

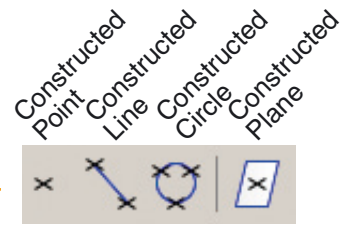
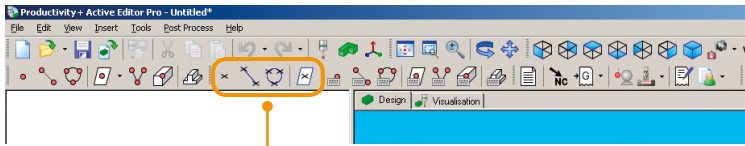
Constructed features

The Constructed Statements toolbar within Productivity+™ Active Editor Pro allows the creation of 'virtual' elements based on positioning information determined from previously measured features.

This module demonstrates how to create the range of available constructed features: constructed point; constructed line; constructed circle; constructed plane

Having completed this module you will be able to:

- Generate constructed point, line, circle and plane features using previously measured feature data

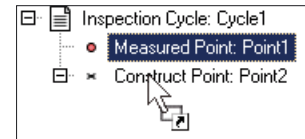


The constructed features toolbar allows the generation of 'virtual' features by using previously established position data.

This position data can be determined from measured features or other constructed features that have been generated earlier in the Productivity+™ Active Editor Pro program.

To create a constructed feature:

- Ensure the elements required to create the feature already exist within the Productivity+™ Active Editor Pro program
- Add an element from the Constructed Feature toolbar (available options are point, line, circle or plane)
- Drag and drop the necessary existing elements onto the constructed feature element (when the cursor changes to a rectangle and an arrow, release the mouse button)
- Open the constructed feature element and add any required offsets (as appropriate, depending on constructed feature type)

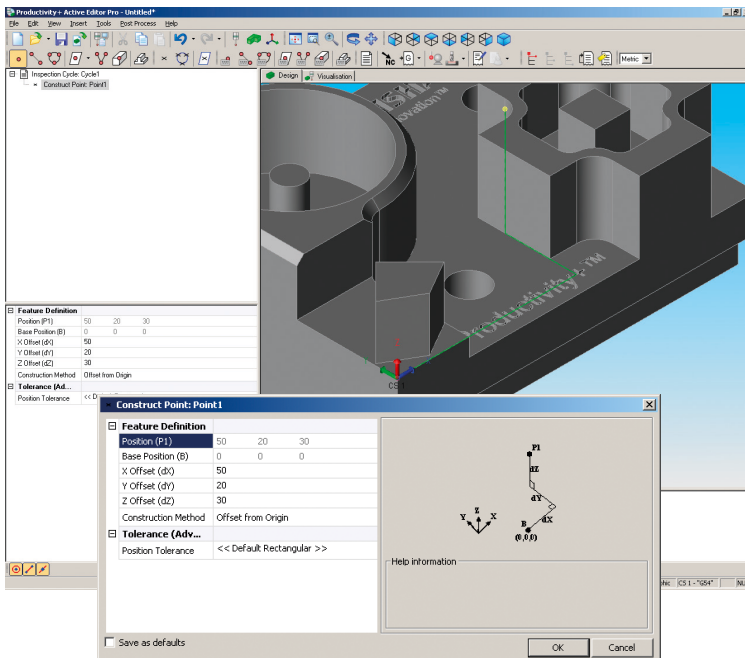


This document contains information the various methods available to create:

- Constructed points
- Constructed lines
- Constructed circles
- Constructed planes

Constructed Point

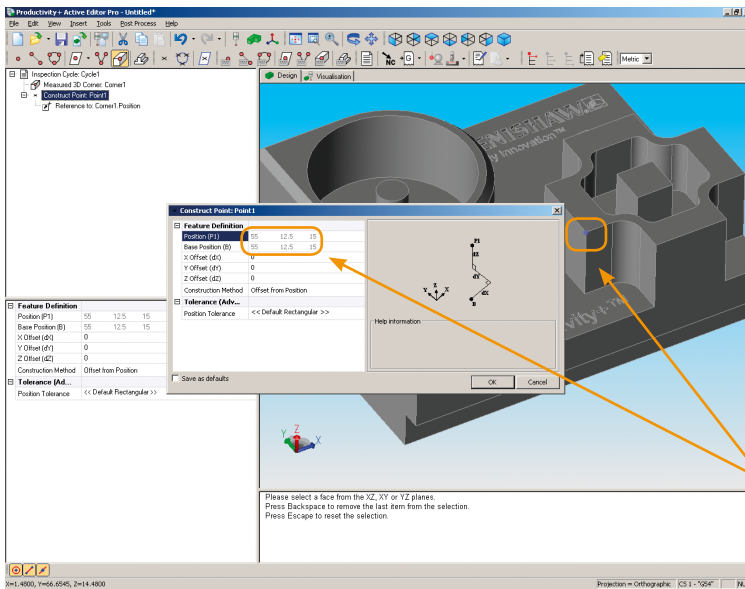
Constructed point features can be generated using a variety of different methods, these methods being differentiated by the number of child statements, and the existing feature types required for point construction.



