T024: Brick Meshing in DEFORM

Introduction

DEFORM allows users to generate brick meshes solely within DEFORM. A brick mesh may be preferable when modeling thin sheet metal components or parts undergoing thermal modeling. If the geometry of the 3D part is either extruded or revolved, a brick mesh can be generated.

This document describes the options for generating a brick mesh within DEFORM. Both extrude and revolve type brick mesh generation will be covered.

Geometry

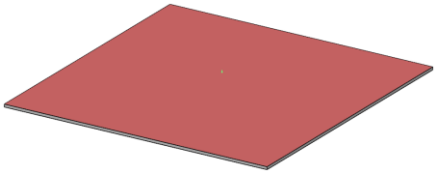
Initial geometry

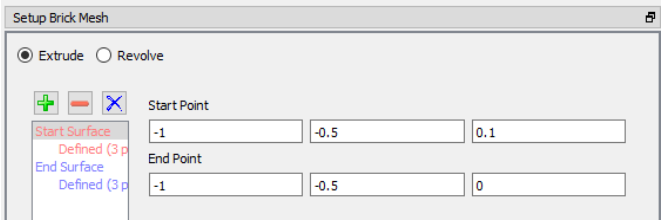
The geometry for the brick meshed component can be created multiple ways. The geometry can be imported as an .stl file like any other geometry in DEFORM. The 3D geometry can also be created based on the 2D cross-section. To use this approach, go to **Geometry** and click **Define primitive**. If the 3D geometry is to be extruded, use the **Extrude** option. If the 3D geometry is to be revolved, use **Revolve**. Within these dialogs, the 2D cross-section can be loaded and edited if needed. Once the extrude length or rotation angle is defined, the 3D geometry will be generated.

Geometry brick meshing parameters

Once the 3D geometry is generated, click **Setup brick mesh** within the Geometry dialog. Specify whether the geometry is Extrude or Revolve type.

If the geometry is Extrude type, click the top surface to highlight it and then use to add this geometry as the Start Surface. Next, click End Surface, pick the bottom surface of the part, and use to add the geometry to the End Surface. Verify that both Start and End surfaces are specified as Defined.





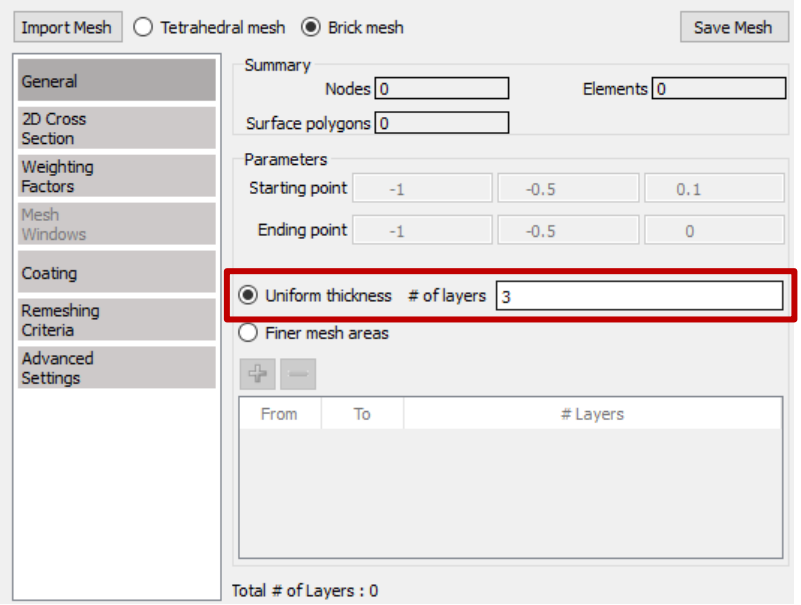
If the geometry is Revolve type, specify the axis and center of rotation.

