# ADDITIVE MANUFACTURING

This tutorial shows how to test parts for trapped supports.
During Additive Manufacturing of a part, sometimes supports may be generated in such a way that they cannot be accessed for removal without destroying the part geometry. If a part consists of such geometry, it needs to be detected.
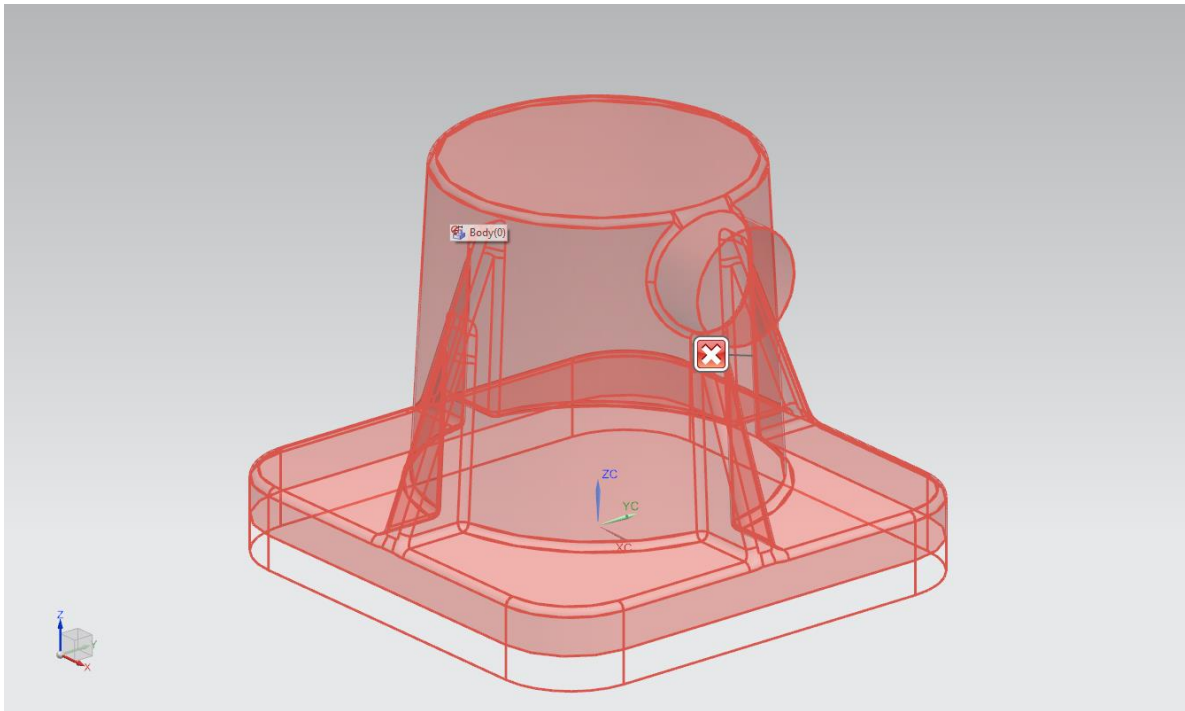
1. Open the part "**Trapped_Volume**"
2. On the **Ribbon bar,** in the **Analysis** tab, click on **Wholly Enclosed Volume**
   NOTE: For more information on **Wholly Enclosed Volume** checker refer (AM_1) and Check Wholly Enclosed Volume dialog box
3. In the **Check Wholly Enclosed Volume** dialog box, **notice** that the body in the graphics window is selected by default. Click **Close**
4. Hover mouse on the ❌ symbol either in the graphics window, or in the **View Style** window of the **HD3D Tools navigator** to view the result of **Wholly Enclosed Volume** checker