Offset from origin method

The most simple method of constructing a point is Offset from origin, where a point feature is generated at a specified X, Y, Z offset from the co-ordinate system (0, 0, 0) position. As this method uses the origin position, no child statements are required.

The example on the left shows a constructed point generated using an X, Y, Z offset (50, 20, 30) from CS1.



Offset from position method

When using Offset from position, a constructed point is created by applying an offset to an existing X, Y, Z position. This method requires a single child feature.

Any previously measured feature can be used to determine the position to which the offset is applied, however certain features allow the selection of more than one position. For example, if using a line feature, the default option is midpoint, but either of the end points may be selected instead. A previously constructed point is also a valid option.

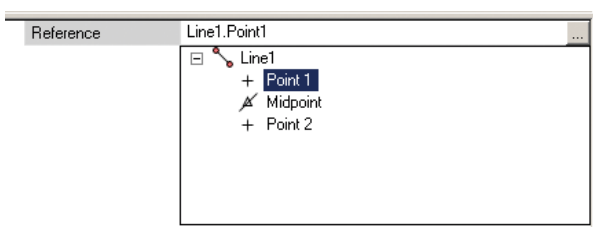
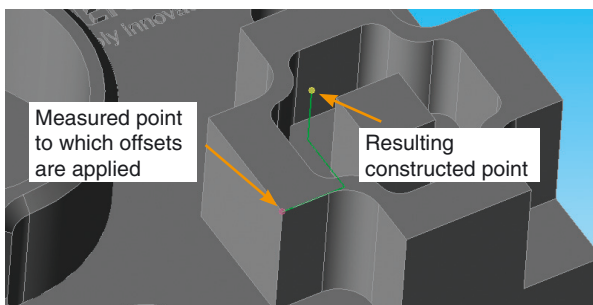
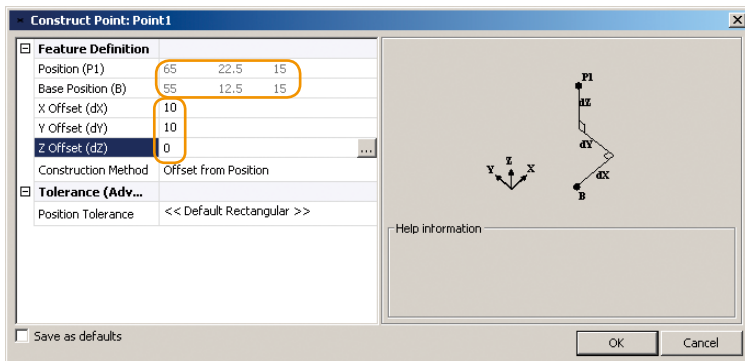
The example on the left uses a previously measured 3D corner as the position to which an offset will be applied.

Having added a constructed point element, double click to open the Construct point dialog.¹ The 3D corner X, Y, Z position is shown and the corner point is indicated on the solid model.

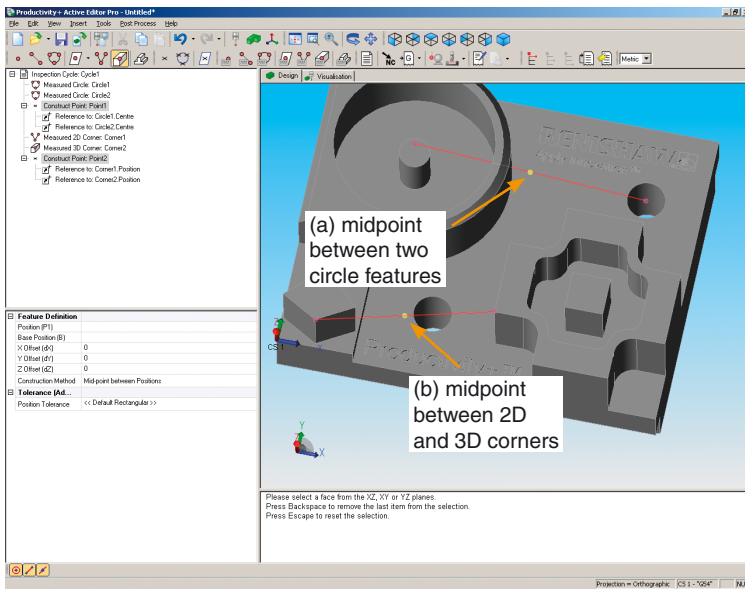
In the appropriate fields of the Construct point dialog, manually enter an offset of 10 in X, Y and Z directions. Note how the values in the Position (P1) field update as these offsets are added. P1 is the position of the resulting constructed point.

