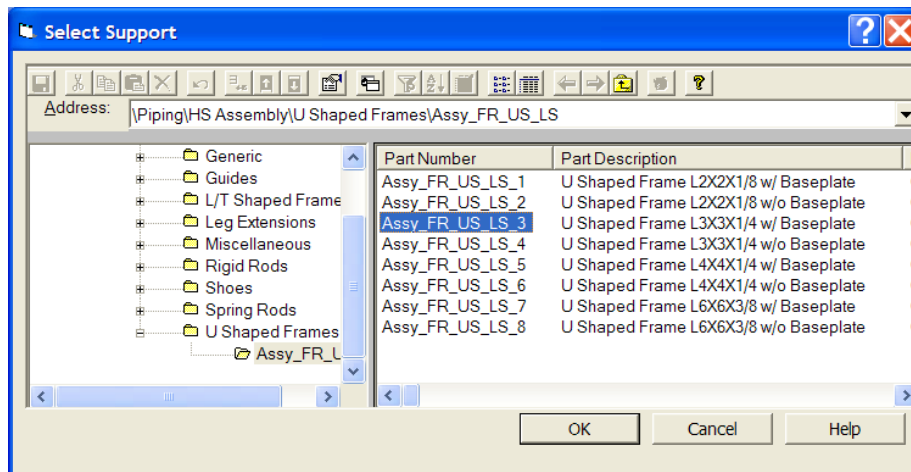


Figure 9: U Shaped Frame L3x3x1/4 w/Baseplate in the Select Support Dialog Box

The selected support will appear in the graphic view, as shown in the highlighted section of Figure 10.

SP3D Hangers & Supports Tutorial: Placing Supports Positioned by Point

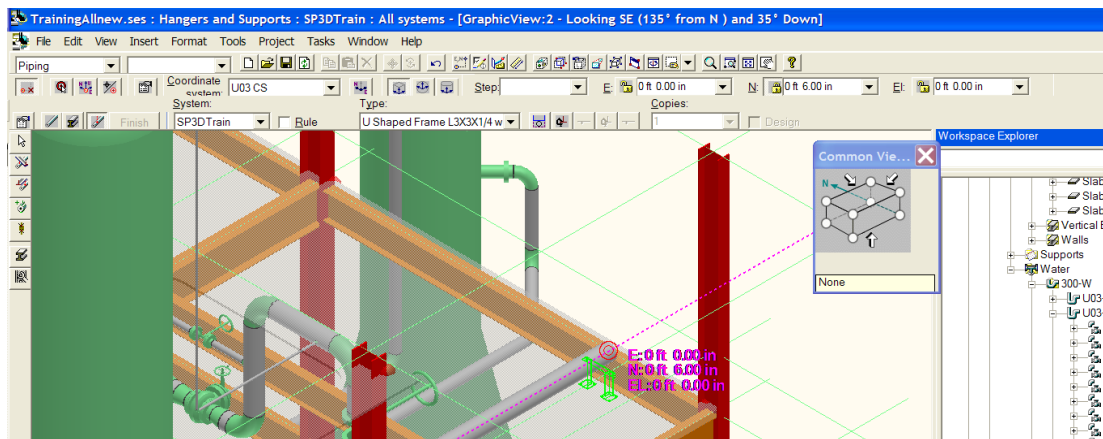


Figure 10: Placing the First U Shaped Frame L3x3x1/4 w/Baseplate

8. In the position smartstep, click to enter the exact placement point along the feature. The point you enter is projected minimum distance to the feature. You can use any of the precision point tools, PinPoint, Point Along, or SmartSketch keypoints to define your placement point.

In this case, position the support at a distance of **6 in** from end of the elbow.

- Activate PinPoint and reset the target to the end of the pipe.
- Use the function key F7 to activate the North dimension and key in **6 in**.
- Click anywhere in the graphic view.

9. Click the **Finish** option on the ribbon to accept the placement of the first support.

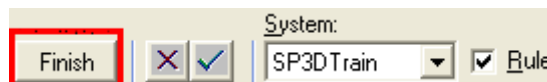


Figure 11: The Finish Option on the Place Support by Point Ribbon

10. The command will now cycle to the position smartstep defaulting to all options you previously selected. You can change any options you wish and repeat step 8 to place another support, as shown in Figure 12.

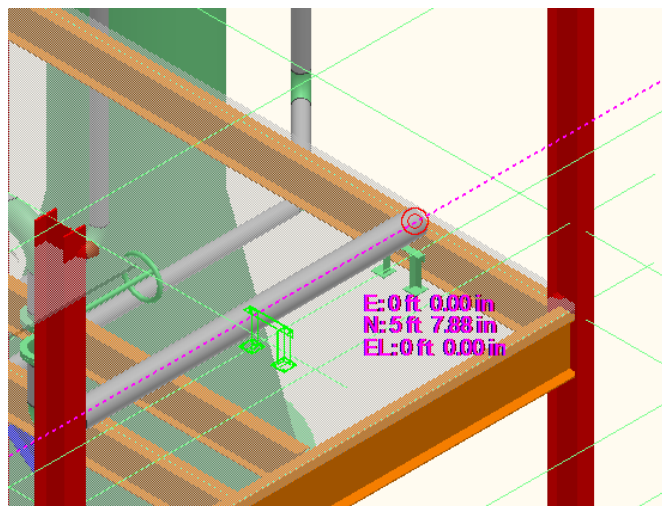


Figure 12: Placing the Second U Shaped Frame L2x2x1/8 w/Baseplate

11. Terminate the **Place Support by Point** command by right-mouse click or picking the

select command. The second support shown in dynamics will not be placed.

For more information related to placing supports from a point, refer to the *Place Support by Point Command* topic in the user guide *HangersSupportUsersGuide.pdf*.

Session 4: Placing Supports Positioned by Reference

Objective:

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

- Place a support on a feature with reference to a position on the supported object using the **Place Support by Reference** command. This is useful if the structure is being modeled by a 3rd party tool or the structure has not been modeled yet.

Prerequisite Sessions:

- S3D Overview
- S3D Common Sessions
- Hangers and Supports: An Overview

Overview:

The **Place Support by Reference** command places a support at a location specified by the user. The user can then specify the length of the support at the selected supported feature (or features) without having to actually select the supporting structure. For example, in Figure 1, a support is placed on a pipe without having to select the supporting structure.

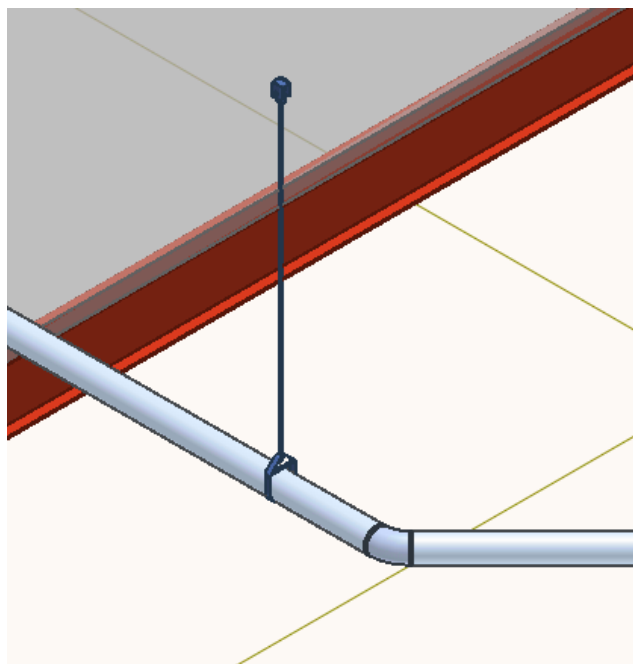



Figure 1: An Example of placing a support by reference

Steps for Placing a Support by Reference:

1. Click Place Support by Reference  on vertical toolbar
2. Select the feature to support
3. Click the Accept on horizontal tool bar
4. Select the position of the support along the feature.
5. Select the reference position of the supporting structure.
6. Select the support type
7. Change the reference structure orientation if desired.
8. Click Finish

Exercise Objective: In this exercise you will be placing a standard support by Reference, the **Rigid Rod with Clevis Hanger** using the pipe straight feature **2001-P**. The support should resemble the support in Figure 1.

Before beginning the procedure:

- Define your workspace to display Unit **U03** and coordinate system **U03 CS**.
 - Make sure you are in the **Hangers and Supports** task and the Active Permission Group is set to **Piping**.
- 1- Click the **Place Support by Reference** button on the vertical toolbar. The **Place Support by Reference** ribbon is displayed.



Figure 3: Place Support by Reference Button

- 2- In the select straight feature smartstep, select the pipe straight feature **2001-P** that will be supported. The selected pipe straight feature should resemble Figure 5.

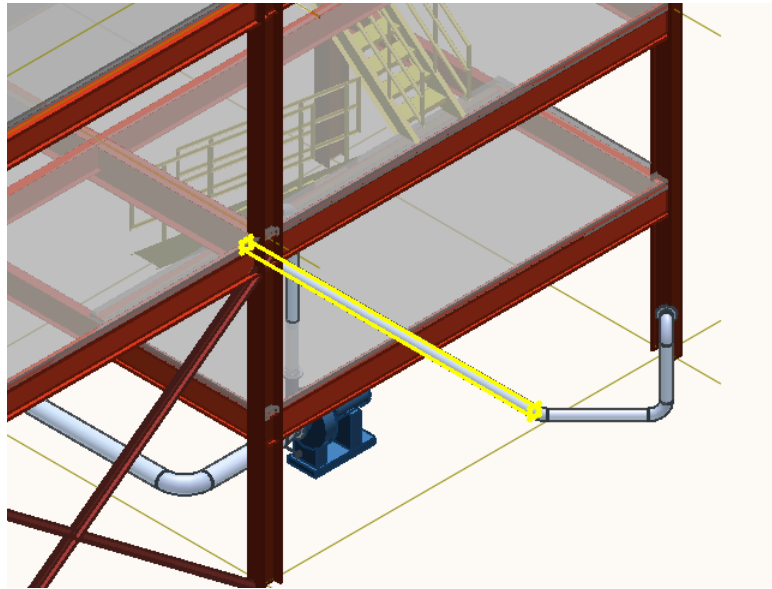


Figure 5: The Pipe Straight Feature 2001-P

- 2- Click the **Accept** button on the ribbon to accept the selection and indicate that you are finished selecting the features to be supported.

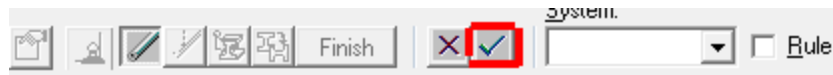


Figure 6: The Accept Button on the pipe selection

- 3- Select the position of the support along the pipe line as in in Figure 7.

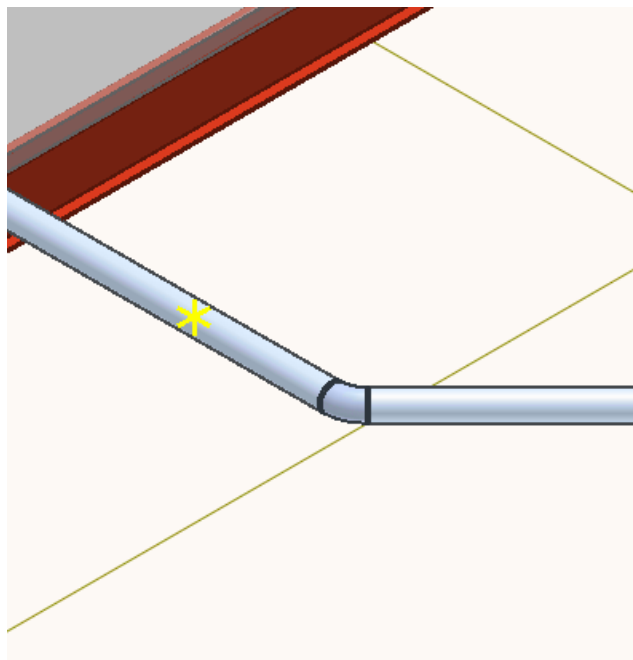


Figure 7: The position of the support along the pipe.

- 4- From the **Type** drop-down list, select Assy_RR_SR_CL_37 as shown in Figure 8.

