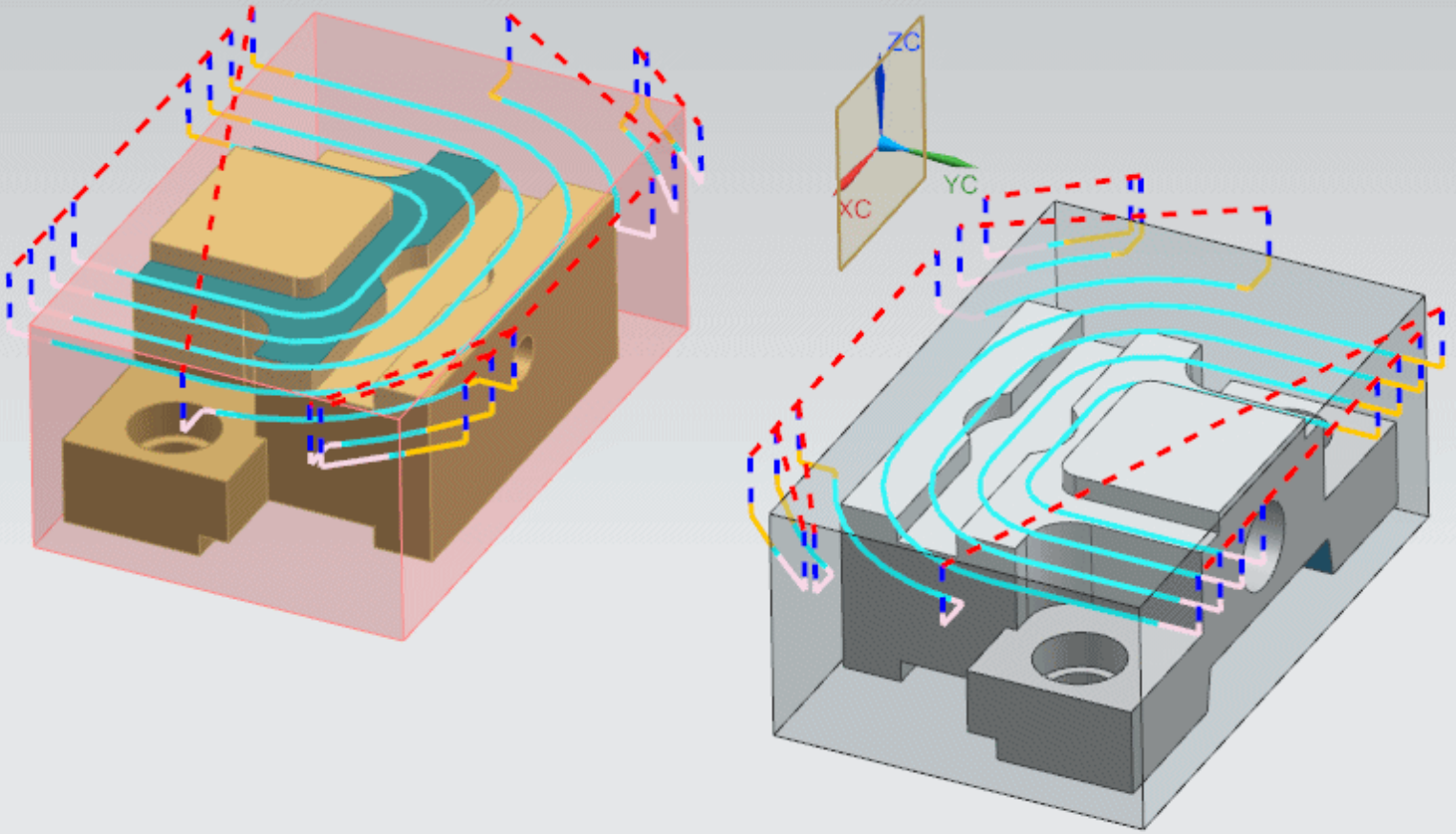


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NX CAM 11.0.1: Mirror Operations

Mirror operations while maintaining associativity and machining intent.

Answers for industry.

About NX CAM

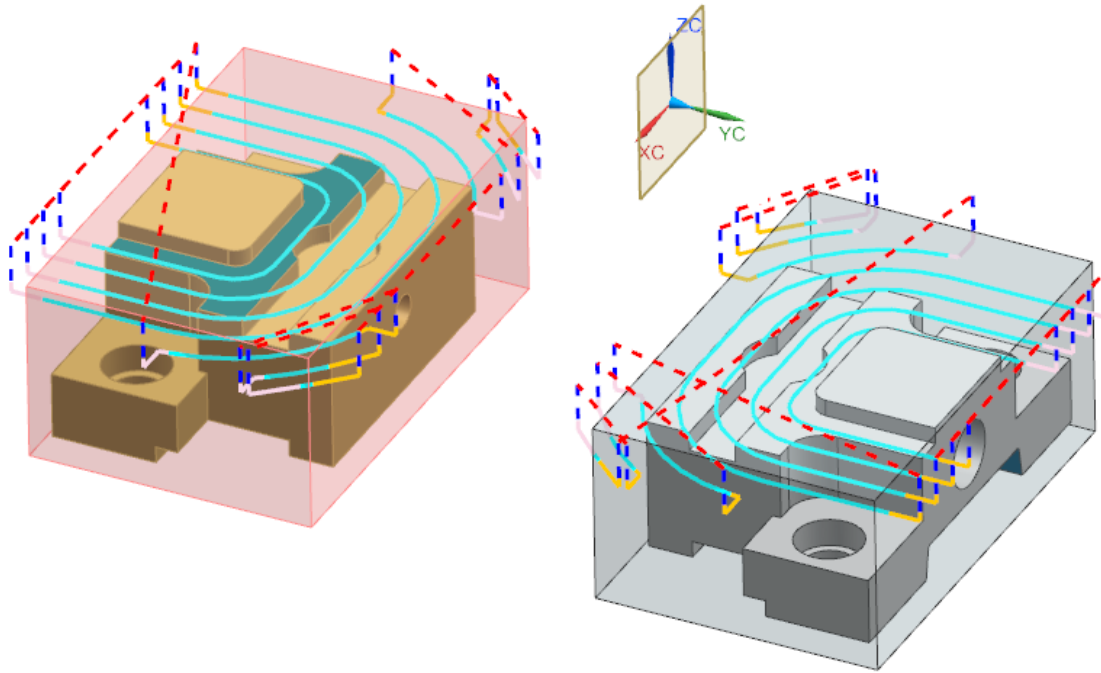
NX™ CAM software has helped many of the world's leading manufacturers and job shops produce better parts faster. You can also achieve similar benefits by making use of the unique advantages NX CAM offers.