Click OK to close the dialog and generate the point.

¹ Alternatively view and edit information via the Property viewer window.



Note: to apply an offset to a position other than the default (this option is available when the child feature is a line or web/pocket), select the appropriate Reference to: statement in the Program viewer. Select the Reference field in the Property viewer, then the ellipsis button. From the drop down, select the required position to which the offset will be applied.



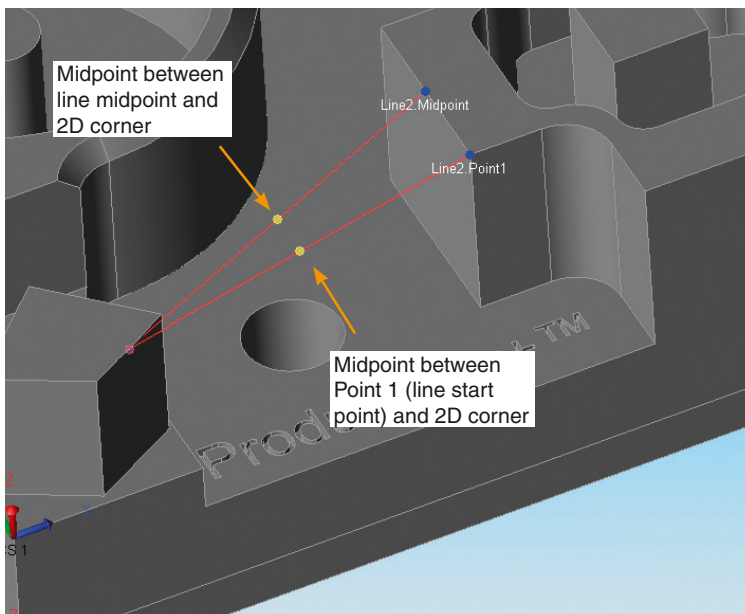
Midpoint between positions method

When using Midpoint between positions, a constructed point is created at the midpoint of the virtual line connecting two selected points. This method requires two child features.

The example on the left shows midpoint positions created on virtual lines between:

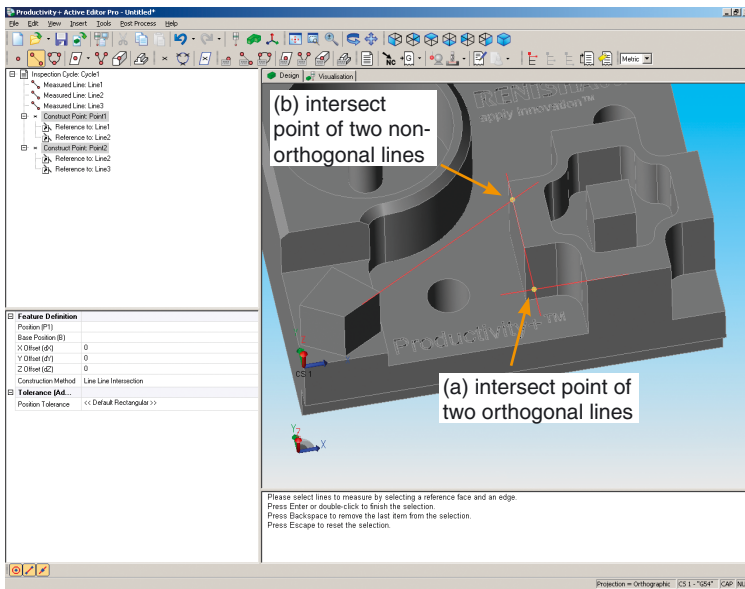
- (a) two circle features
- (b) a 2D corner and a 3D corner

Once a point has been created at the midpoint position, open the Construct Point dialog and apply any required X, Y, Z offset values.