Notice that the part has failed the **Wholly Enclosed Volume** checker. This implies that the part has at least one enclosed volume
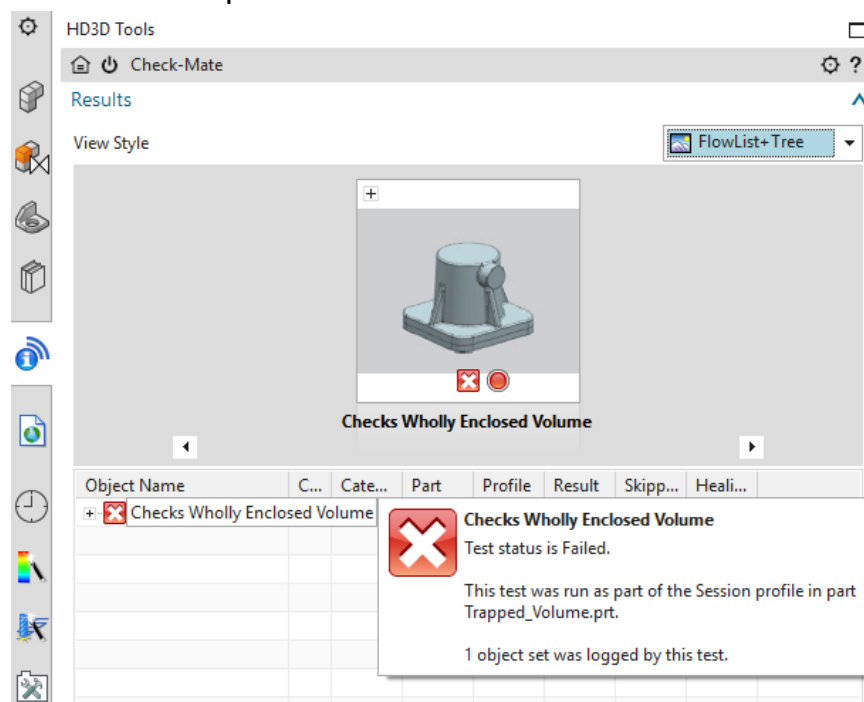
NOTE: In the graphics window, right-click on the part. From the list select **View --> Rendering Style --> Partially Shaded**. Hover mouse over the part to

see the hollow region of the part highlighted. This hollow region of the part is the wholly enclosed volume


TRAPPED SUPPORTS

The AM checker **Trapped Supports** is used to find those support requiring areas on a part from which supports are inaccessible for removal upon manufacturing. Wholly enclosed volume areas exceeding the maximum overhang angle always result in trapped supports. However, trapped supports may be generated even in cases where the areas are not necessarily wholly enclosed.

This test displays results in highlighted Non-trapped and Trapped support requiring areas exceeding the specified maximum overhang angle

NOTE: For more information refer Check Trapped Support dialog box

1. On the **Ribbon bar,** in the **Analysis** tab, click on **Trapped Supports**
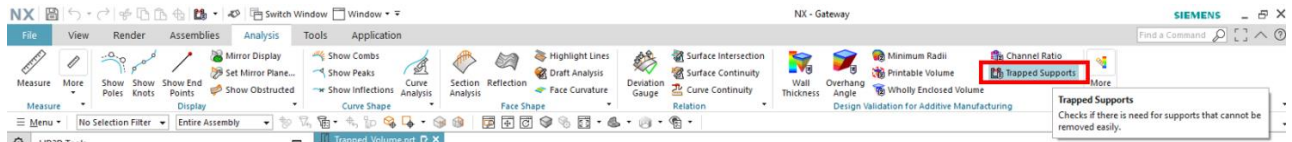
Notice that the body in the graphics window is selected by default

2. In the **Build Plane** group, in **Specify Build Plane CSYS**, click on ⟟ icon
   In the **CSYS** dialog box, use default values-
   Dynamic
   Reference = Absolute Displayed Part
   **Specify Orientation (X, Y, Z) = (0, 0, 0)**
   Click **OK**

3. In the **Check Trapped Supports** dialog box, use default values-
   Maximum Overhang Angle = 45 degrees

4. Check the box **Show only Trapped Support Areas**

5. In the **Process Results** group, click on **Calculate Trapped Supports** ⊞
   Notice the percentage progress of calculation in the **Status Line**