This is one of many hands-on demonstrations designed to introduce you to the powerful capabilities in NX CAM 11.0.1. In order to run this demonstration, you will need access to NX CAM 11.0.1.

Visit the [NX Manufacturing Forum](#) to learn more, ask questions, and share comments about NX CAM.

Hands-on Demonstration: Mirror Operations

You can now mirror operations that are associative to the source operations and that maintain the machining intent of the original operations.



The existing mirror function (found under Object→Transform→Mirror Through a Plane) is a simple transformation of the tool path which does not maintain associativity or machining intent.

Note: You cannot mirror Turning operations or operations created using the Transform, Paste with Reference, or Copy CAM from Component commands.

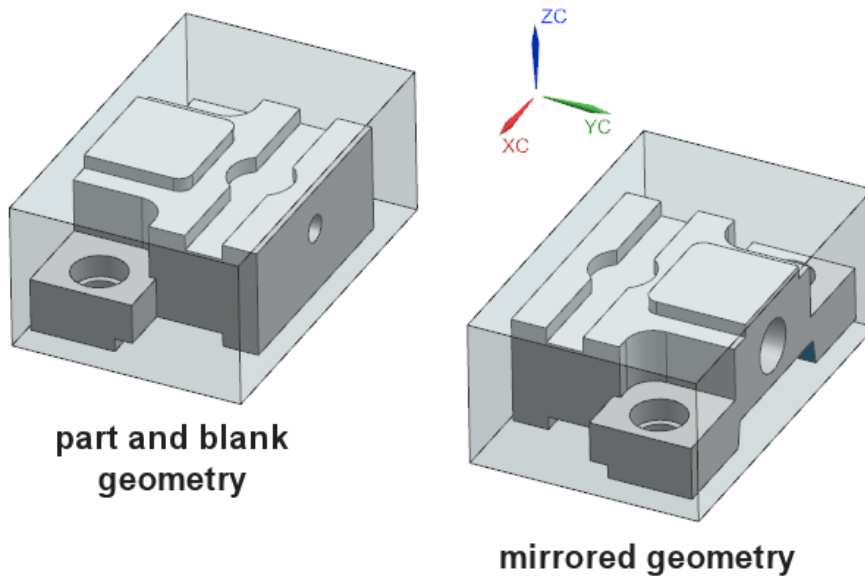
Prerequisites:

1. You will need access to **NX CAM 11.0.1** in order to run this demonstration.
2. If you haven't done so already, download and unzip **mirror_operation.7z**.

Demo:

1. Open **mirror_operation.prt** in NX.

Note: If the blank geometry is not translucent as shown below, choose **Menu→Preferences→Visualization**, click the **Visual** tab, and select the **Translucency** check box.



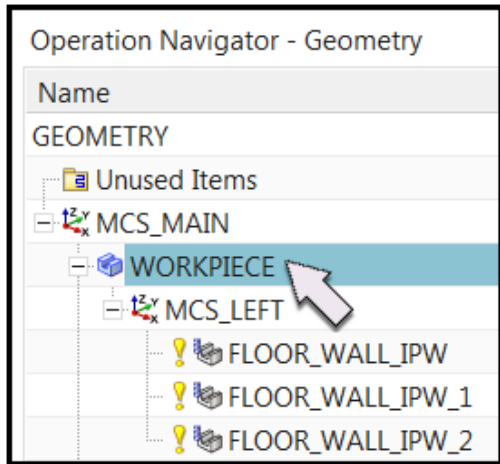
Mirrored operations use the part and blank geometry defined for the source operations to generate the tool paths. The mirrored geometry is not used for tool path generation and is shown in this example for visual reference only.

2. In the background of the Operation Navigator, click **MB3→Columns→Dependencies** to add the Dependencies column and then **MB3→Columns→Configure** so that you can clearly see the Path and Dependencies columns in the Program Order View.

Operation Navigator - Program Order		
Name	Path	Dependencies
NC_PROGRAM		
Unused Items		
PROGRAM_LEFT		
FLOOR_WALL_IPW	✓	
FLOOR_WALL_IPW_1	✓	
FLOOR_WALL_IPW_2	✓	
PROGRAM_RIGHT		