Note: when using line features with the Midpoint between positions method you are able to select and use Point 1 (start point), Midpoint, or Point 2 (end point) to create the virtual line. The default option is midpoint.

If an option other than midpoint is required, select Reference to:Line 1.Midpoint in the Program viewer. A Reference field appears in the Property viewer. Select this, followed by the ellipsis button that appears to the right of the field. Double click to select the required alternative point from the drop down list.



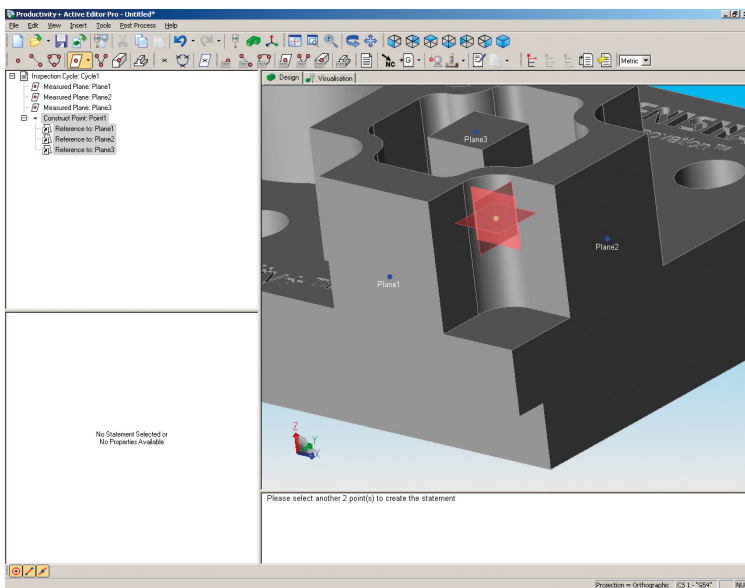
Line line intersection method

When using Line line intersect, a constructed point is created at the intersecting position of two lines. This method requires two child line features.

The example on the left shows two constructed points generated by the intersection of:

- (a) two orthogonal lines (both lines projected)
- (b) two non-orthogonal lines (single line only projected)

Once a point has been created at the line line intersect position, open the Construct Point dialog and apply any required X, Y, Z offset values.



Intersection of 3 planes method

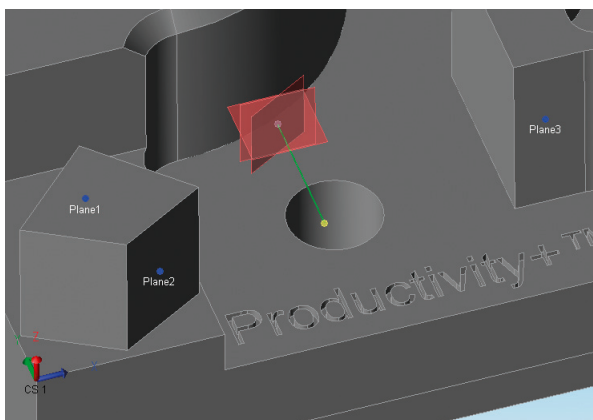
When using this method, a constructed point is created at the intersection point of three projected planes. This method requires three child plane features.

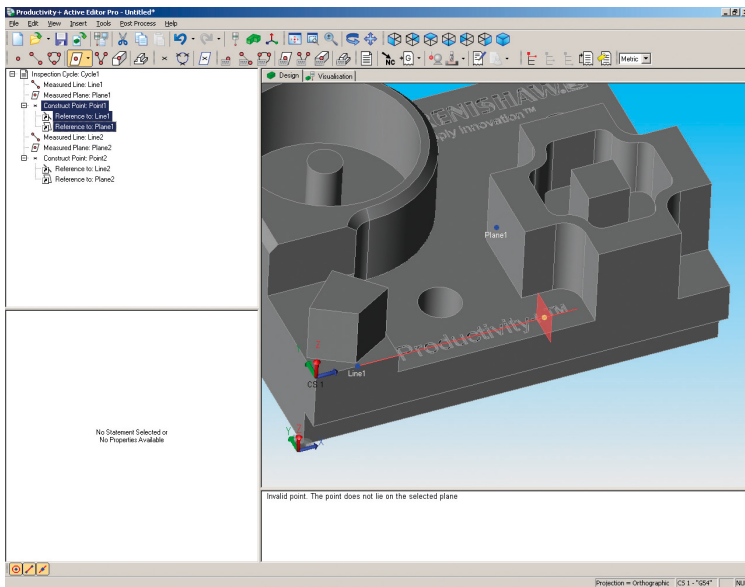
Any of the plane construction methods (Measured 3 points; Measured N points rectangular; Measured N points radial; Constructed plane) may be used to define the three reference planes.