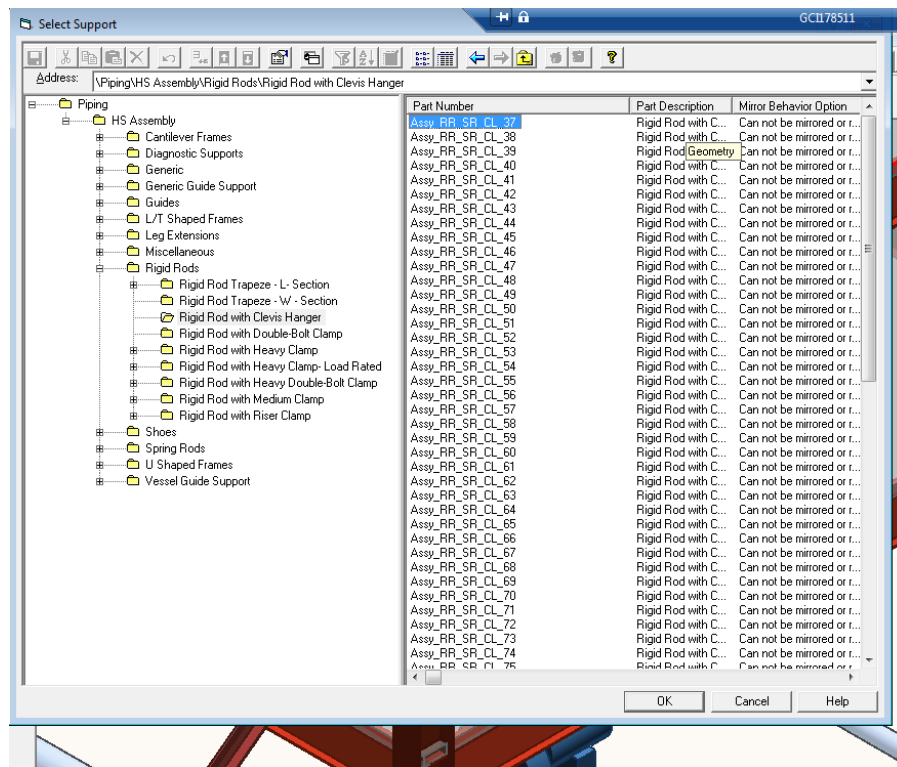


Figure 8: The drop down list of the supports

- 5- Select the reference position of the *supporting* structure as in Figure 9

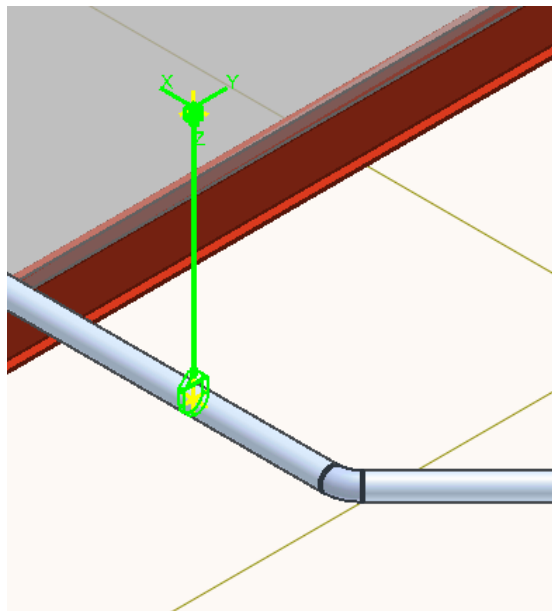


Figure 9: The Support Type: Assy_RR_SR_CL_37

- 6- Click Finish to place the support.

Your support should resemble Figure 10.

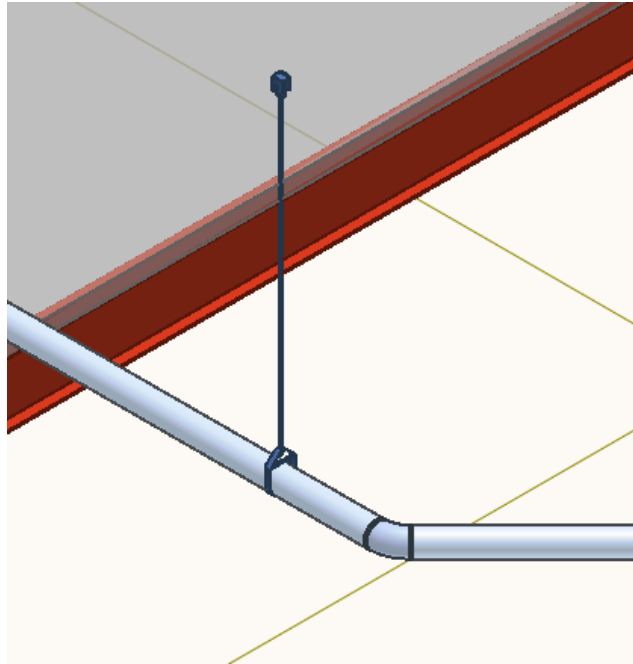


Figure 10: Placed Support by Structure: Rigid Rod with Clevis Hanger

For more information related to placing supports from a structure, refer to *Place Support by Reference*, topic in the user guide *HangersSupportUsersGuide.pdf*.

Session 5: Building Designed Supports

Objective:

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

- Build custom designed supports by using the **Place Part** command.

Prerequisite Sessions:

- S3D Overview
- S3D Common Sessions
- S3D Structure Sessions
- Placing Support Positioned by Structure
- Placing Support Positioned by Point

Overview:

A designed support is a custom configuration of parts or assemblies (Figure A) or parts and assemblies (Figure B).

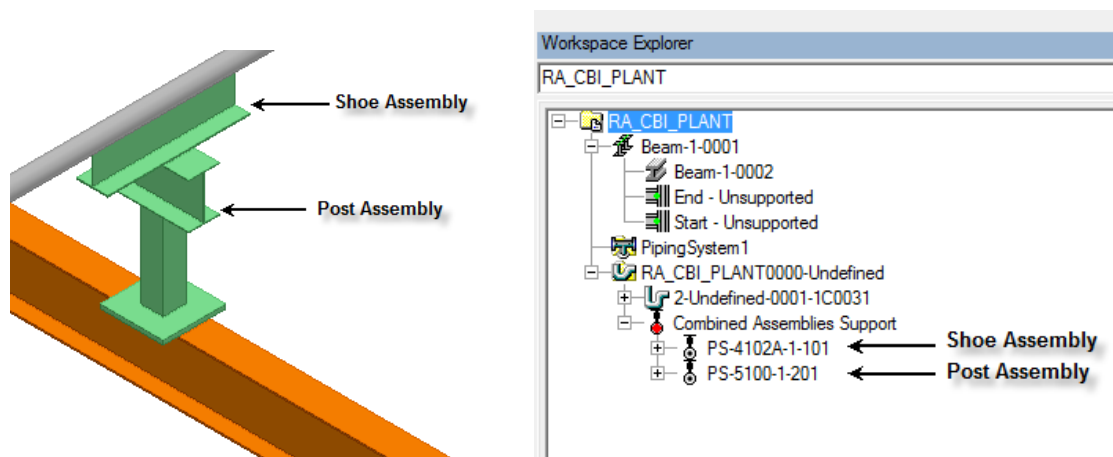


Figure A: Designed Support with two assemblies

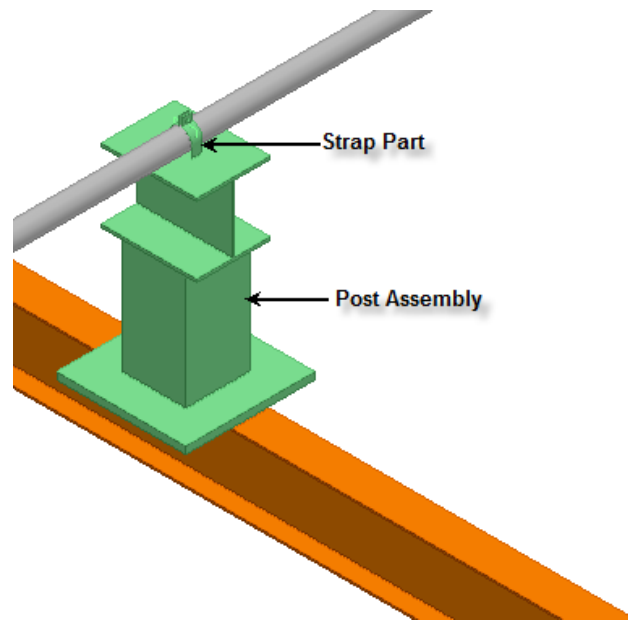


Figure B: Designed Support with one assembly and one part

Figure B1 shows how the designed assembly consisting of a Standard Support assembly and a part are shown in the Work Space Explorer.

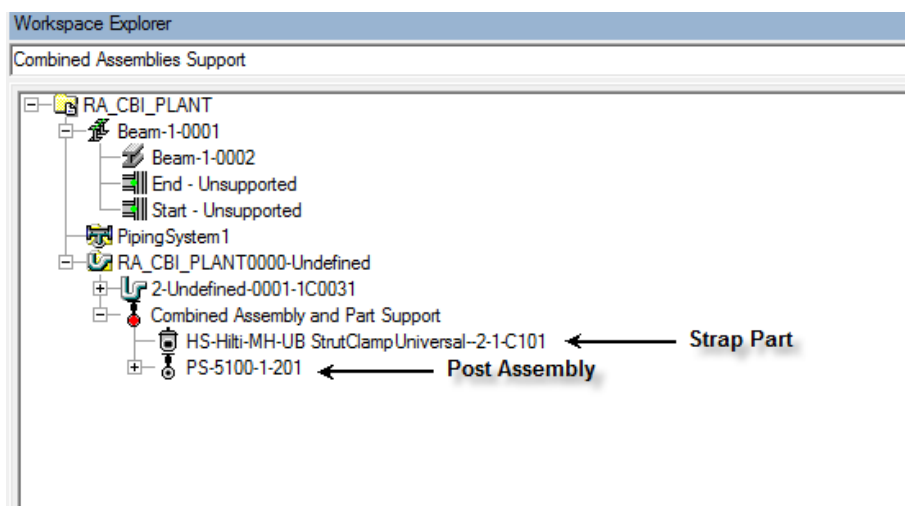


Figure B1: Work space explorer of designed assembly shown in Figure B.

You create the designed support by selecting the option to place a designed support instead of a standard support on the ribbon of the support placement commands. The designed support option creates reference graphics at the identified support location instead of placing parts. You can manually place support parts in the designed support by using the **Place Part** command. You can use the reference graphics of the designed support to help position the support parts. You edit the position and orientation of these parts by using the **Move** and **Rotate** commands on the **Common** toolbar. In Figure 1, the reference graphics enclose the two pipes that were selected when the designed support was placed using the **Place by Structure** command with the **Design** check box selected.

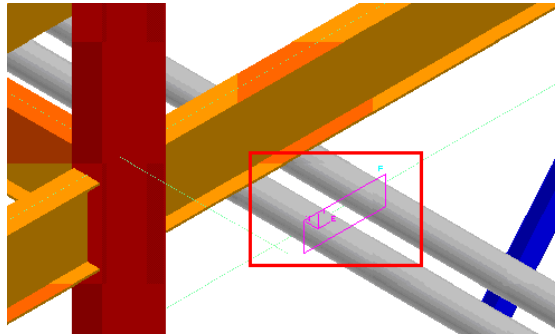


Figure 1: Designed Support with No Parts Added

You can place a standard support within a designed support by simply selecting the designed support as the system parent of the standard support. This lets you use the automation of the standard support for selecting and positioning some of the parts of the designed support. You can optionally report the nested standard support identity in the material reports or the individual support parts by setting the reporting properties.

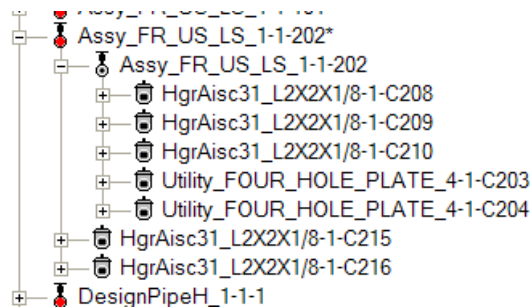





Figure 2: Designed Support with Standard Supports and Support Parts in the Workspace Explorer

Notes:

-  Icon for designed support
-  Icon for standard support
-  Icon for support part

If you want to modify the individual parts of a standard support after you have placed a standard support, you must convert the standard support to a designed support by using the **Drop Standard** command. This removes the control of the standard support over the part selection and positioning and leaves all parts in their current location. It is as if you had started with a designed support and placed the individual parts manually in the designed support.

If you want to add parts to a standard support, the standard support must be converted to a designed support. The software will automatically make this conversion, following a warning, if you add a part to a standard support.

Steps for Creating a Designed Support by Adding a Part to a Standard Support:

Exercise Objective: In this exercise you will be placing a support part, **Anvil_FIG137_12**,

choosing the standard support as the parent. The resulting designed support is highlighted in Figure 3 (Isometric view **Looking South-West**).