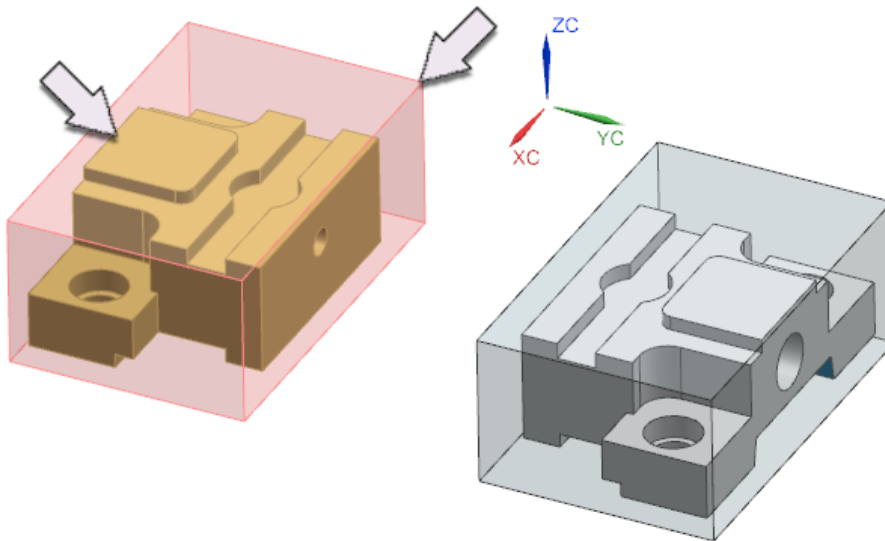
First, we'll take a look at how the part and blank geometry have been defined in the geometry groups.

3. In the Geometry View of the Operation Navigator, double-click **WORKPIECE** to edit the object.



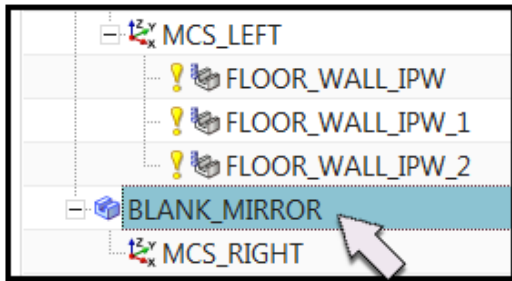
4. Click **Display**  next to **Specify Part** and **Specify Blank**.

The part and blank geometry have been defined in the WORKPIECE object. Both the original operations and the mirrored operations use this geometry for tool path generation.



5. Click **Cancel**.

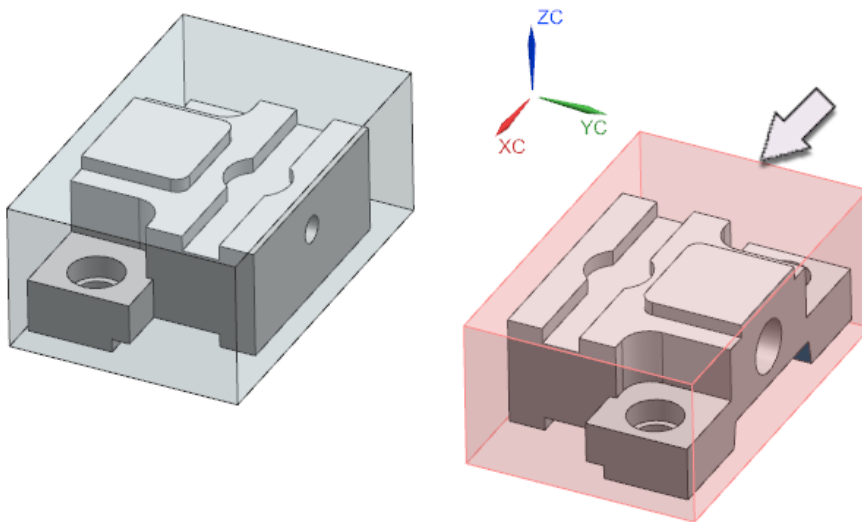
6. Double-click **BLANK_MIRROR** to edit the object.



The part geometry is not defined inside this object.

7. Click **Display**  next to **Specify Blank**.

NX uses the blank geometry defined in the BLANK_MIRROR object only to display the resulting 3D in-process workpiece for the mirrored operations. This geometry is used for visualization purposes only.

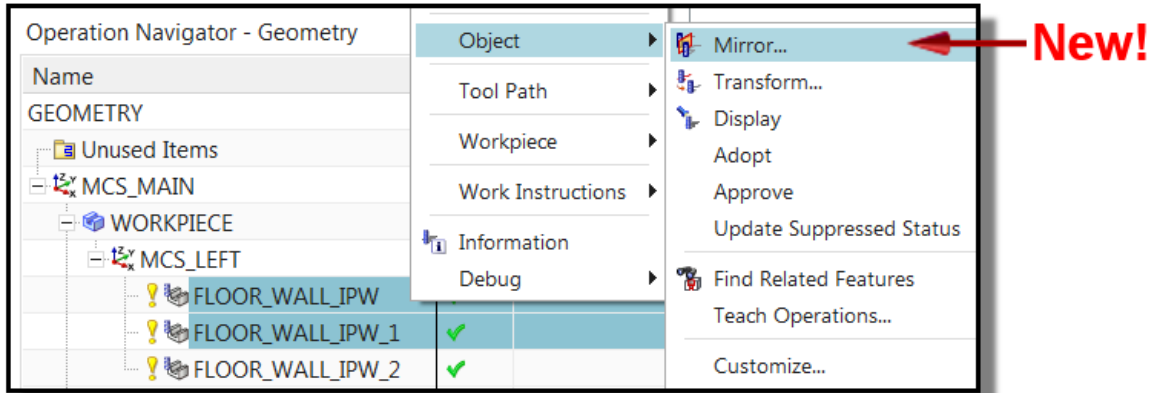


8. Click **Cancel**.


Now you will create the mirrored operations and see how they use the part and blank geometry defined in the WORKPIECE object for the original operations.