Notice in the graphics window, the support requiring areas which result in trapped supports
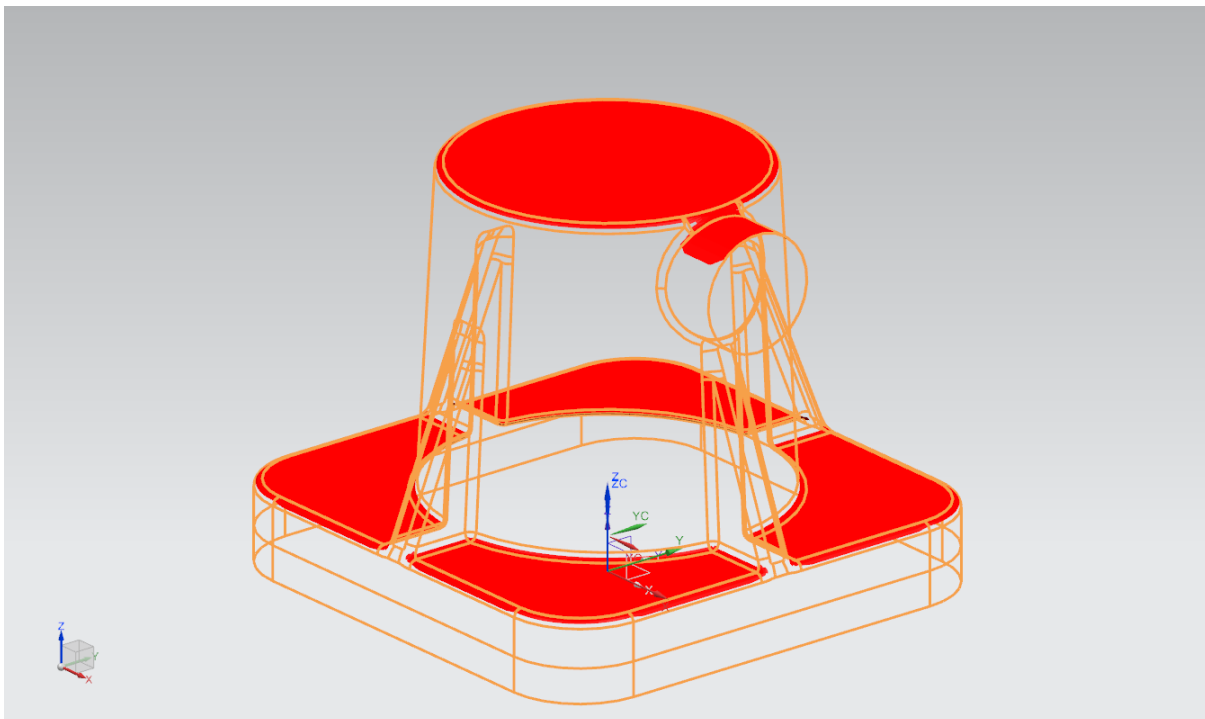

6. Click **Close**

VISUALIZE TRAPPED SUPPORTS

This part of the tutorial is to visualize the trapped supports. For this, launch the **Additive Manufacturing** application, select printer, add component, position component and create automatic supports. For more information on this procedure, refer (AM_1)
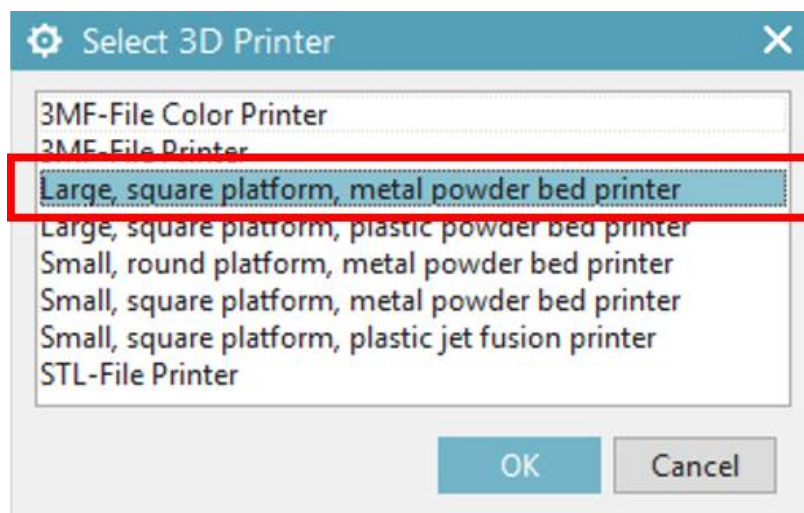
OPEN AM TEMPLATE