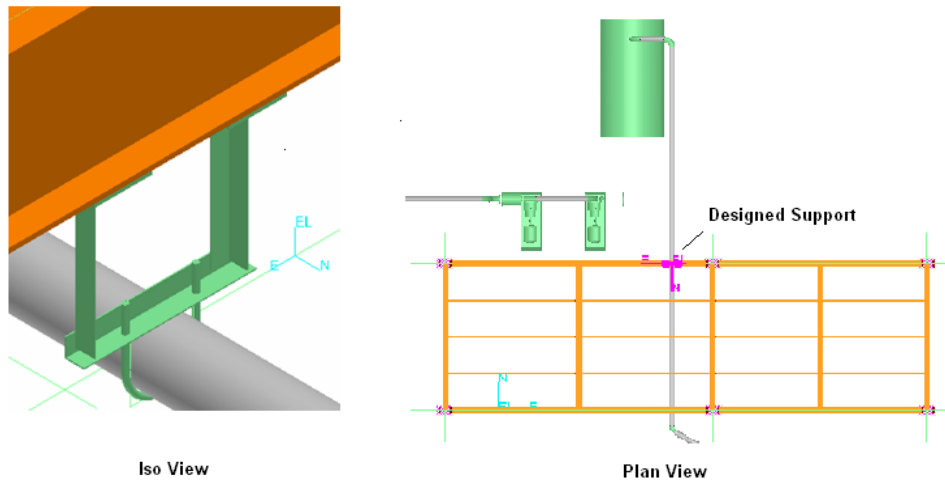


Figure 3: Final Output: Placed Designed Support U Bolt Anvil_FIG137_12

Before beginning the procedure:

- A standard support **U Shaped Frame L2x2x1/8 w/o Base plate** by structure, using the indicated pipe straight feature on pipeline **2001-P** and the indicated steel beam that crosses the pipe straight feature should have been placed by using the **Place Support by Structure** command. The placed support should resemble the highlighted support in Figure 4.

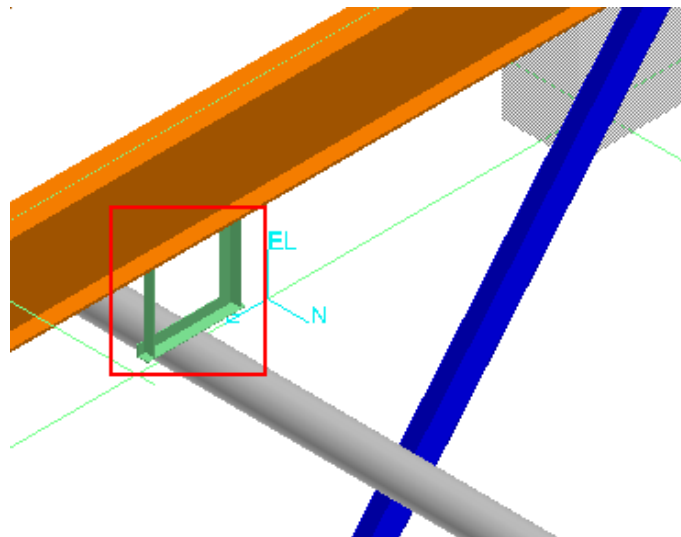


Figure 4: Placed Support by Structure: U Shaped Frame L2x2x1/8 w/o Baseplate

- Define your workspace to display Unit **U02** and coordinate system **U02 CS**.
- Make sure you are in the **Hangers and Supports** task and the Active Permission Group is set to **Piping**.

12. Click the **Place Part** button on the vertical toolbar.



Figure 5: Place Part Button

13. Select the standard support, **U Shaped Frame L2x2x1/8 w/o Baseplate**, in which you will place the new part, a U-bolt, as shown in Figure 6.

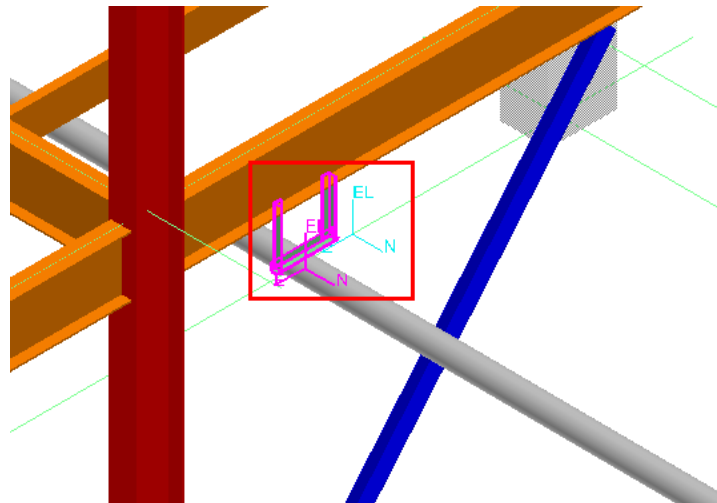


Figure 6: Selected Standard Support

The system prompts you with the following message:

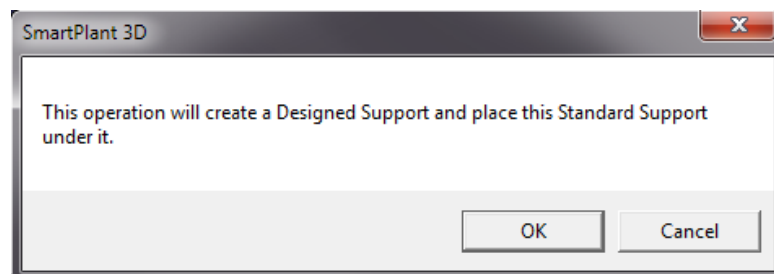


Figure 7: System Prompt

When you click **OK**, the system displays the **Select Part** dialog box.

14. In the **Select Part** dialog box, select expand the folder to **\Parts\Anvil\Pipe Clamps\U-Bolt** until you see that part **Anvil_FIG137_12**. Select the part **Anvil_FIG137_12** and then Click **OK** to add it to the support.

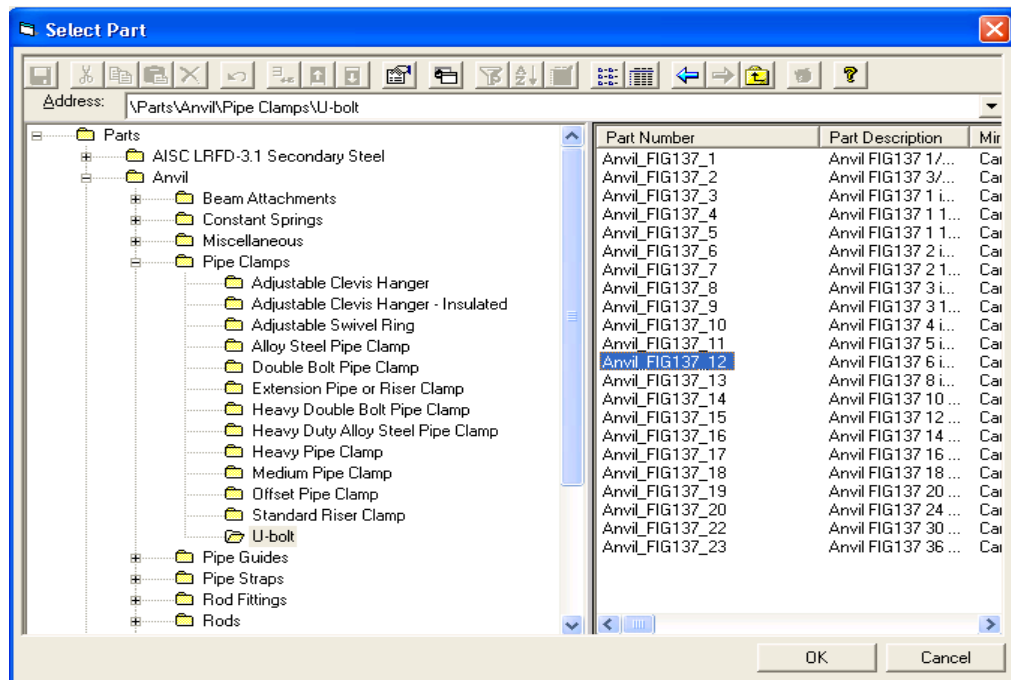


Figure 8: Select Part Dialog Box

- Position and orient the selected part, **Anvil_FIG137_12**, as shown in Figure 9. You can do this very easily using the up & down arrows to select the axis of orientation you would like the U-Bolt to rotate around (blue axis) and the left & right arrows to rotate the U-Bolt. After rotating the U-Bolt correctly with respect to the pipe and support, then you can move it to place it within the middle of the design green support box.

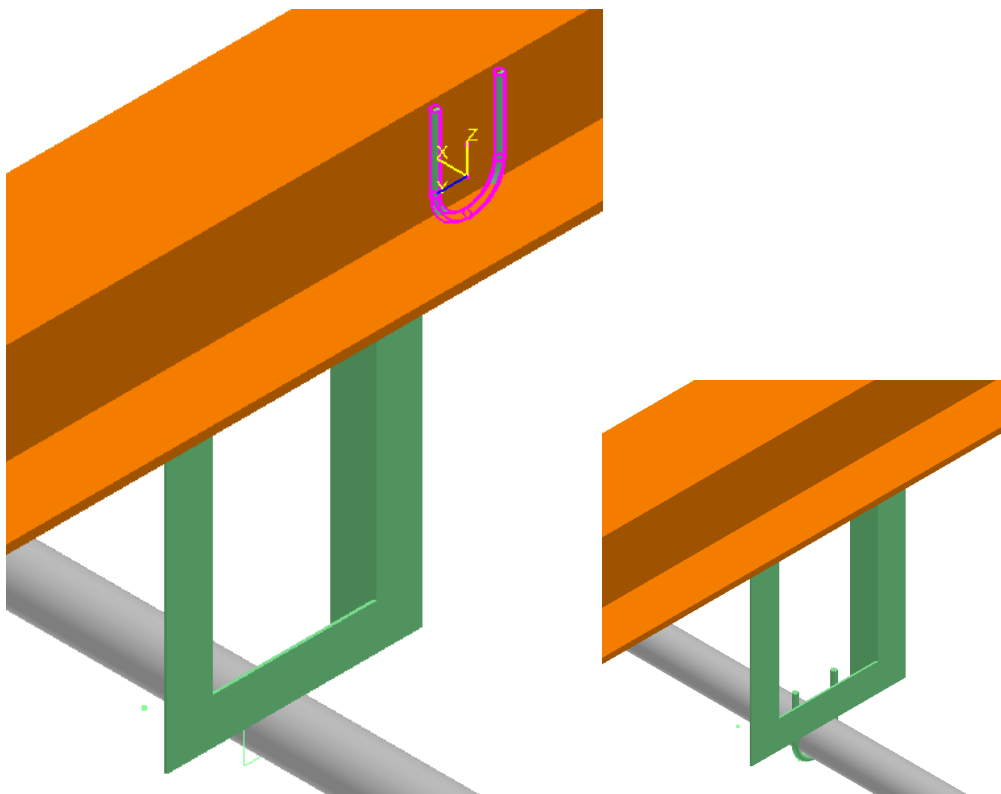


Figure 9: Designed Support Rotation Feature

Tips:

- You can toggle the placement point for the part by clicking the **Toggle Port** option on the **Place Part** ribbon or pressing the 't' key on the keyboard. Use the U-bolt port located at the center of the radius.
- If you are having trouble locating the key point of the designed support, toggle the SmartSketch surface locate option off by pressing F3 on the keyboard. F3 will toggle the surface locate option back on when you need to locate points on surfaces.

Steps for Creating a Designed Support and then Adding Parts to the Designed Support:

Exercise Objective: In this exercise you will be placing a designed support on pipeline **2001-P** and then manually select and position the individual parts of the support. The resulting support will resemble Figure 10 in standard Isometric view **Looking North-East**.

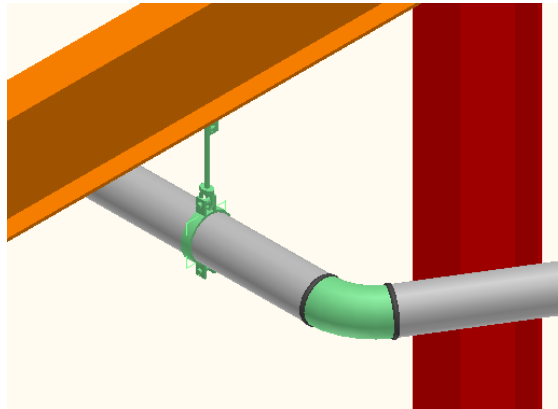


Figure 10: Designed Support with All Parts Placed Manually

Tip:

- This is just a simple example of manually placing parts to define a support assembly. You will typically have standard Catalog supports available for hangers such as these. Your Catalog administrator can arrange to have custom Catalog of support assemblies created for your specific project requirements.

Before beginning the procedure:

- Define your workspace to display Unit **U02** and coordinate system **U02 CS**.
 - Make sure you are in the **Hangers and Supports** task and the Active Permission Group is set to **Piping**.
1. Click the **Place Support by Structure** button, select the **Design** check box, and then locate the same straight feature in pipeline **2001-P** that you selected for the support in the previous exercise.