9. Select the **FLOOR_WALL_IPW** and **FLOOR_WALL_IPW_1** operations.

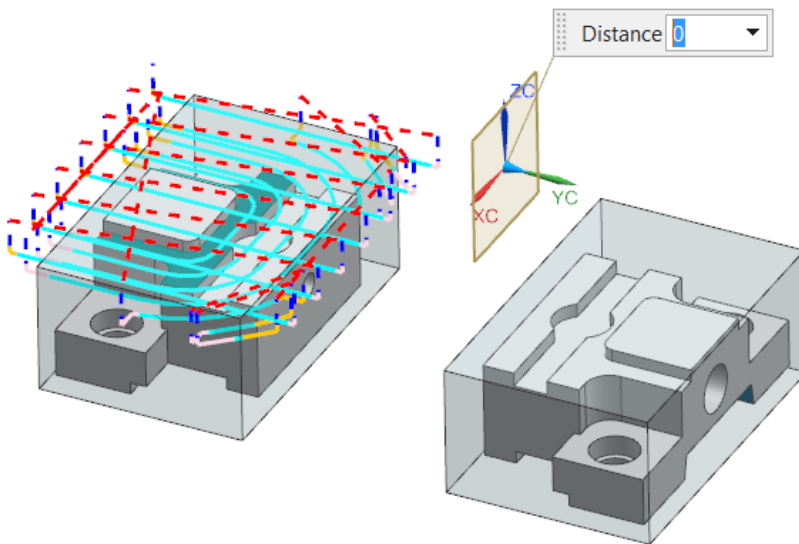
10. Right-click on the selected operations and choose **Object**→**Mirror**.



You will specify the plane about which the operations will be mirrored.

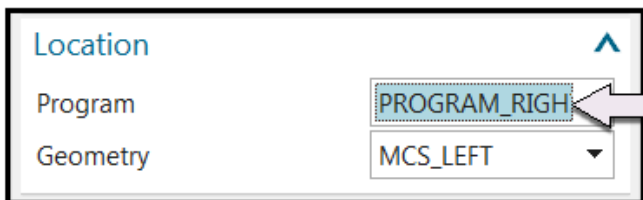
11. Select  from the **Specify Plane** list.

This is the same plane that was used to mirror the solid geometry.



The Program option allows you to place the mirrored operations in a separate program group so they can be posted independently.

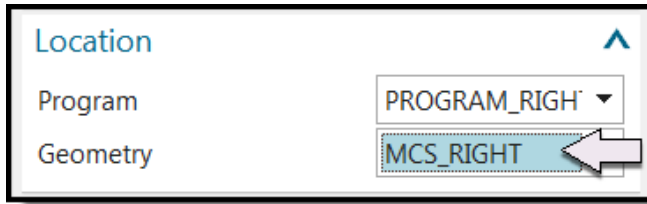
12. Select **PROGRAM_RIGHT** from the **Program** list.



The Geometry option allows you to specify a different MCS other than the source operation to keep them logically organized inside the Geometry View of the Operation Navigator. It also

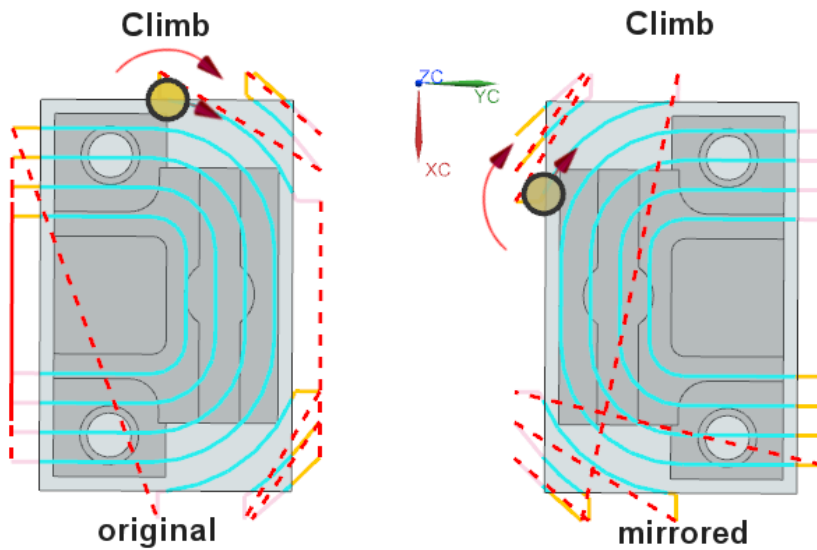
allows you use a different blank but only for the purpose of displaying the 3D in-process workpiece (the mirrored tool path can be applied to a different blank).

13. Select **MCS_RIGHT** from the **Geometry** list.

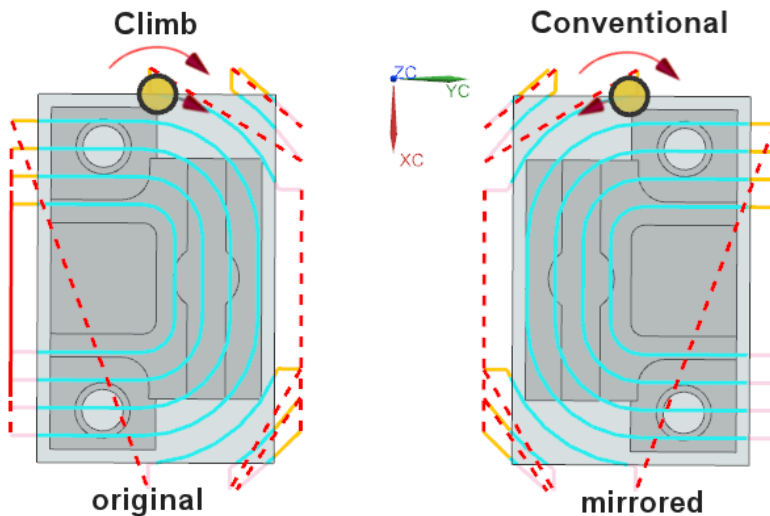


The Path Settings allow you to determine whether or not the original climb or conventional cut direction and cut angle are maintained in the mirrored tool path.