The example on the left shows the intersect point of the three identified projected planes.

Once a point has been created at the intersect position, open the Construct Point dialog and apply any required X, Y, Z offset values.

The example on the left shows a constructed point generated at the intersect of planes 1, 2 and 3, with an offset applied in -Y.





Line plane intersection method

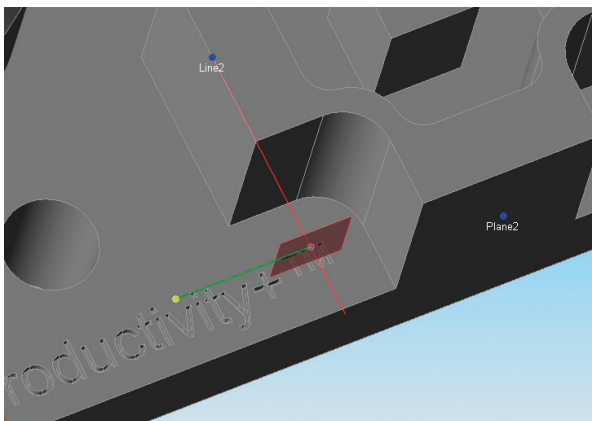
When using Line plane intersect, a constructed point is created at the intersecting position of a line and a plane feature. This method requires two child features: a single line and a single plane.

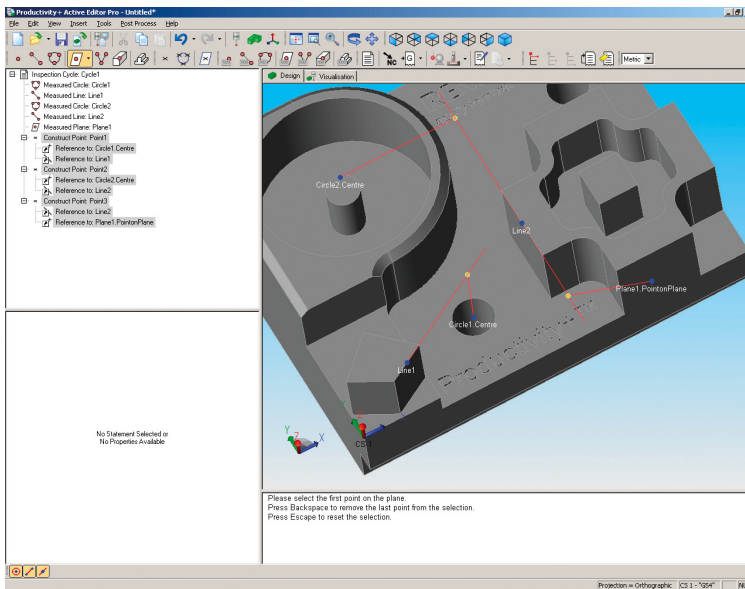
Any of the plane construction methods (Measured 3 points; Measured N points rectangular; Measured N points radial; Constructed plane) may be used to define the required reference planes.

The example on the left shows a constructed point generated by the intersection of Line1 and Plane1.

Once a point has been created at the line plane intersect position, open the Construct Point dialog and apply any required X, Y, Z offset values.

The example on the left shows a constructed point generated at the intersect of Line2 and Plane3, with an offset applied in -X.



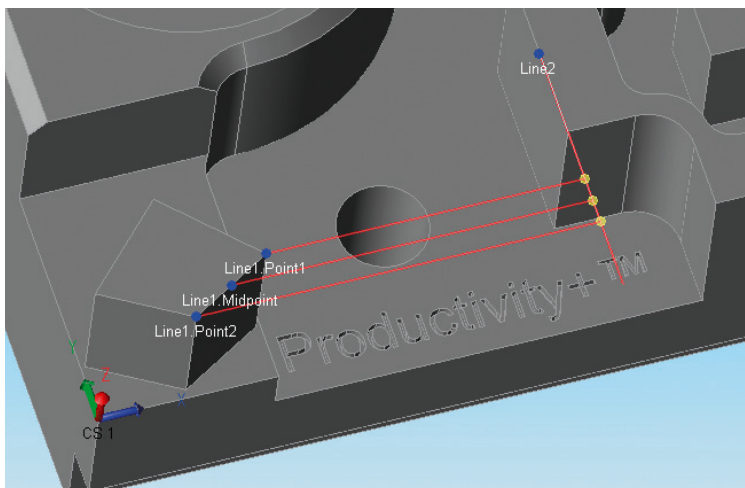


Closest position on line method

When using Closest position on a line method, the central position of a selected feature (e.g. the centroid of a plane, or the centre of a circle) is projected at 90° to the selected line to determine the closest point of intersection.