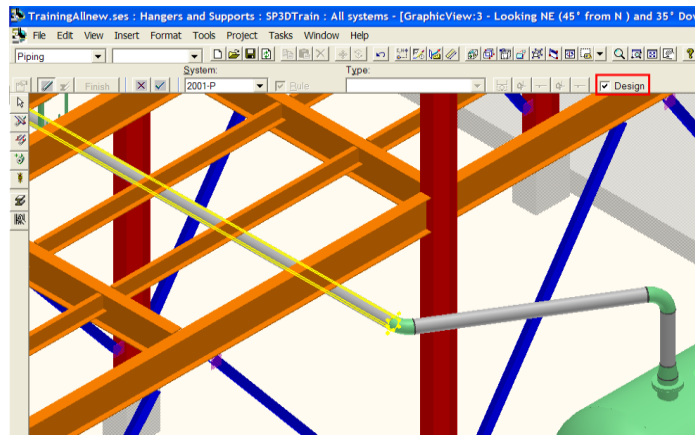


Figure 11: Select Pipe Feature

2. Click the **Accept** button on the ribbon to accept the selection and indicate that you have selected the features to be supported.
3. Select the crossing beam and accept the one selection. The highlighted green rectangle is the graphic for the designed support. Click **Finish** to commit the designed support to the database.

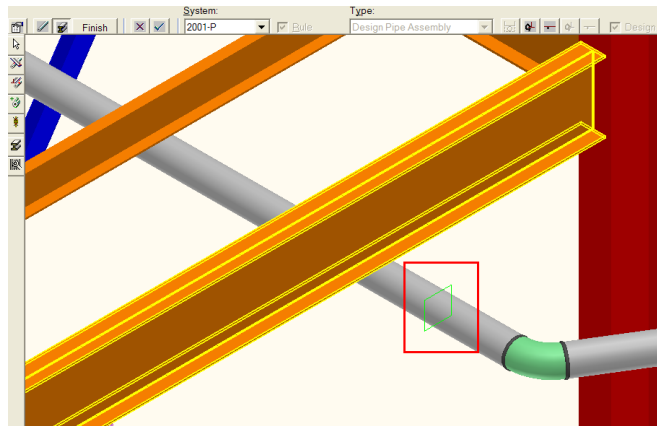


Figure 12: Designed Support Graphic

Note:

- In the current version of the software, you may need to reset the target by using the **PinPoint** ribbon before placing a part.
4. Click the **Place Part** button on the vertical toolbar to open the **Select Part** dialog box and then, expand the folder **\Parts\Anvil\Pipe Clamps\Medium Pipe Clamp** to select a pipe clamp, **Anvil_FIG212_12** for the 6 in diameter pipe.

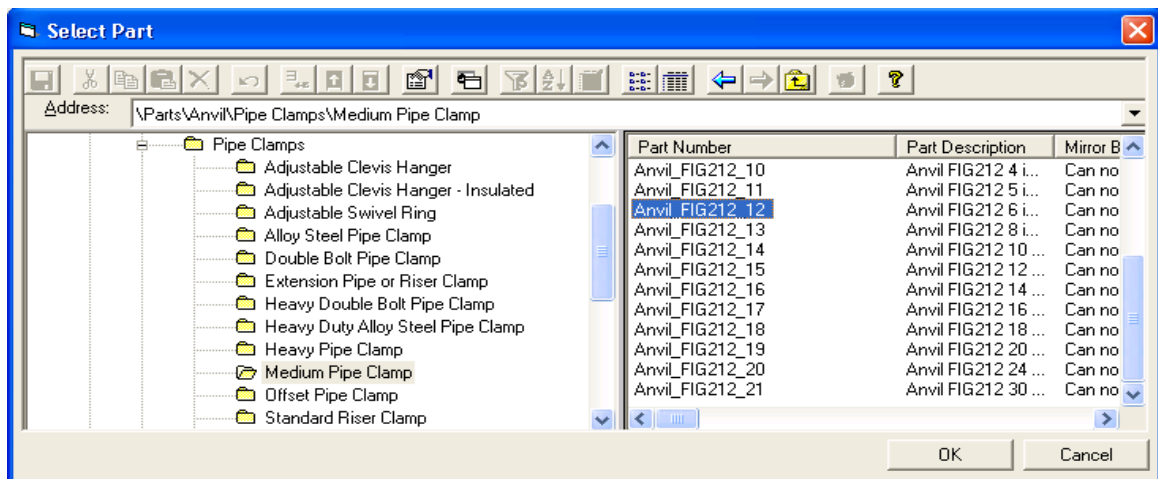


Figure 13: Select Pipe Clamp, Anvil_FIG212_12

- Position the pipe clamp at the designed support key point and use the arrows to orient the part on the pipe.

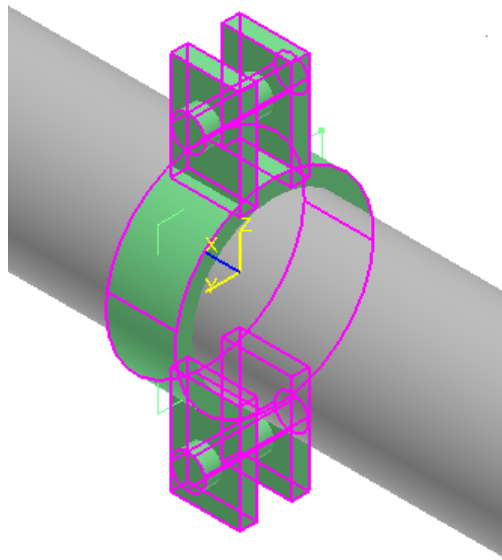


Figure 14: Pipe Clamp Anvil_FIG212 local coordinate system

- Click the **Place Part** button and select a rod fitting **Anvil_FIG290_4** under \Parts\Anvil\Rod Fittings\Weldless Eye Nut folder.

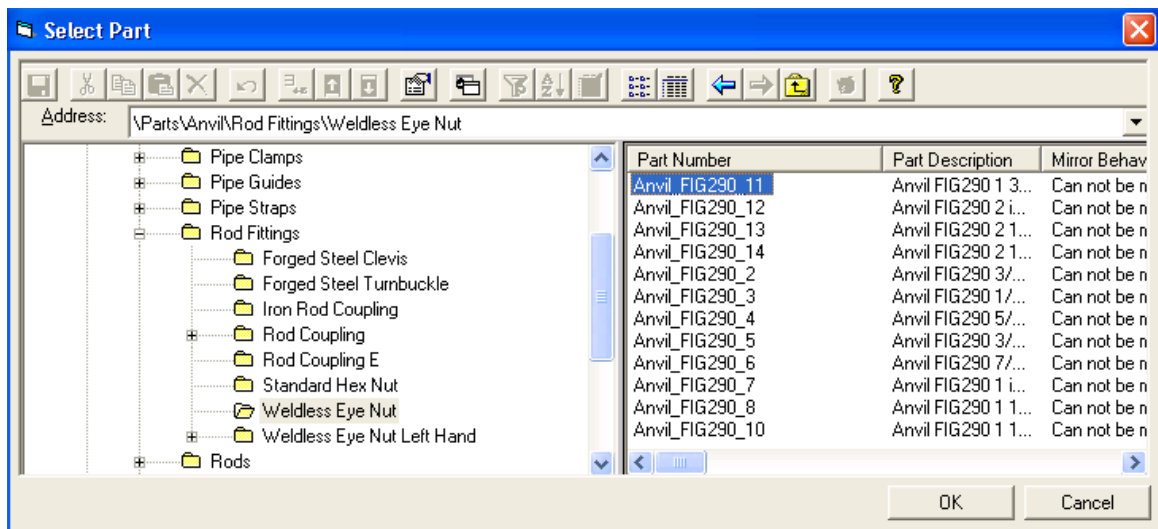


Figure 15: Select Rod Fitting, Anvil_FIG290_4

- Click the **Toggle Port** option on the ribbon to choose the port to connect the pipe clamp as shown in Figure 16 (2). Position relative to the appropriate key point on the pipe clamp.

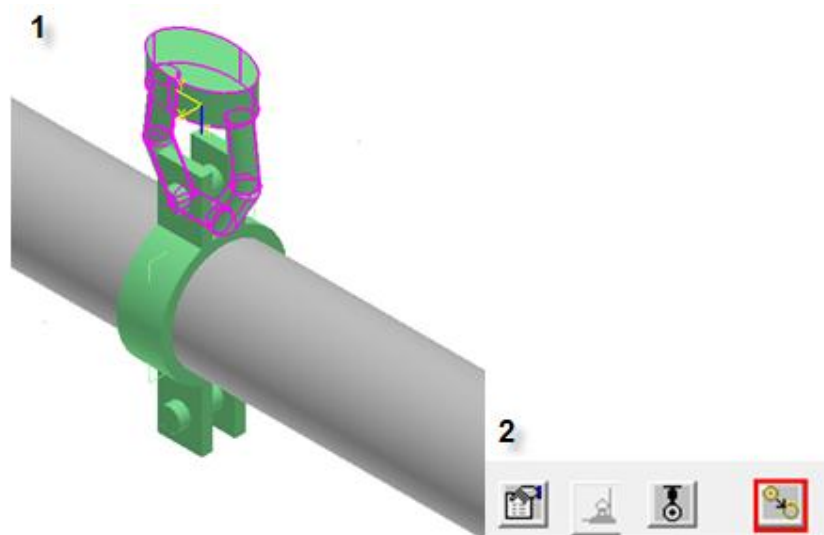


Figure 16: (1) Eye Nut Local Coordinate System. (2) Toggle Port Option icon

- Click the **Place Part** button and select the rod, **Anvil_FIG140_4** under **\Parts\Anvil\Rods\End Threaded Rod Right Hand Thread** folder.

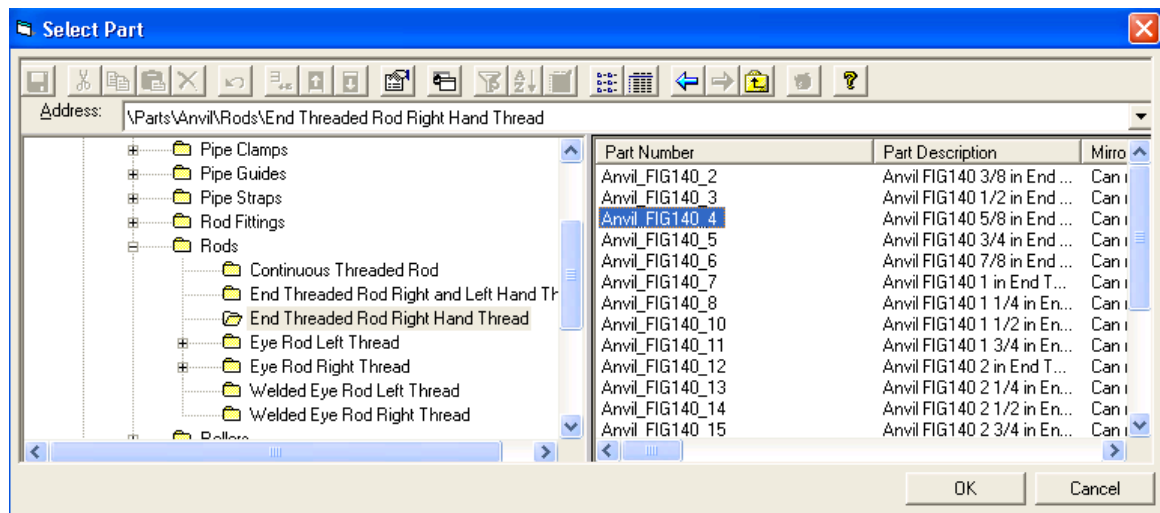


Figure 17: Selected Rod, Anvil_FIG140_4

Tips:

- This part is a type whose length is defined by the identification of two points during placement. You are prompted to locate these points after you select the part.
 - Locate key points on the support parts and structure when you position the part.
9. Enter two points to place the rod. One point on the rod fitting (eye nut) and one point in space vertically above the first point (locate the vertical axis with SmartSketch and click).

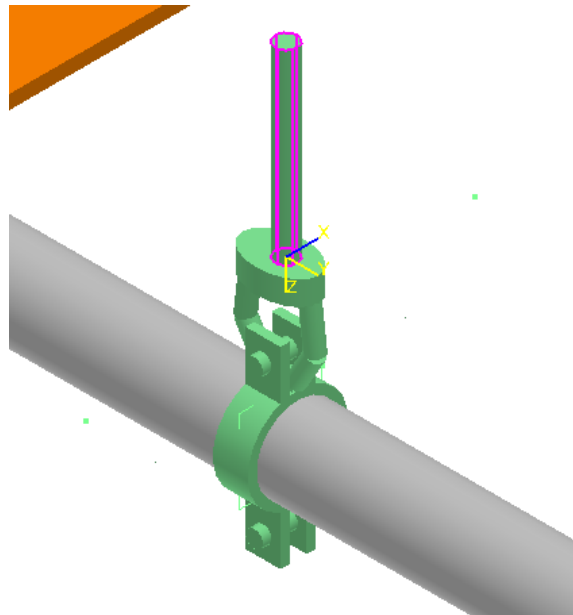


Figure 18: Place Rod

Tips:

- This part is a type whose length is defined by the identification of two points during placement. You are prompted to locate these points after you select the part.
- When you select the type of support parts that stretch, the **Edit** ribbon for the part will show the **Stretch** option. When you click the option, you can edit the location of the ends of the part. The **Toggle Port** option appears when you select the **Stretch**

option. This allows you to choose the port of the stretchable part you want to move.