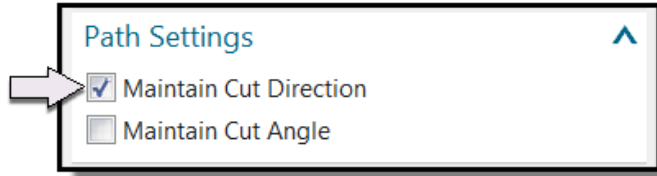
When turned on, Maintain Cut Direction maintains the climb or conventional cut direction of the original operations by reversing the path, allowing the mirrored operations to maintain the original machining intent.



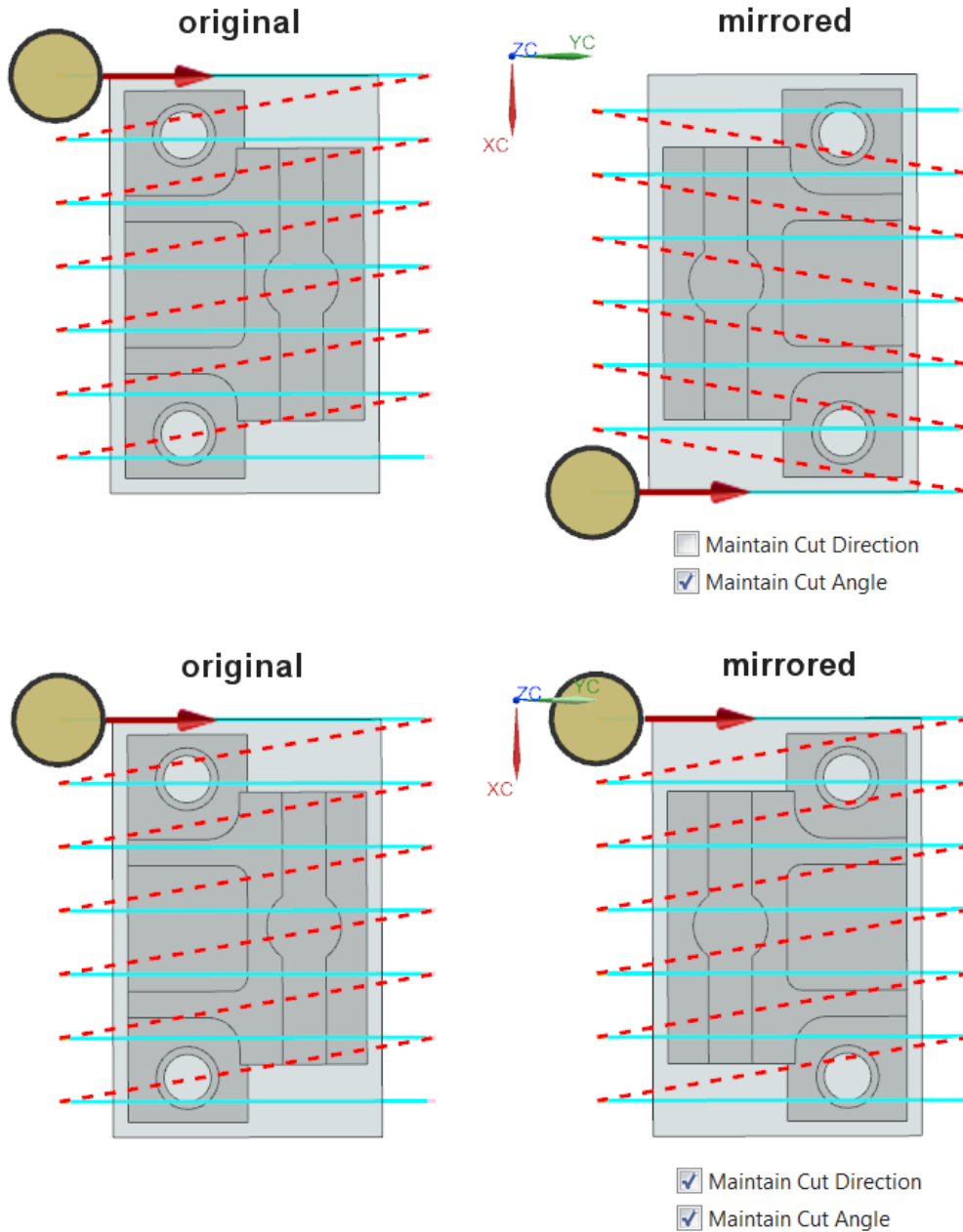
When turned off, the path is not reversed and the cut direction is not maintained.