1. In NX, on the **Ribbon bar** in the **Home** tab, select **New**
2. In the **New** dialog box, select **Additive Manufacturing,** enter a name for the part file, (default additive_manufacturing1.prt) then click **OK**
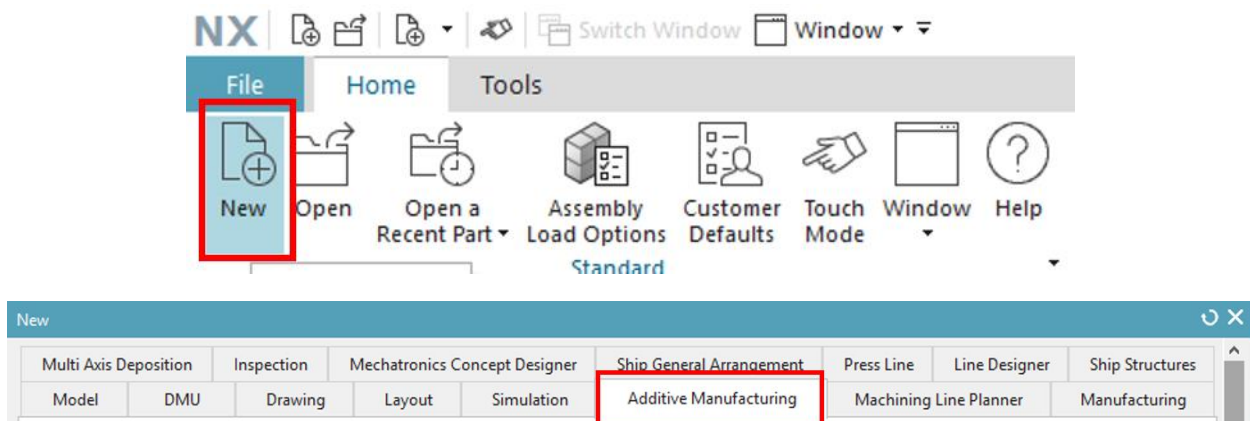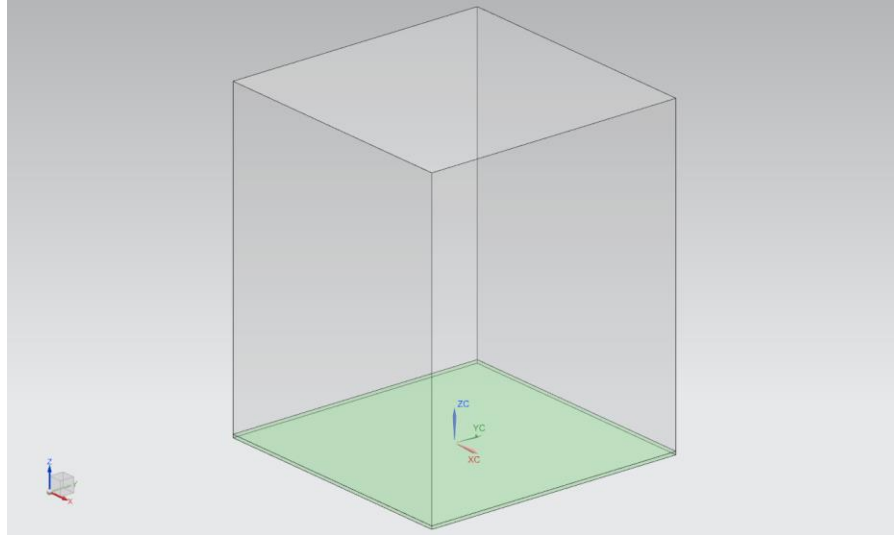