10. Rotate the view so that you can click the bottom surface of the beam. Use PinPoint to lock the East and North coordinates to the location at the end of the rod and then select the surface of the beam.
11. Click the **Place Part** button and select a rod fitting **Anvil_FIG66_4** under **\Parts\Anvil\Beam Attachments\Welded Beam Attachment** folder. Position relative to the appropriate key point on the beam attachment.

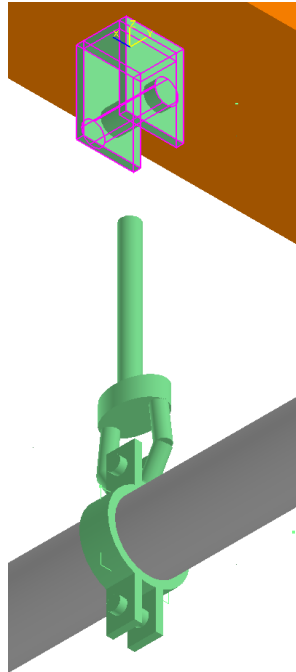


Figure 19: Beam Attachment Placing

12. Select the rod and then select the **Stretch** smartstep on the **Edit** ribbon. Select the key point on the beam attachment to define a new length for the rod.

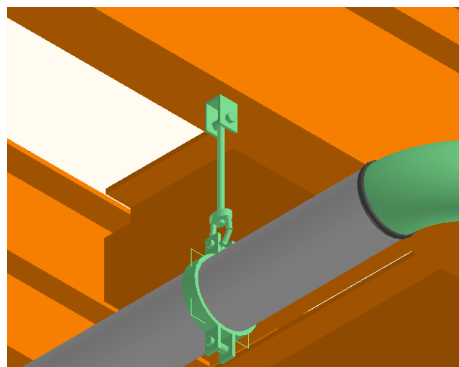


Figure 20: Stretch Rod and Attach to Beam Attachment

Manipulating Parts in a Designed Support:

You manipulate the position and orientation of the parts in a designed support by using the **Move** and **Rotate** commands on the **Common** toolbar. The support parts have appropriate key

points that you can reference for precise positioning.

The parts you place by using the **Place Part** command do not establish associative positioning relationships. If you move one part, the others will not move even if you have referenced a key point when you positioned the part. All parts of the designed support will move if you select the designed support (the system parent of the support parts) and move it.

The following examples illustrate how to use the key points in conjunction with the **Move** and **Rotate** commands to position and orient the parts.

Notice that the beam attachment in Figure 21 should be rotated to give free movement in direction of the pipe expansion. Select the beam attachment part you placed in the previous exercise and rotate it **90 deg** to give the result shown in Figure 21.

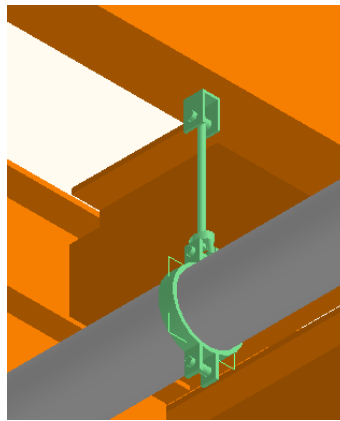


Figure 21: Rotated Beam Attachment

Tips:

- The **Rotate** command automatically sets the origin of the rotation to the origin of the hanger part. In this case, the origin is at center of the beam attachment.
- Make sure the vertical axis is highlighted as the axis of rotation.
- It is much easier, of course, to have standard supports that position and orient the parts automatically. These examples could be achieved with customized standard supports.

Exercise Objective: In this exercise you will be placing a lug on an elbow that is rotated relative to the unit's auxiliary coordinate system. The example is chosen to illustrate the manipulation of the part's position using the **Move** and **Rotate** commands and the key points of the part. The end result of the designed support and single part placement is shown in Figure 22.

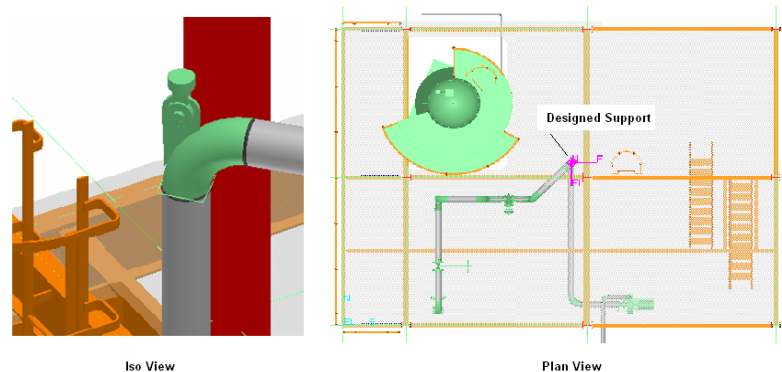


Figure 22: Final Position of Elbow Lug

1. Define your workspace to include system **A2 > U03** and **U03 CS** (including nested objects).
2. Make sure you are in the **Hangers and Supports** task and the Active Permission Group is set to Piping.
3. Place a designed support by point selecting the elbow on pipeline **U03/Water/300-W**, as shown in Figure 23.

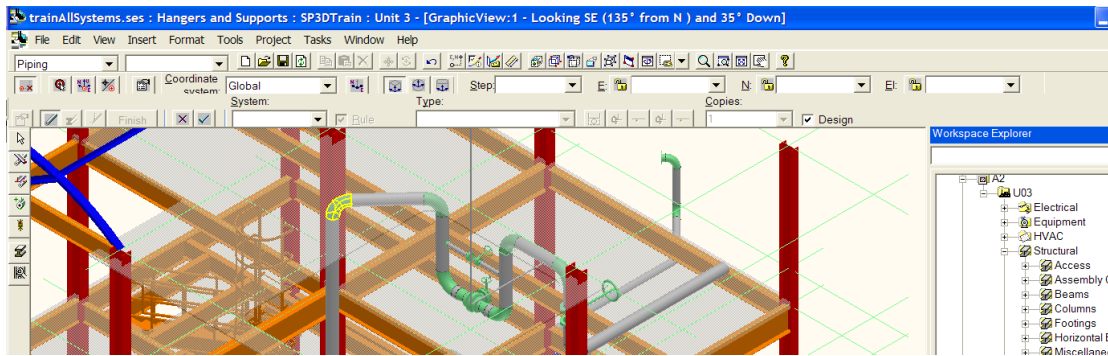


Figure 23: Selected Elbow

4. Select the slab as the supporting structure, as shown in Figure 24.

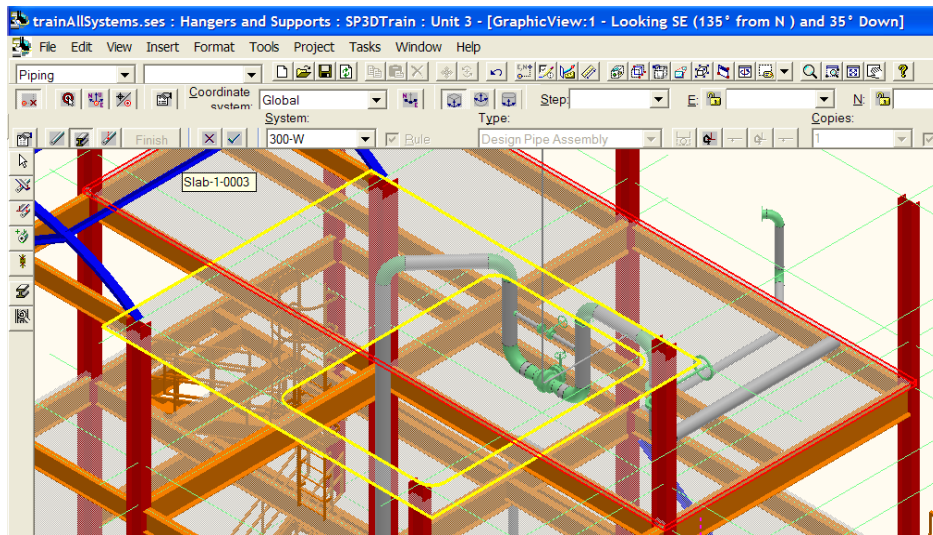


Figure 24: Selected Supporting Structure

5. Position the designed support at the vertical port face of the elbow.

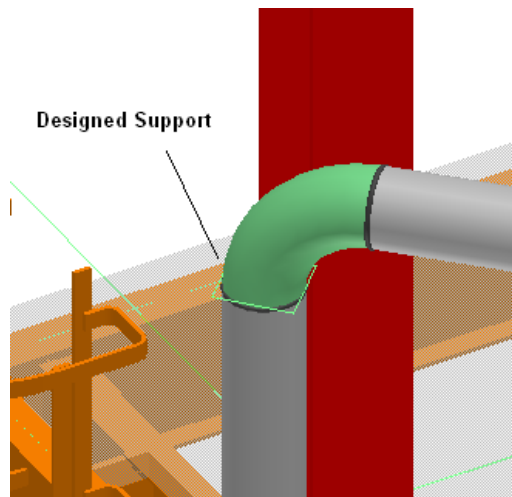


Figure 25: Position of the Designed Support

Tips:

- Notice that the helper graphics for the designed support are oriented with the plane of the elbow. These graphics can be used to help position parts during placement.
6. Create a temporary coordinate system for PinPoint by using the **By Three Points** method and align the Easting (x) axis with the plane of the turn and the elevation in the global vertical.



Figure 26: PinPoint Ribbon

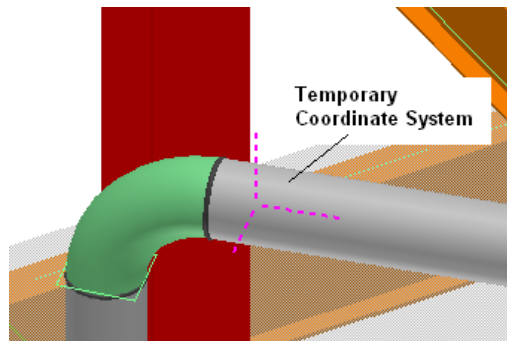


Figure 27: Temporary Coordinate System by Three Points

Tips:

- Lock PinPoint elevation when pointing at the pipe straight feature (F8) and then click to far side to make North (y) axis parallel to global plan plane and Elevation axis pointing in global up direction.
- Optionally, you can reposition the target of the active coordinate system. The elevation value should be same for the three points.
- Parts are placed by default, oriented with the active coordinate system axes. The active coordinate system should be selected so that the rotations you will need to apply to the part are about the axes of the active coordinate system. It does not matter where the origin of the temporary coordinate system is located.
- When selecting the points for the temporary coordinate system, toggle the

surface locate off by using the F3 function key. This will prevent SmartSketch from locating the surface of the slab. Optionally, you can hide the slab. All figures shown here are looking at the elbow through the transparent slab.

7. Click the **Place Part** button, select the designed support you just created, and then select the **Parts/Utility/Miscellaneous/HgrElbowLug** part class.