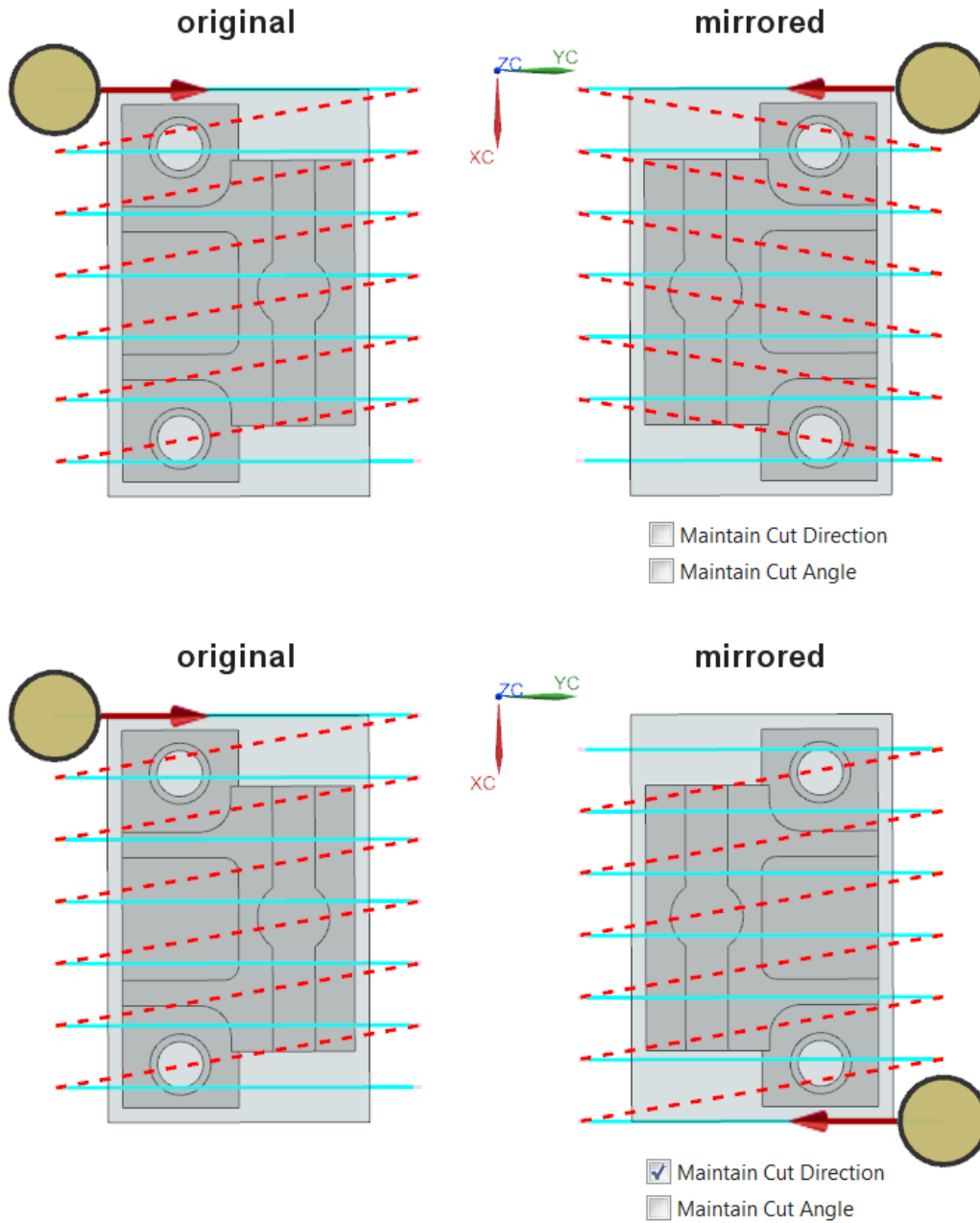
14. Select the **Maintain Cut Direction** check box.



When Maintain Cut Angle is turned on, the tool maintains the same directional movement in the mirrored operations as in the original operations regardless of whether Maintain Cut Direction is turned on or off. Both settings toggled on will maintain the cut direction and the cut angle (usually required when using zig patterns).

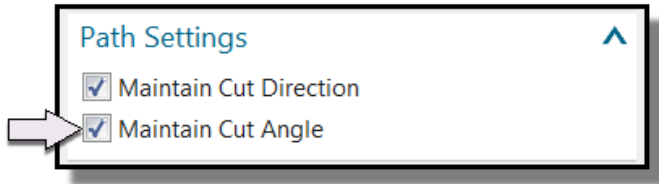


When Maintain Cut Angle is turned off, the directional movement of the tool is reversed by 180 degrees regardless of whether Maintain Cut Direction is turned on or off.



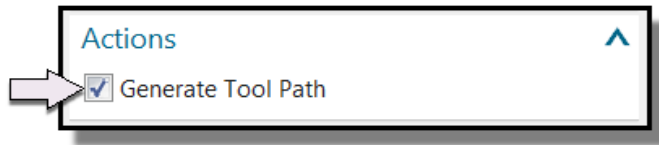
Note: Maintain Cut angle might behave unpredictably when Cut Angle is set to Automatic in the original operation and should therefore be used only when the Cut Angle has been explicitly specified.

15. Select the **Maintain Cut Angle** check box.



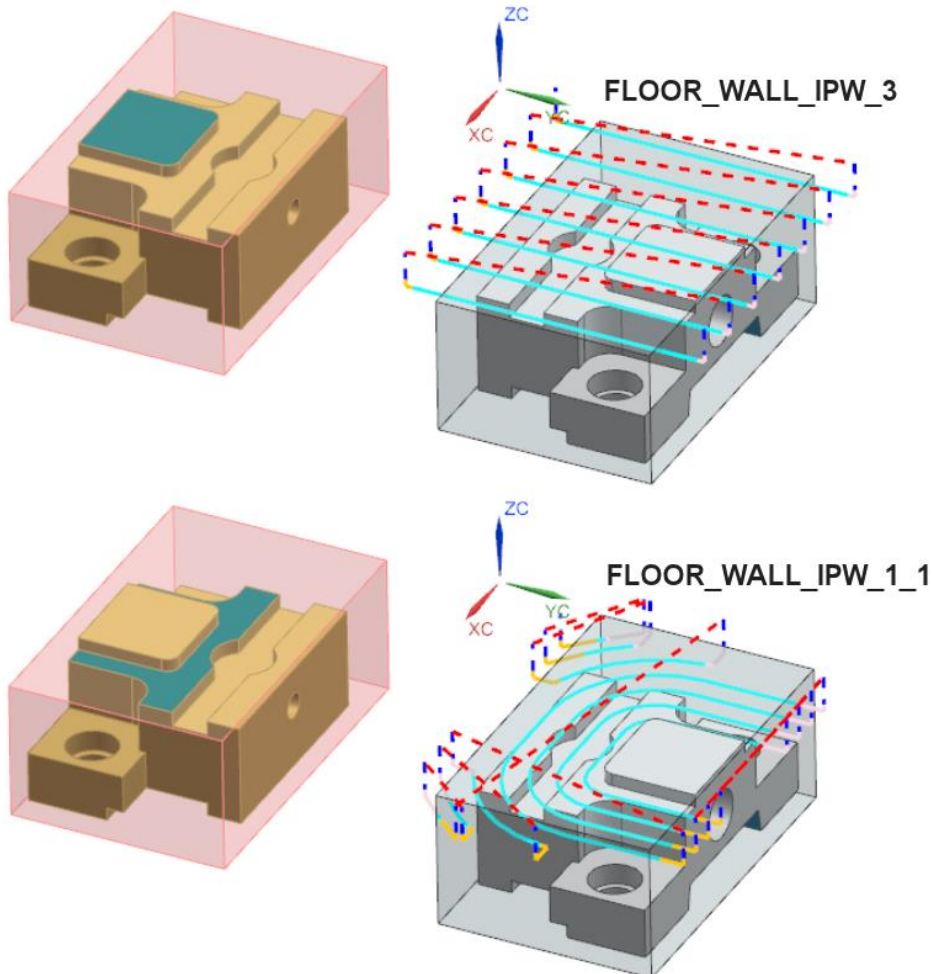
The above settings will only be applied if the tool path is generated. The Generate Tool Path option allows you to conveniently generate the tool paths while mirroring the operations.