SELECT PRINTER

1. **Select 3D Printer** dialog box prompts to select a type of printer from the available list. Upon selection, click **OK**
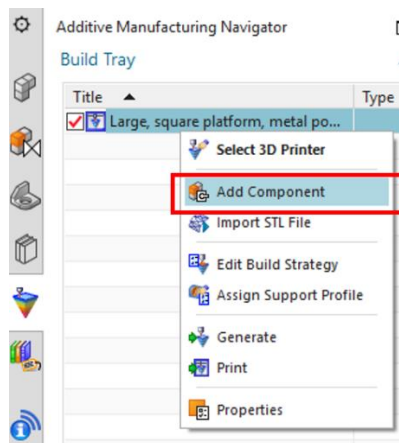
Notice the **Large, square platform, metal powder bed printer** appear in the graphics window
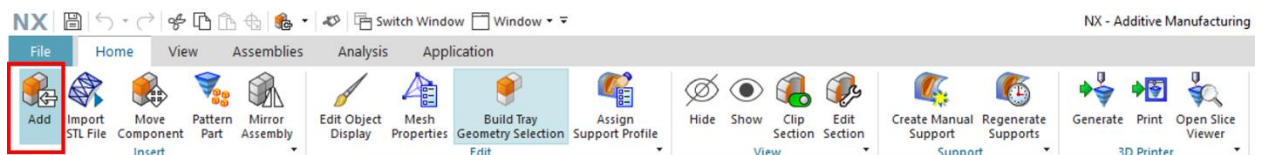

ADD COMPONENT

1. To add a component to the build tray, in the **Additive Manufacturing Navigator** menu, right click on the printer in the **Build Tray** group, from the drop-down menu, select **Add Component**

OR

In the Ribbon bar, under the **Home** tab, click on **Add**

2. In the **Add Component** dialog box, click on **Open** ⬀ icon to browse for the part "**Trapped_Volume**" in the stored folder
   Notice the selected part appears on the build tray in the graphics window
   <u>**NOTE:**</u> Multiple parts can be selected
3. Enter the desired number of copies of the selected part (or parts) under the **Count** list. Enter **Count = 1**
4. Specify desired **Location** of the part
   Component Anchor = Absolute
   Assembly Location = Absolute – Displayed Part
   Cycle Orientation = WCS ⬉
5. Specify the **Placement** of the part
   Placement = Move