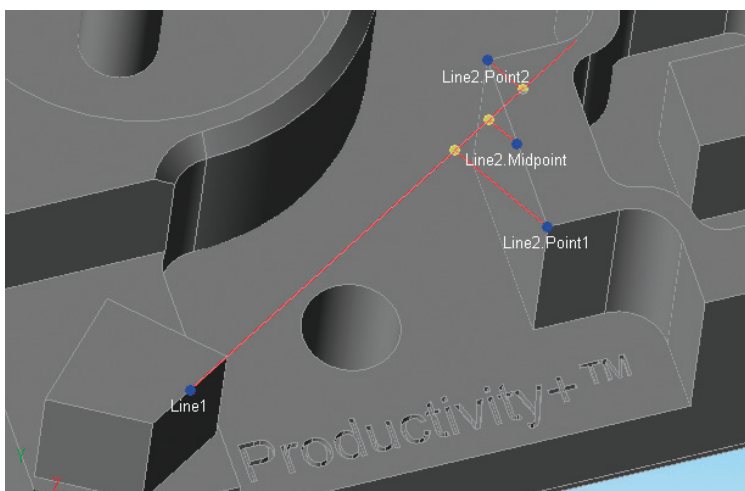
This method requires two child features, at least one of which must be a line feature.

Once a point has been created at the closest point on the projected line, open the Construct Point dialog and apply any required X, Y, Z offset values.



When using this construction method and both child features are lines, it is necessary to treat one of these features as a point to project onto the other line.

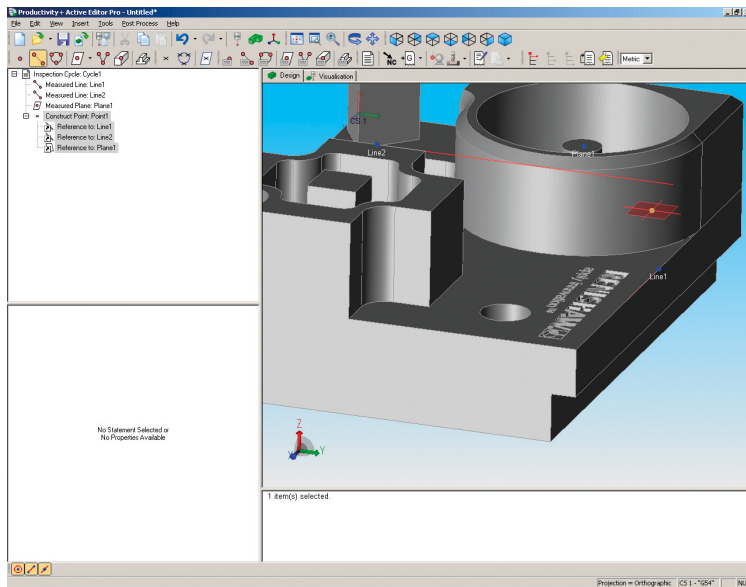
Determine which line will be used as a point, and select the corresponding Reference to: statement in the Program viewer. From the Property viewer select the Reference field, and using the ellipsis button select the required point to project from: Point 1, Midpoint, or Point 2.



The examples on the left demonstrate how a constructed point may vary depending on the line projected onto, and which position (Point 1, Midpoint, Point 2) of the other line is used as the origin for the projection.

If the second child feature is a plane, there may be instances where the resulting constructed point is in the same position as would be generated using the line plane intersection method.

Any of the plane construction methods (Measured 3 points; Measured N points rectangular; Measured N points radial; Constructed plane) may be used to define a required reference plane.



Line line intersection on plane method

When using Line line intersection on plane method, two lines are projected onto a common plane, and a constructed point is generated at their intersection position.

This method requires three child features: two line features and one plane feature.

Once a constructed point has been created on the reference plane, open the Construct Point dialog and apply any required X, Y, Z offset values.

Any of the plane construction methods (Measured 3 points; Measured N points rectangular; Measured N points radial; Constructed plane) may be used to define a required reference plane.