16. Select the **Generate Tool Path** check box.



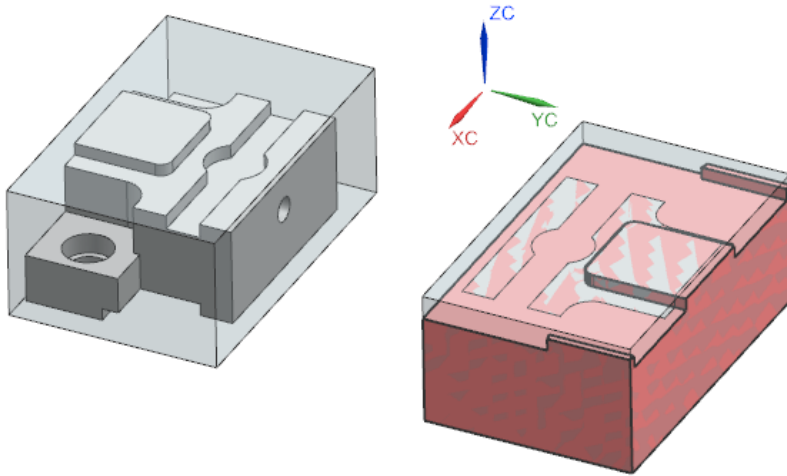
17. Click **OK**.


18. Select the mirrored operations to see the tool paths.



The blank geometry defined in the MIRROR_BLANK geometry object can be used to show the resulting 3D in-process workpiece for the mirrored operations.

19. Right-click **FLOOR_WALL_IPW_1_1** and choose **Workpiece→Show 3D**.



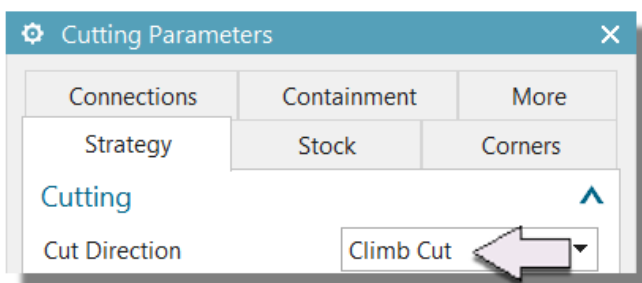
Note: Verify Tool Path  does not use the mirrored blank geometry for 3D Dynamic Verify. 3D Dynamic Tool Path Visualization with material removal is only shown for non-mirrored operations.

Recall that when turned off, Maintain Cut Direction reverses the original climb or conventional cut direction in the mirrored operations.

20. Double-click **FLOOR_WALL_IPW_2** to edit the operation.

21. Click **Cutting Parameters** .

Notice that the **Cut Direction** is set to **Climb Cut**.



22. Click **Cancel** twice to exit the operation.

Now you will take a look at how the Cut Direction option is set in the mirrored operation.

23. Mirror the **FLOOR_WALL_IPW_2** operation as described above, but with the **Path Settings** toggles turned **off**. Note that you do not need to generate the tool path.

24. Double-click **FLOOR_WALL_IPW_2_1** to edit the operation.

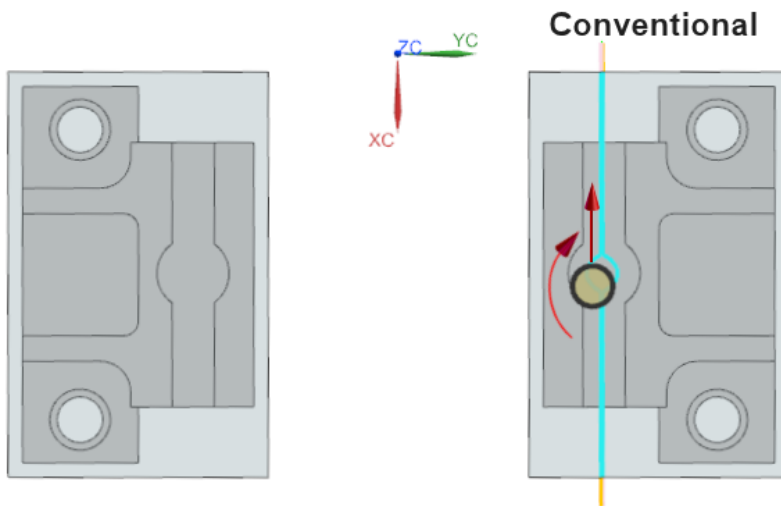
25. Click **Cutting Parameters** .