   Click on **Specify Orientation** ⬉
   In the graphics window, on the part, specify position and orientation
   X = 0
   Y = 0
   Z = 100
   Rotate about XC-axis
   Angle -15
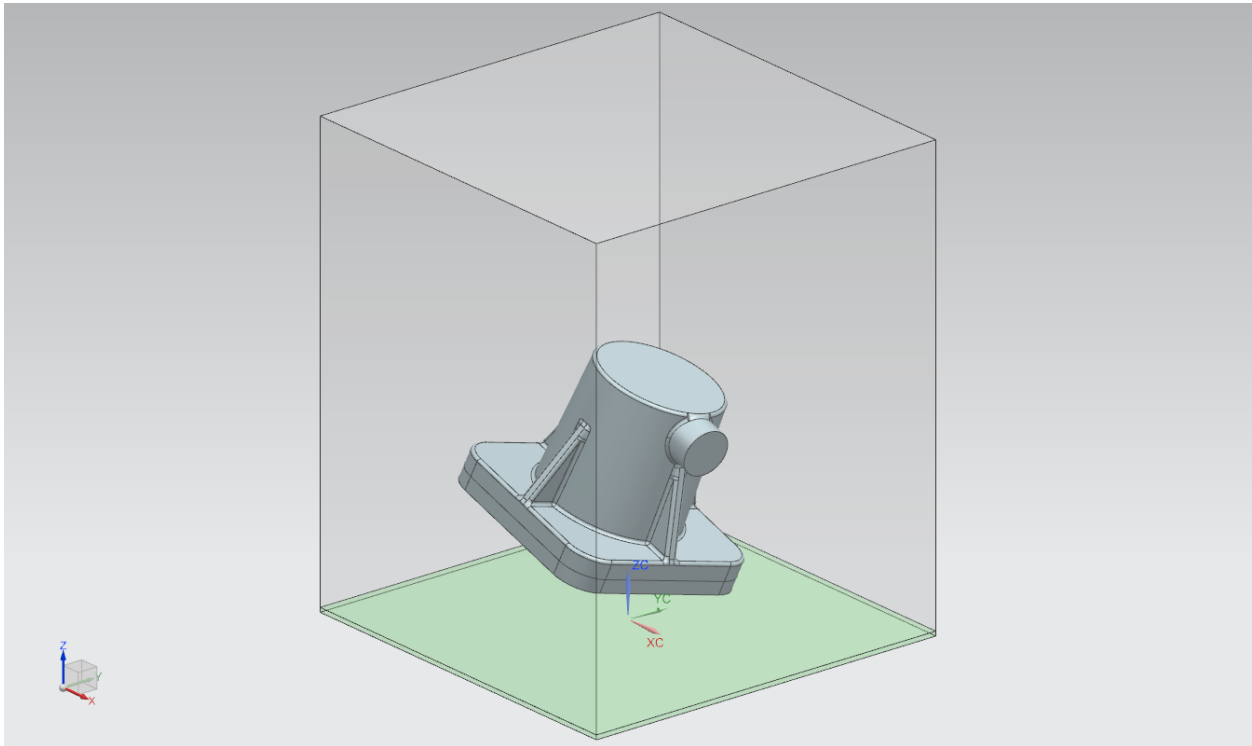   **Snap 5**
   Rotate about YC-axis
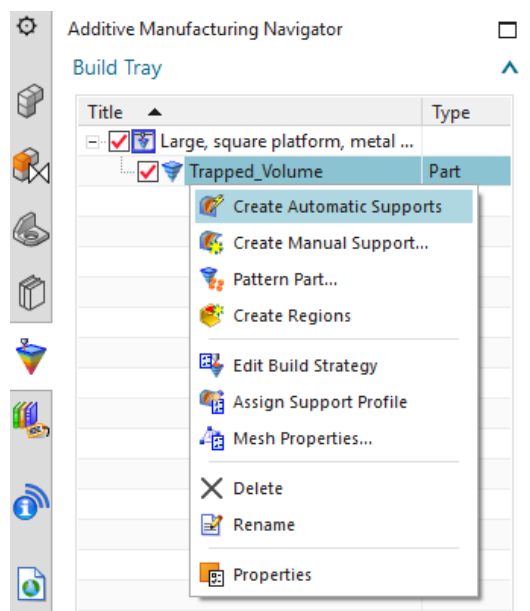   **Angle 15**
   Snap 5

   Click **OK** to close the **Add Component** dialog box

Notice the part orientation on the printer in the graphics window


CREATE AUTOMATIC SUPPORTS

1. For automatic support generation, in the **Additive Manufacturing Navigator** menu, right click on the part in the **Build Tray** group, from the drop-down menu, select **Create Automatic Supports**