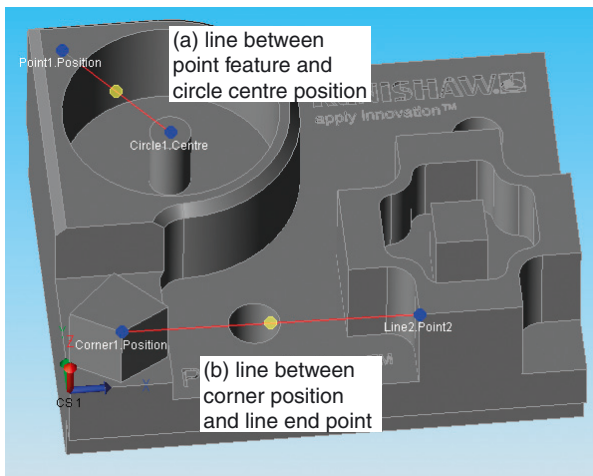
Constructed Line

Constructed line features can be generated using two different methods: Line between two points and Intersection of two planes. Each of these construction methods requires two child features.

Any feature providing X, Y, Z position data, such as circle centre point and line (mid-point, start point or end point), including previously generated constructed features are valid as child features when using the Line between two points method.

When using the Intersection between two planes method, all plane generation methods, including constructed plane, are valid for defining the two plane child features to be used.

It is not possible to apply any offsets to constructed lines.



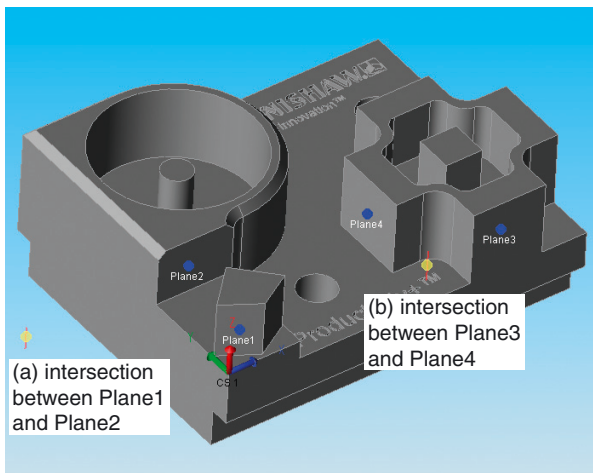
Line between two points method

When using Line between two points, a line is generated between two point features, or selected positions (Centre, Point 1, Midpoint or Point 2) from other available features.

The example on the left shows constructed line elements generated between:

- (a) a point feature and circle centre position
- (b) a corner position and line end point

Constructed lines generated using this method are bounded: i.e. they have a start point, an end point and a length.



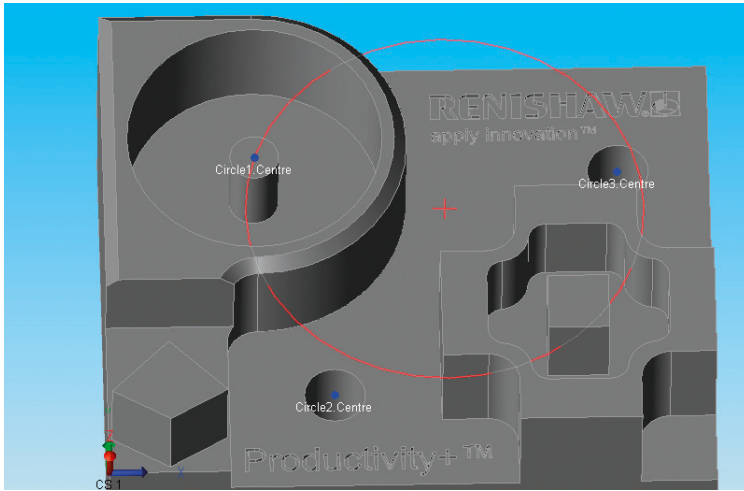
Intersection of two planes method

When using Intersection of two planes, a line is generated between the intersection of two projected plane features.

Any of the plane construction methods (Measured 3 points; Measured N points rectangular; Measured N points radial; Constructed plane) may be used to define the two reference planes.

Constructed lines generated using this method are unbounded: i.e. they have a position, but no start point, end point or length.

A constructed line can be used as a child feature for the generation of subsequent constructed features in all instances where use of a measured line is valid.