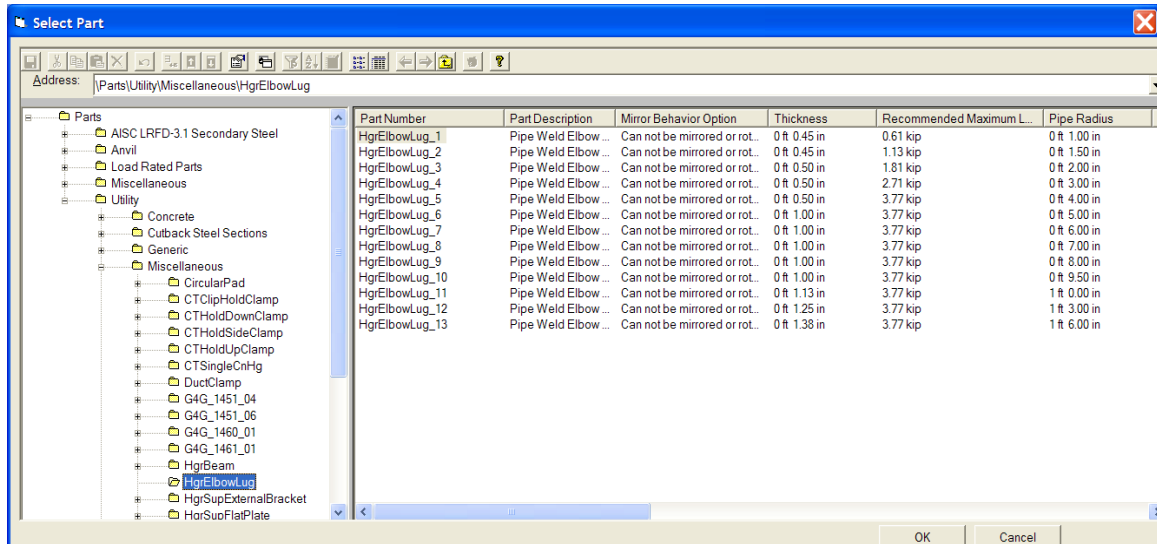


Figure 28: Selected Hgr Elbow Lug Part Class

Tips:

- If you just select the part class (in this case **HgrElbowLug**) and the **OK** button is enabled, then the part has an **Automatic Selection Rule**. You can leave the selection on just the part class to allow the software to select the right specific part by rule.
 - Optionally, you can select the specific part.
8. Click the **Support Properties** smartstep on the placement ribbon and enter the radius of the long-radius elbow ($1.5 \times \text{NPD} = 16.125 \text{ in}$) in the **Bend Radius** dimension property of the lug.

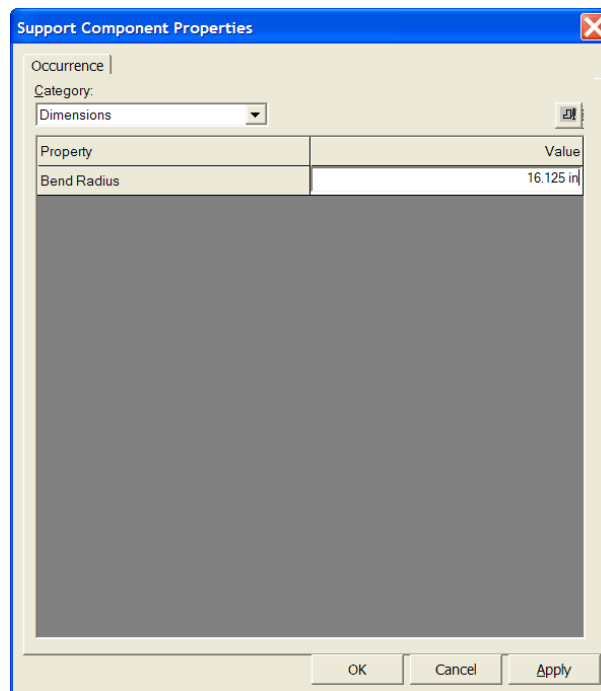


Figure 29: Define Elbow Bend Radius

9. Toggle the key point being used for placement from the center of radius to the point that corresponds to the horizontal port of the elbow.

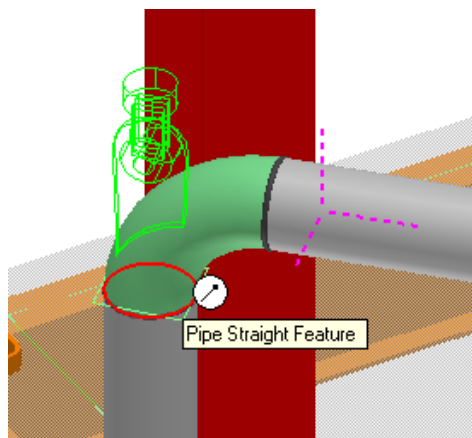


Figure 30: Initial Horizontal Port of the Elbow

Tips:

- This illustrates the general idea that the parts have key points at locations that are useful for positioning the parts.
- If you forget to toggle the placement key point before you place the part, you can use the **Move** command to reposition the part.

Depending on how you place the temporary coordinate system, the **HgrElbowLug** support may need to be rotated. If the temporary coordinate system is oriented, as shown in Figure 31, then you have to rotate the support.

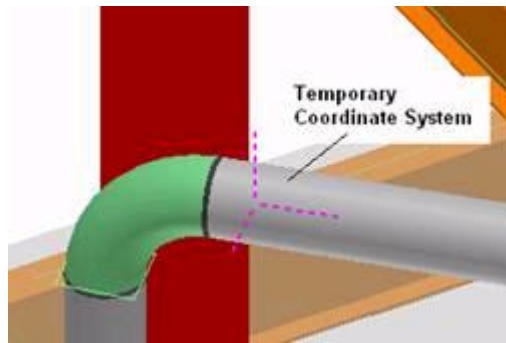


Figure 31: Temporary Coordinate System

If the temporary coordinate system is oriented, as shown in Figure 32, then you do not have to rotate the support.

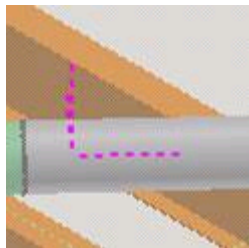


Figure 32: Temporary Coordinate System

10. Click the **Rotate** button on the **Common** toolbar to rotate the part into position. The default rotation point is the origin of the part's local coordinate system. In this case, this is not the desired rotation point. Select the **Axis Position Point** toggle to move the rotation point.

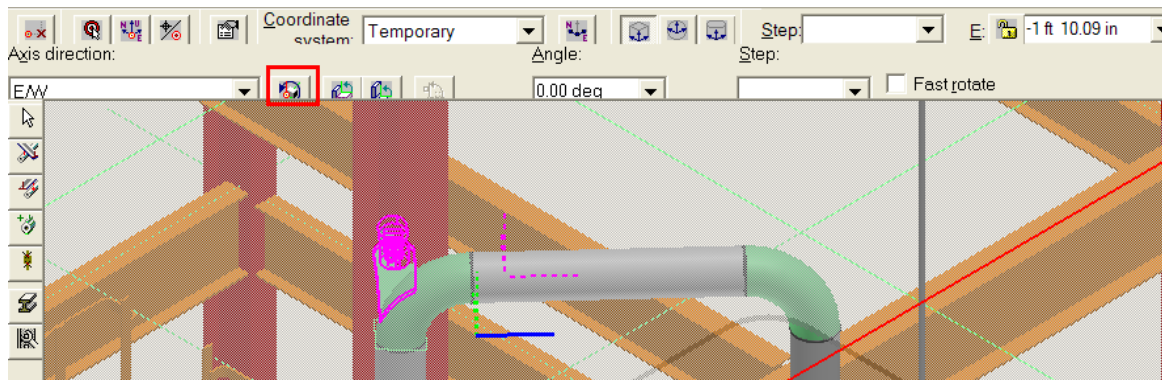


Figure 33: Select the Axis Position Point Button to Move Rotation Point

11. Select the port of the elbow (or the end of the straight feature) as the rotation point.

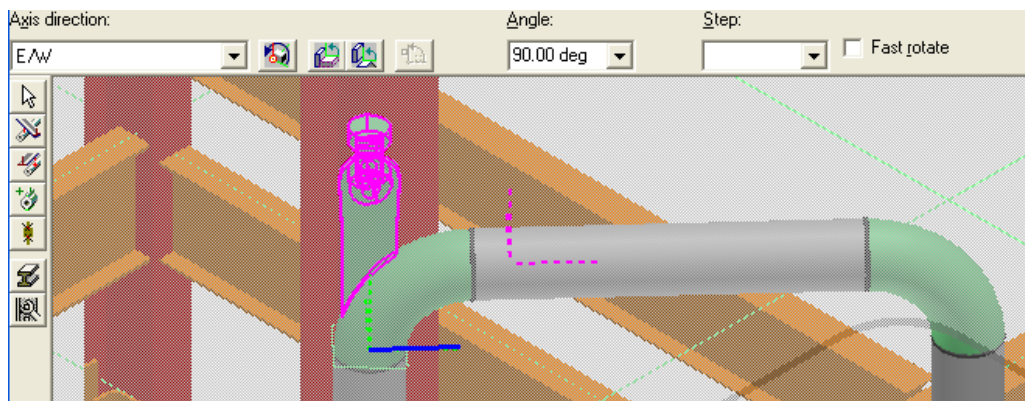


Figure 34: Rotate Part 90 Deg About Active Coordinate System East(x) Axis

Tips:

- The rotation axis is highlighted. You can change the rotation axis by selecting in the **Axis direction** drop-down list or selecting the axis or another linear element in the graphic view.
- Refer to the *Common* sessions for more information on the **Move** and **Rotate** commands.
- You can finish building the support by adding a rod and a beam attachment part as an extended exercise.

For more information related to building designed support, refer to the following topics in the user guide *HangersSupportUsersGuide.pdf*:

- *Place Support by Structure Command*
- *Place Support by Point Command*
- *Place Part Command*

Session 6: Editing Supports

Objective:

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

- Edit the existing standard supports, designed supports, and support parts.

Prerequisite Sessions:

- S3D Overview
- S3D Common sessions
- Hangers and Supports: An Overview
- Placing Supports Positioned by Supporting Structure
- Placing Supports Positioned by Point

Overview:

You can edit supports in the following ways:

- **Modify properties:** You can edit the reporting and other management properties of both the standard and designed supports. You can edit the dimensions of the standard support that control the size of the parts in the standard support. You can edit the individual properties of parts within designed supports.
- **Select different inputs:** You can select different supported route features and different supporting structure.
- **Move:** You can move a support positioned by point by using the **Move** command or by entering the position smartstep on the **Edit** ribbon. You must select a different structure to move a support positioned by structure.
- **Copy:** You can copy a standard and designed support, and support parts to a different location.
- **Delete:** You can delete the standard and designed support. You cannot delete a part from a standard support because the parts are controlled by the standard support. You must convert the standard support to a designed support to delete a part.

Steps for Adding Supported Features to a Support:

You will copy/paste a pipe run to create a new pipe run in pipeline **2001-P** in Unit **U02**. You will then extend the U-frame pipe support, **U Shaped Frame L2x2x1/8 w/ Baseplate**, to include an additional pipe. After the new pipe is created and the support is extended, it will resemble the support, as shown in Figure 1.

Note:

- You can create the new shaped frame by using the same procedure in *Placing Supports Positioned by Structure* session.
- The new pipe you create by copy/paste is just used for this example and is not part of the training plant design. You will delete it later.

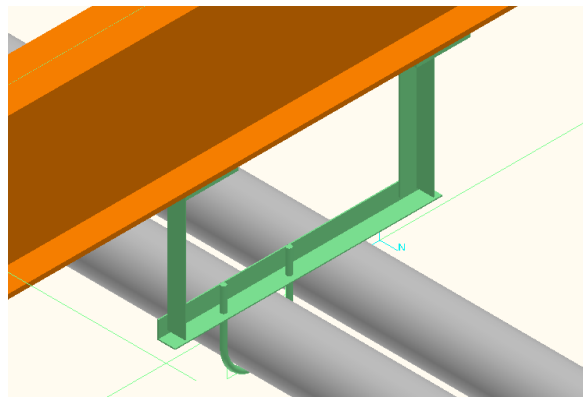


Figure 1: Output: Support Extended for Additional Pipe

Before beginning the procedure:

- Define your workspace to display Unit **U02** and coordinate system **U02 CS**.
 - Make sure you are in the **Hangers and Supports** task.
1. Set the filter to **All** in the **Locate Filter** drop-down list and select the pipe run **2001-P** that is supported by the U shape frame support.
 2. Activate the **PinPoint** ribbon by using the **Tools > PinPoint** command.
 3. Click the **Relative Tracking** option on the **PinPoint** ribbon.
 4. Click the **Copy** command in the shortcut menu to copy the pipe run at a distance 10 in west from original location.

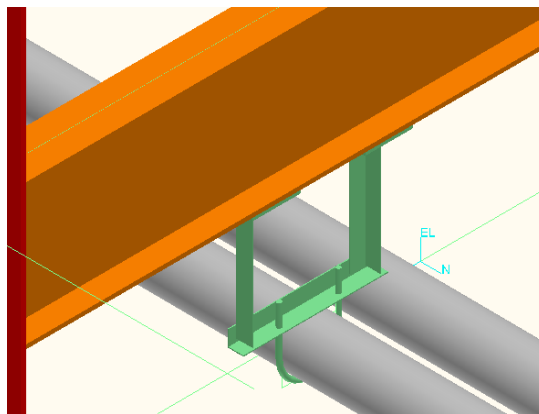


Figure 2: New Pipe Run Created

5. S3D prompts you to select the reference point within the selected set of objects. Select the key point located where the pipe and the support touch.
6. Click the **Paste** button on the **Common** toolbar.
7. The **Paste** dialog box appears. Keep the parent system for piping as **2001-P**. Clear the **Paste in place** option in the **Paste** dialog box to paste the copied objects in different location and click **OK**.
8. Key in the following coordinates on the **PinPoint** ribbon to specify the position of the

new pipe run.