2. In the **Additive Manufacturing Navigator**, in the **Build Tray** group, uncheck the box for the selected printer to hide the printer from the graphics window
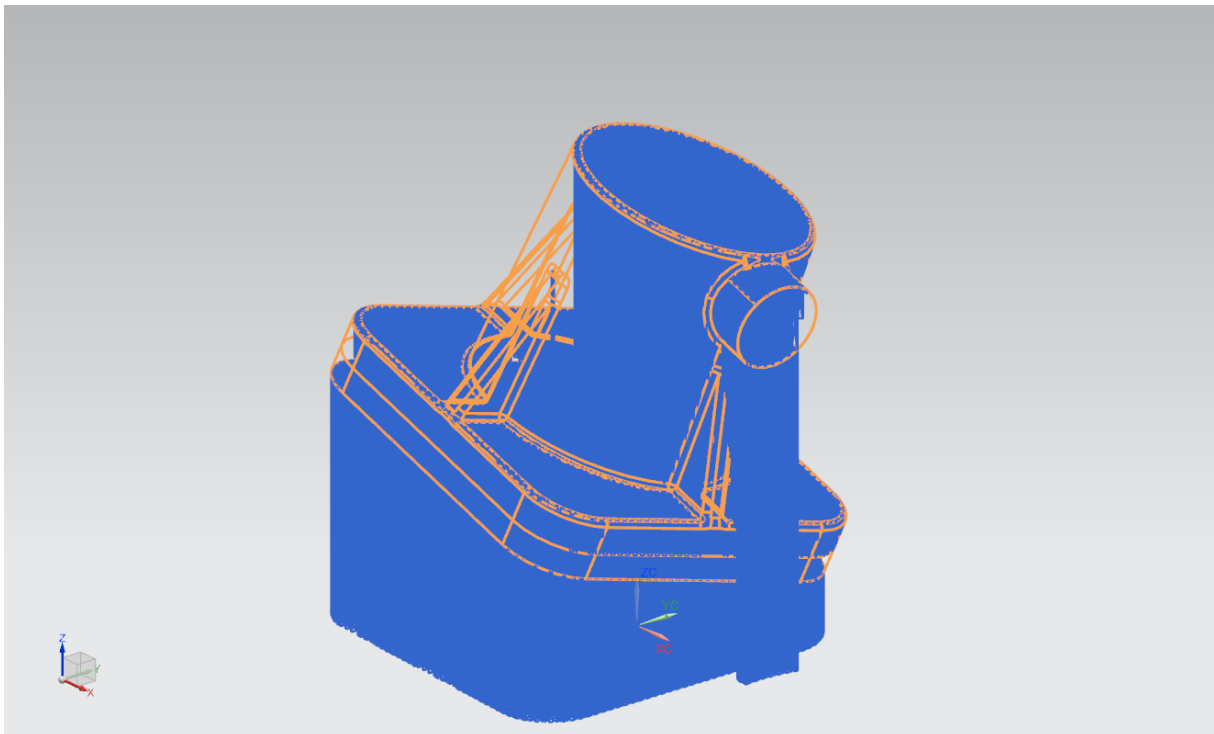
   <u>TIP:</u> Zoom the part to **Fit** in the graphics window for better visibility

   Notice the block supports generated in the **Additive Manufacturing Navigator** menu and on the part in the graphics window
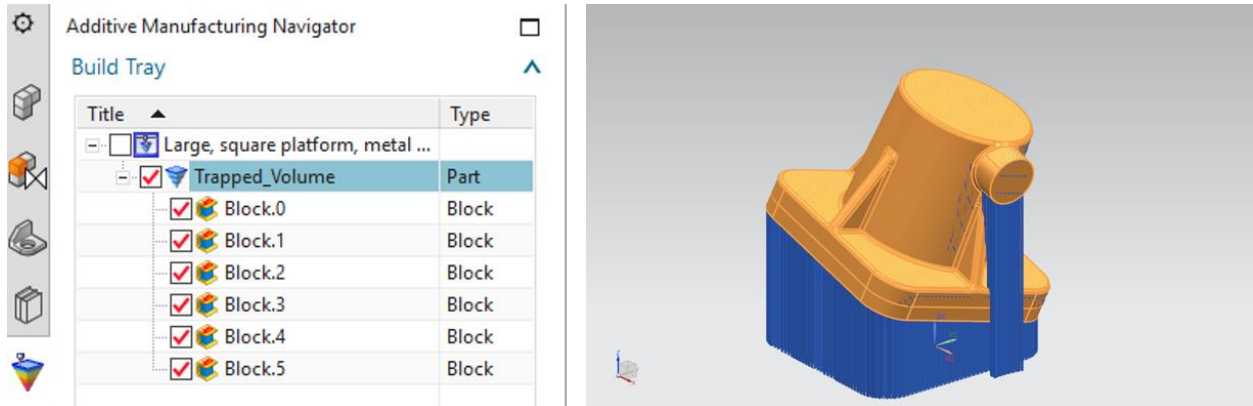
3. In the graphics window, right-click on the part. From the list select **Rendering Style --> Partially Shaded**

   Notice the supports generated **inside** the part volume

4. In the **Additive Manufacturing Navigator**, in the **Build Tray** group, select the trapped block supports (use **Ctrl** button to multiple select)

Notice the trapped supports (different from the accessible supports) highlighted in the graphics window