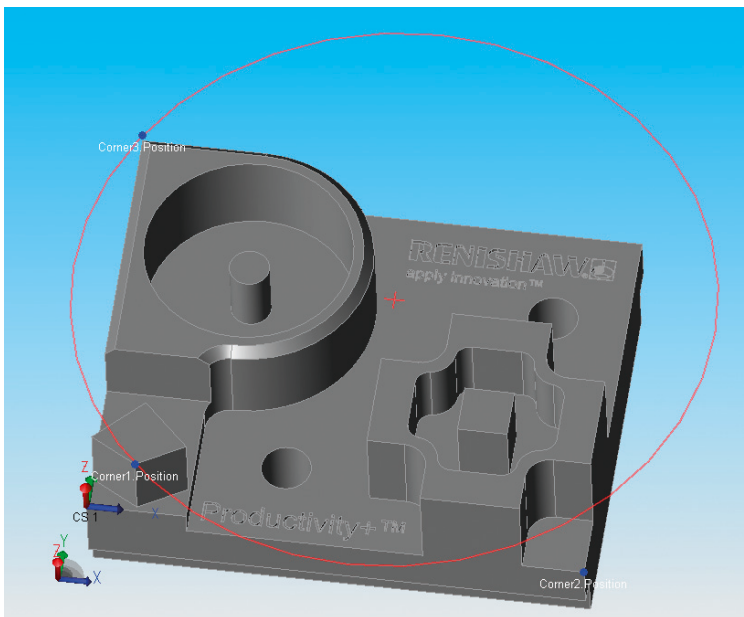
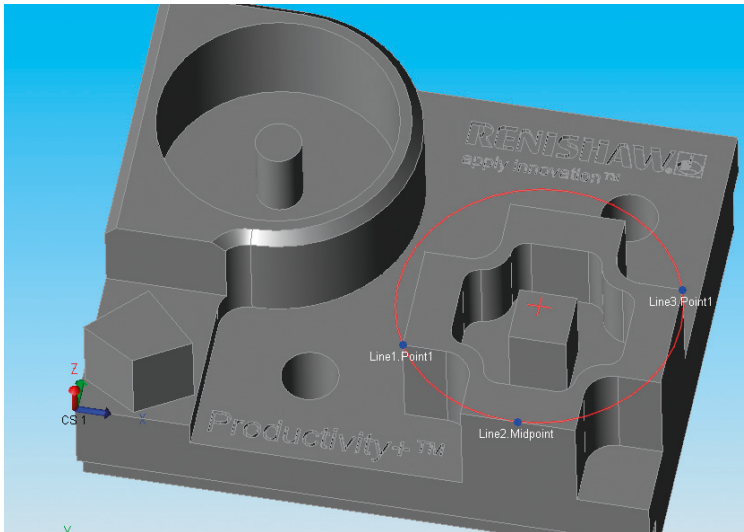
Constructed Circle

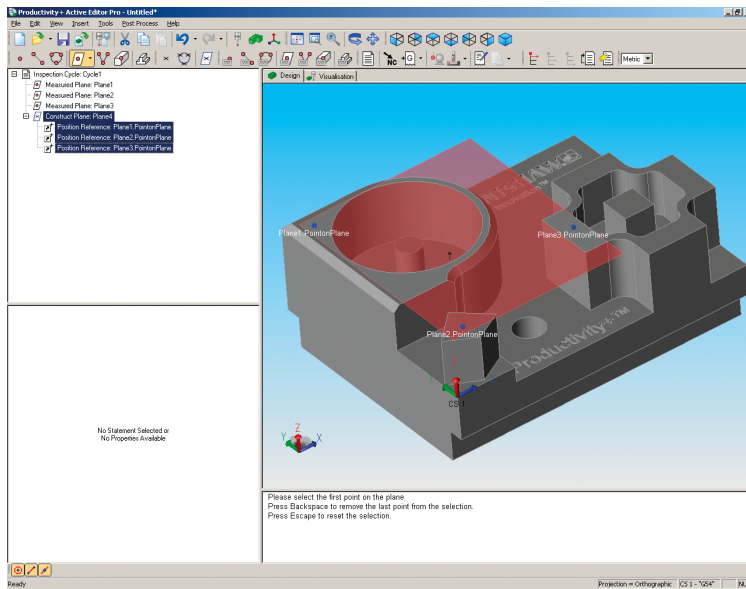
Generating a constructed circle requires a minimum of three child features.

Valid child features are any that provide X, Y, Z position data, for example, circle centre point, 3D corner, measured or constructed point.

The features referenced from the solid model geometry form points on the circumference of the constructed circle.

It is not possible to apply any offsets to constructed circle features.





Constructed Plane

Generating a constructed plane requires a minimum of three child features.

Valid child features are any that provide X, Y, Z position data, for example, circle centre point, 3D corner, measured or constructed point.

It is not possible to apply any offsets to constructed plane features.

Note: some valid combinations of child features will produce a constructed plane that is partially within the solid model.

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