- East: -10 in
- North: 0 ft
- Elevation: 0 ft

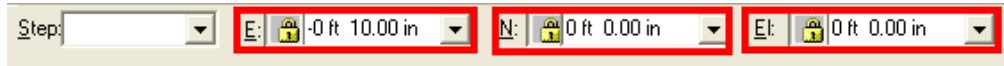


Figure 3: PinPoint Ribbon

- Click in the graphic view to accept the placement of the pipe run.
- Set the filter to **Support** option in the **Locate Filter** drop-down list.



Figure 4: Locate Filter drop-down list

- Select the standard U-frame support that is nested under the designed support, select the select straight feature smartstep, and select the straight feature of the new pipe run to add it to the support. Accept the selection and click **Finish**.

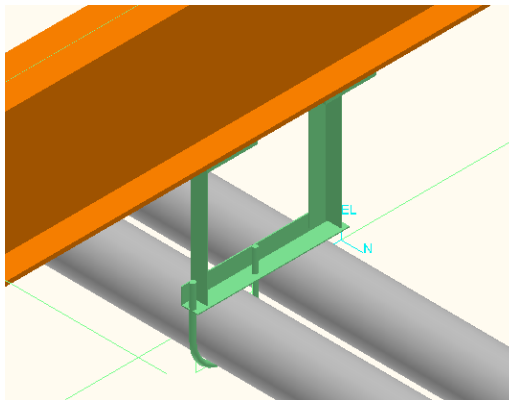


Figure 5: Second Pipe Added to Standard Support

Notes:

- Before clicking **Finish**, make sure the original designed support is still the system parent of the standard support.
 - Adding the straight feature to the standard support repositions the support and adds key points at the center of the pipe. You will use this key point later to position another U-bolt.
- Click the **Settings** option on the **Support Placement** ribbon to edit the properties of the support.



Figure 6: Settings Option on the Support Placement Ribbon

- The **Support Properties** dialog box is displayed. Change the span of the support to 2 ft, and click OK.

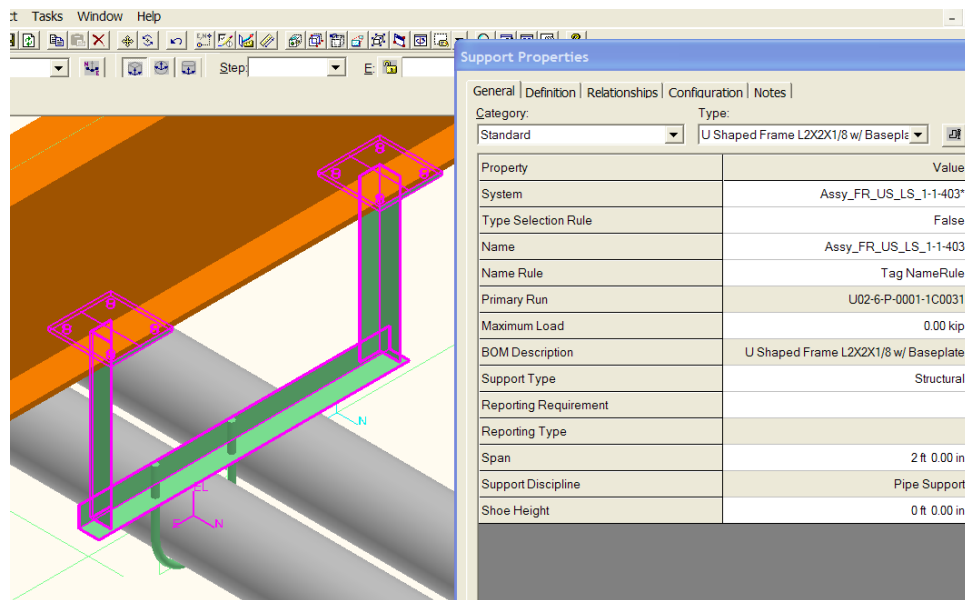


Figure 7: Support Properties Dialog Box

Notes:

- You can specify options to include pipe support parts in the same spool as the components to which they are welded. The supports must have the **Fabrication Requirement** property set to **By fabricator**, the **Fabrication Type** set to **Shop fabricated**, and the **Fabrication Responsibility** set to **By Piping**. These properties are set in the **Support Properties** dialog box under the **Fabrication and Construction** and the **Responsibility** categories on the **General** tab.
- Your Catalog administrator can set defaults on your supports so that supports that include parts welded to the pipe are always placed with these property values set.

Steps for Copying and Pasting Supports:

Exercise Objective: In this exercise you will be copying and pasting the **U-bolt** in the designed support of the previous exercise to the adjacent Straight pipe, *as shown in Figure 8*.

Notes:

- In S3D you can copy and paste an entire support **assembly** or just a support **part**.

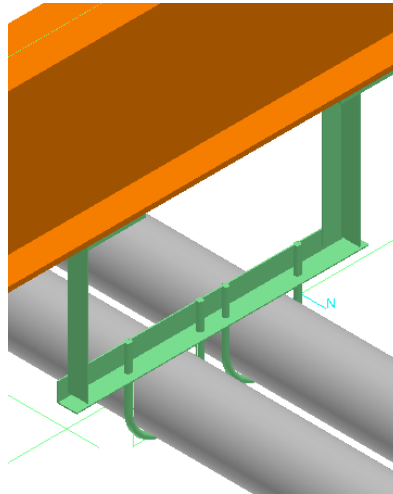


Figure 8: Output: Pasted Support

1. Set the filter to **Support Component** in the **Locate Filter** drop-down list.
2. Select the U-bolt (part number **U Bolt Anvil_FIG137_12**).
3. Click the **Copy** command.
4. The **Copy** command prompts you to select the reference point within the selected set of objects. Select the key point located where the pipe and the support touch.
5. Click the **Paste** command to paste the objects.
6. The **Paste** dialog box appears. In this dialog box, you define inputs needed by the objects you are pasting. All design objects will at least require a system parent. In this case, paste the U-bolt to the same parent designed support system. Make sure that the **Paste in place** option in the **Paste** dialog box is cleared to paste the copied objects in different location. Click **OK**.

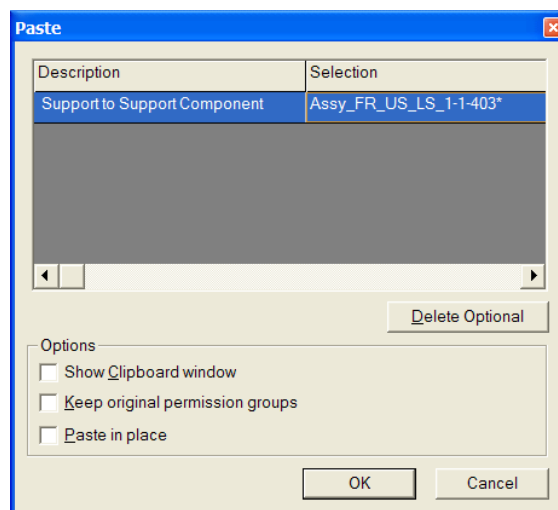


Figure 9: Paste Dialog Box

You can change the system by highlighting it in the **Paste** dialog box and selecting a different support system from the **Workspace Explorer**. The parent system will be highlighted in the

Workspace Explorer corresponding to the selection in the **Paste** dialog box.

7. Paste the U-bolt using the keypoint of the U-frame support located where the pipe and the support touch.

Steps for Deleting Supports in a Model:

Delete the designed support you have just created.

1. Select the **Support** option in the **Locate Filter** drop-down list.
2. Position your cursor over the U-frame support and pause. The **QuickPick** dialog box displays. Highlight the options and select the designed support. The designed support is the system parent of the U-frame assembly and the two U-bolt parts.

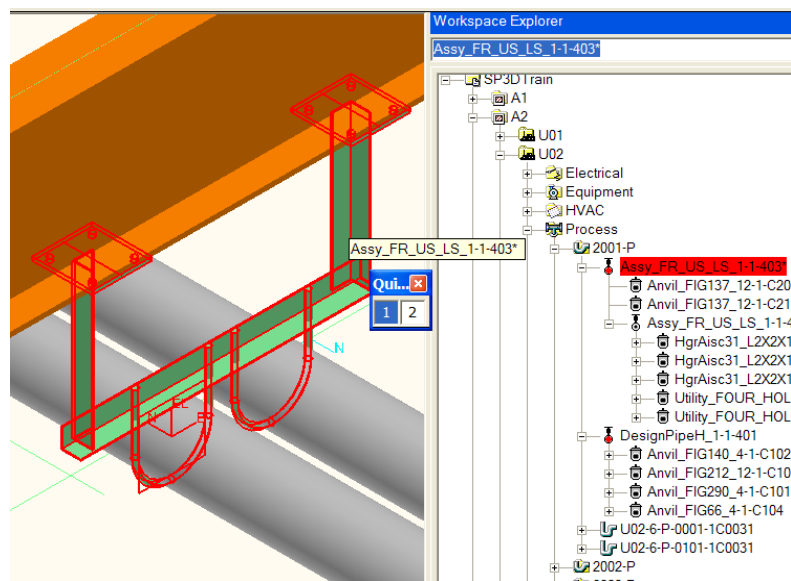


Figure 10: Selected Designed Support

3. Click the **Delete** button on the **Common** toolbar to delete the designed support and all objects nested in the system hierarchy under it.
4. Set your select filter to **All** and select the pipe run you created in this exercise and delete it.

For more information related to manipulating supports, refer to *Editing Supports* topic in the user guide *HangersSupportUsersGuide.pdf*.

Session 7: User Defined Forums

Objective:

By the end of this session, you will have a clear view of user defined forums and their usage in placing hangers content, parts and supports as well as editing attributes after they have been placed.

Prerequisite Sessions:

- S3D Overview
- S3D Common sessions
- Hangers and Supports: An Overview
- Placing Supports Positioned by Supporting Structure
- Placing Supports Positioned by Point
- Placing Supports by Reference

Overview:

User defined forms are a more friendly way in presenting important occurrence variables of parts and assemblies during placement and editing. With user defined forms, the user will have better understanding of the attributes of parts and assemblies prior to placement. As was explained earlier in the training, these properties can also be accessed through the property pages of parts and assemblies, however, with a user defined form these occurrences are presented in a clearer and easier way to deal with and understand.

Only a very limited set of parts and assemblies delivered with S3D have User Defined Forms already developed. This part of the tutorial will show these forms in action. It is the responsibility of the customer to create User Defined forms for the parts and assemblies they use most and see the need for a more user friendly placement dialog. Your Administrator should be able to create the User Defined forms you need.

Steel Parts User Defined Forums:

Exercise Objective: In this exercise you will be placing RichSteel W section using the pipe straight feature 2001-P.

Before beginning the procedure:

- Define your workspace to display Unit **U03** and coordinate system **U03 CS**.
 - Make sure you are in the **Hangers and Supports** task and the Active Permission Group is set to **Piping**.
-
- 1- Place a designed Support using Place by Point as explained earlier in this document.
 - 2- Click on the designed support and place the any part from the W sections under AISC LRFD-3.1 Steel. Let us say W40X183 AISC-LRFD-3.1 as shown in Figure 1.

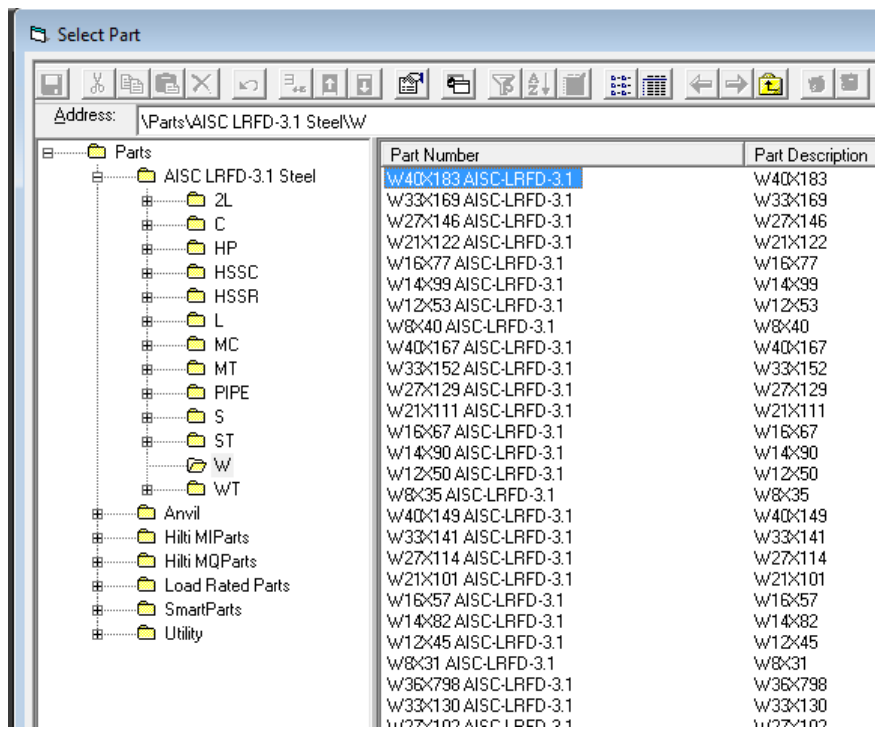


Figure 1: The drop down list of the selected steel part.