Notice that the **Cut Direction** is set to **Climb Cut**, the same as in the original operation.

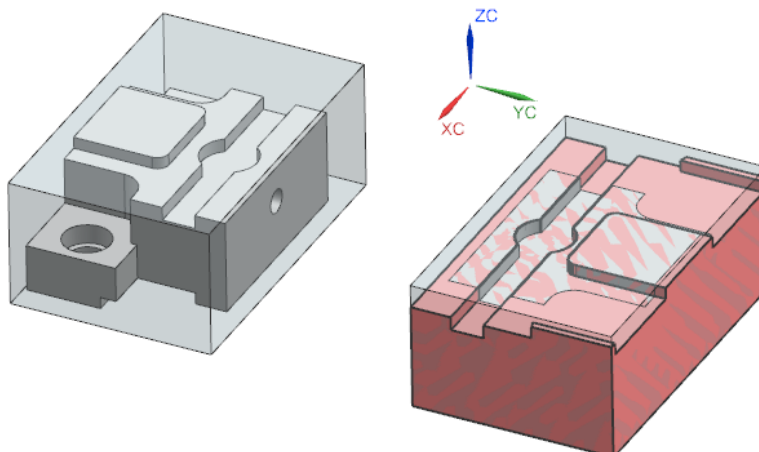


When Maintain Cut Direction is turned off as in this case, the path is not reversed and therefore the result is a conventional cut. The Cut Direction option shown in the dialog box does not update to reflect the actual cut direction. You can see this when you replay the mirrored operation.


26. Click **Cancel** twice to exit the operation.
27. Select **FLOOR_WALL_IPW_2_1** and click **Verify Tool Path**.
28. Slow down the **Animation Speed** and click **Play**.





29. Click **OK** to complete the tool path visualization.
30. Right-click **FLOOR_WALL_IPW_2_1** and choose **Workpiece→Show 3D** to see the resulting 3D in-process workpiece.




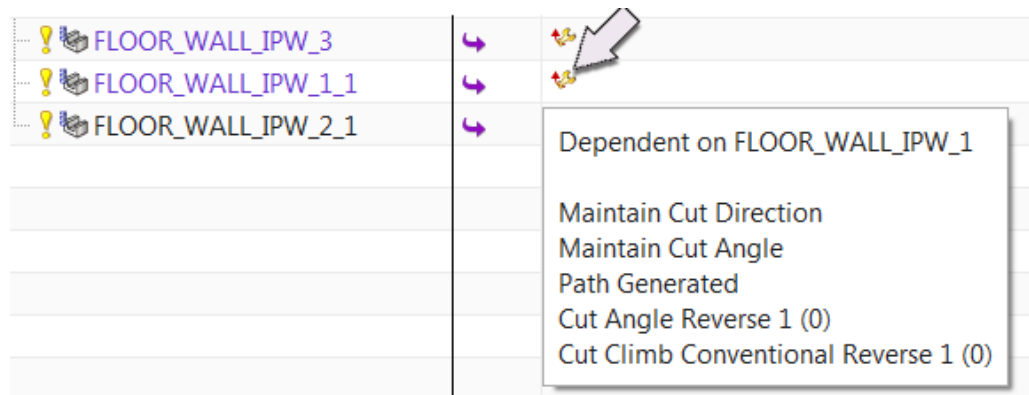
31. Display the **Program Order View** of the Operation Navigator.

In the Path column,  indicates that the new tool path is a mirrored copy of the original. Selecting the mirrored operation highlights the parent in red.

In the Dependencies column,  indicates the original source operations. The tooltip reads “**Other objects are dependent on this**” indicating that these are source or “parent” objects.

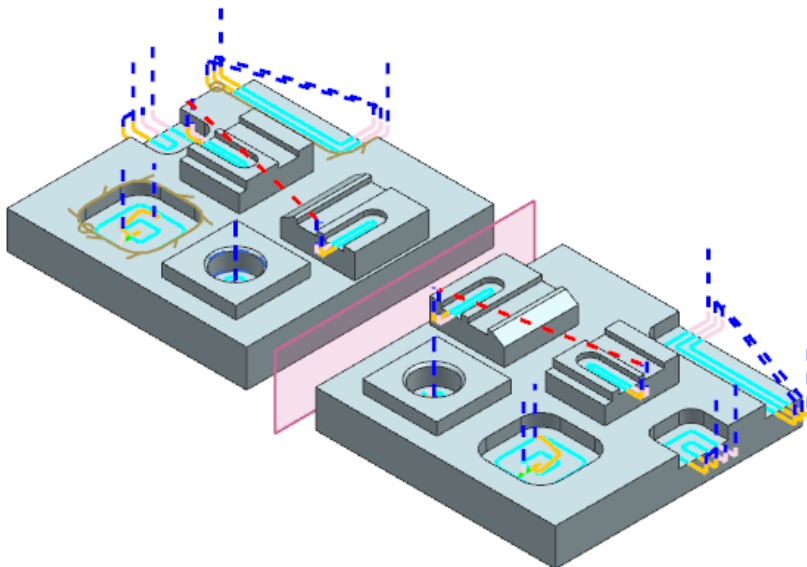
 indicates which operations are the mirrored copies. The tooltip for each icon reads “**Dependent on other objects**” indicating that these are copied or “dependent” objects.

 indicates when a mirrored operation has modified parameters. When you hover over the icon, NX lists the modified parameters that are no longer associative. All of the other parameters remain associative.



Note: You cannot mirror an operation that has already been mirrored. The MB3→Object→Mirror option is not available.

32. Use **mirror_operation_practice.prt** for additional practice.



33. When you are finished, close the part without saving.

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