- 3- After selecting the above shown part, a box will pop up showing the important occurrences of the selected part and allowing the user to alter them prior to placing the steel part. This box is what is called User Defined PIPE Forums for Steel Part as shown in Figure 2.

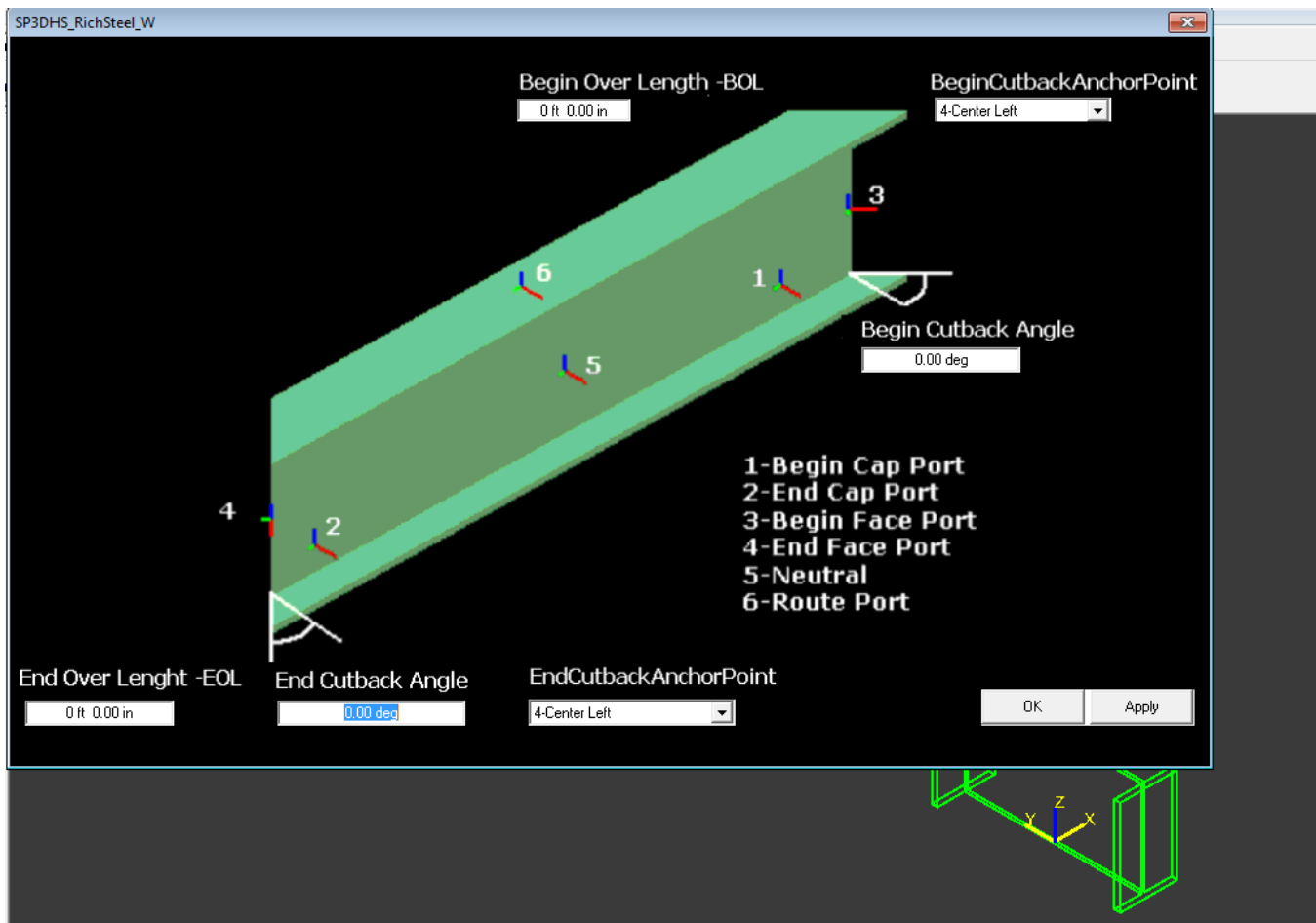


Figure 2: User Defined Forums for steel part.

As it can be noticed from Figure 2 that the user defined form includes the important properties for the steel part and gives the user the ability to easily alter them. These occurrences are:

- 1- Begin Over Length
- 2- End Over Length
- 3- End Cutback Angle
- 4- Begin Cut Back Angle
- 5- EndCutBackAnchor Point
- 6- BeginCutBackAnchor Point

Also, the user defined form shows the ports on the steel part.

Frame Support User Defined Forms:

Exercise Objective: In this exercise you will be placing a Standard Support which has a User Defined form, using the pipe straight feature **2001-P**.

Before beginning the procedure:

- Define your workspace to display Unit **U03** and coordinate system **U03 CS**.

- Make sure you are in the **Hangers and Supports** task and the Active Permission Group is set to **Piping**.
- 1- Place a standard Support using Place by Point as explained earlier in this document.
 - 2- Click on the U-FrameL_001 under L Section Frames as shown in Figure 3.

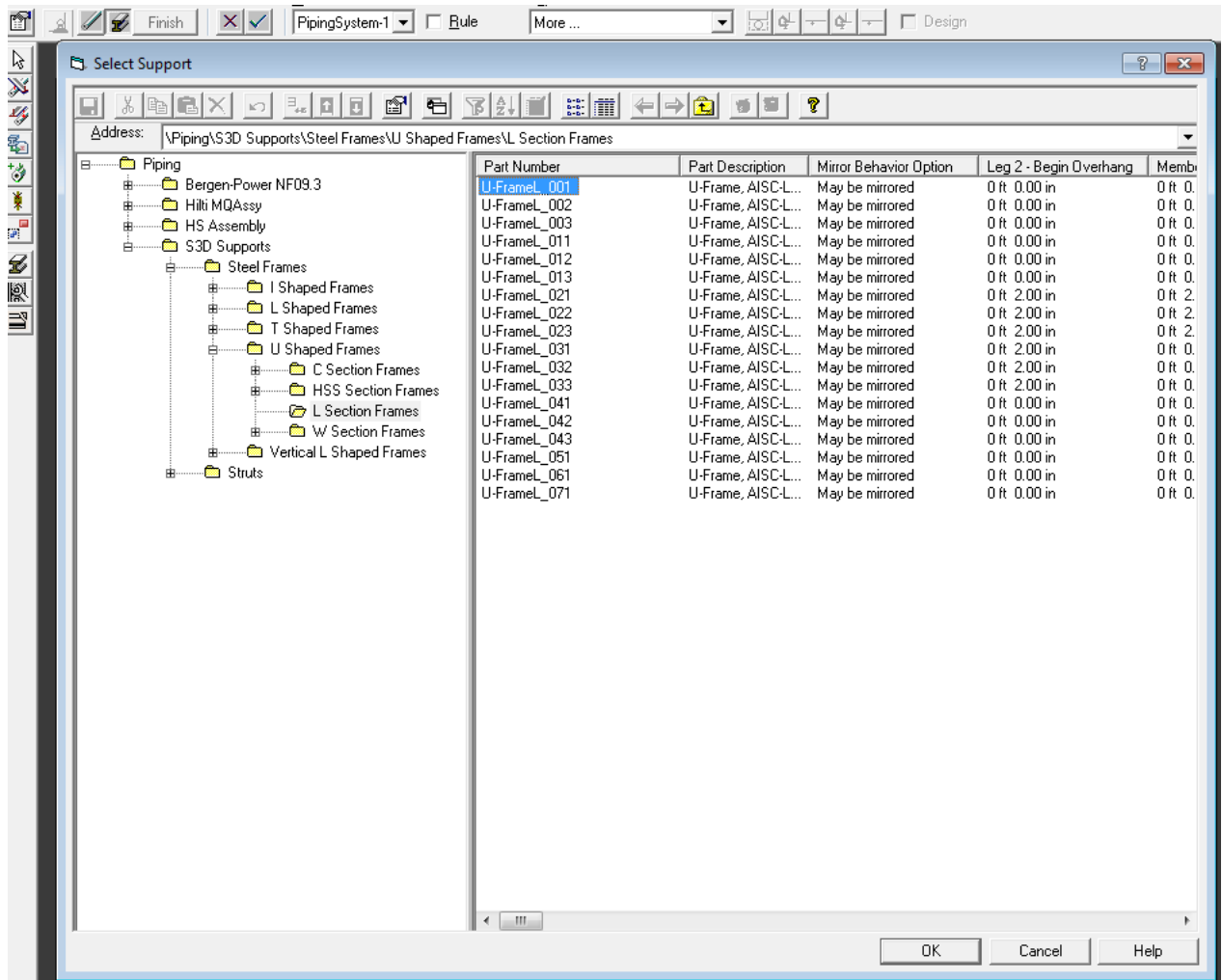


Figure 3: The drop down list of the selected support.

- 3- After selecting the above shown support, a box will pop up showing the important occurrences of the selected support and allowing the user to alter them prior to placing the support. This box is what is called User Defined Forums for frame support as shown in Figure 4.

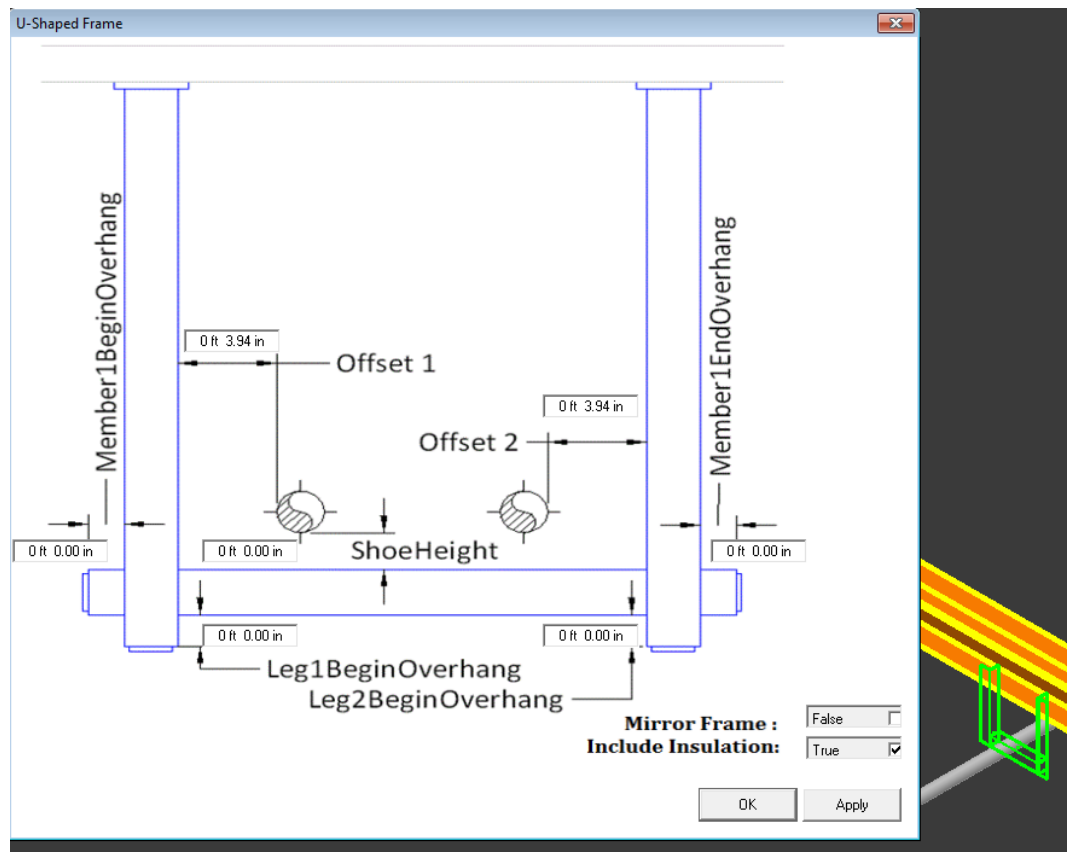


Figure 4: User Defined Forums for frame support.

As it can be noticed from Figure 4 that the user defined forum include the important occurrences for the frame support and give the user an access to alter them. These occurrences are:

- 1-Member1BeginOverHang
- 2-Member1EndOverhang
- 3-Shoe Height
- 4-Leg1BeginOverhang
- 5-Leg2BeginOverhang
- 6-Offset 1
- 7-Offset 2