Brick Meshing

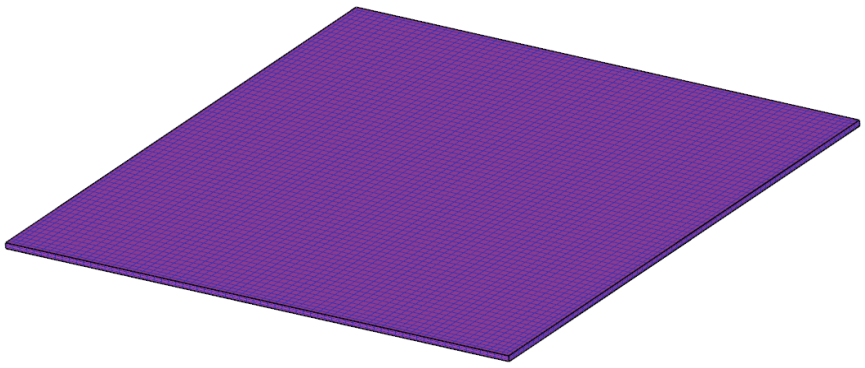
Extruded brick mesh

Once the start and end surfaces of the geometry have been defined, the object can be brick meshed. Go to the Mesh dialog and select **Brick mesh**.

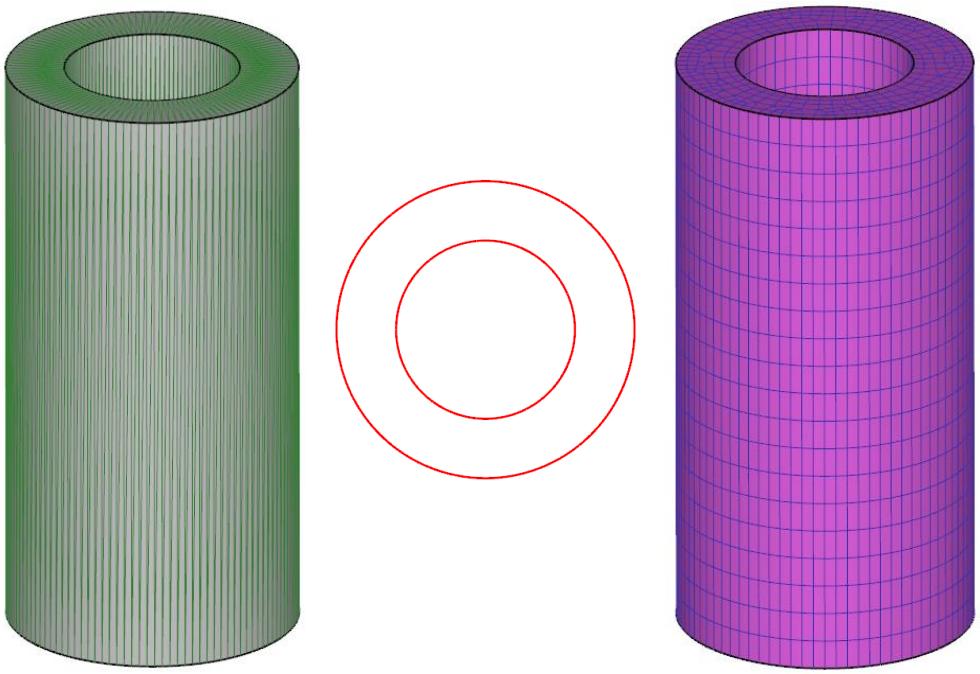
In the **General** tab, specify the **# of layers** of elements you want in the thickness direction. For thin sheet metal parts, at least three elements through the thickness is desirable for accurate springback calculations.



In the **2D Cross Section** tab, specify the number of elements and size ratio of the mesh to be generated on the start surface. Mesh windows can be used when generating this 2D mesh if desired. When ready to generate the brick mesh, click **Generate Mesh**. Below is an example of a brick mesh on a sheet metal blank.



An extruded brick mesh can also be generated on an object that has a 2D cross-section with multiple boundaries. Below is the geometry of a hollow cylinder, where the 2D cross-section has two loops. Once the start and end surfaces are defined, a brick mesh can easily be generated on this object as well.



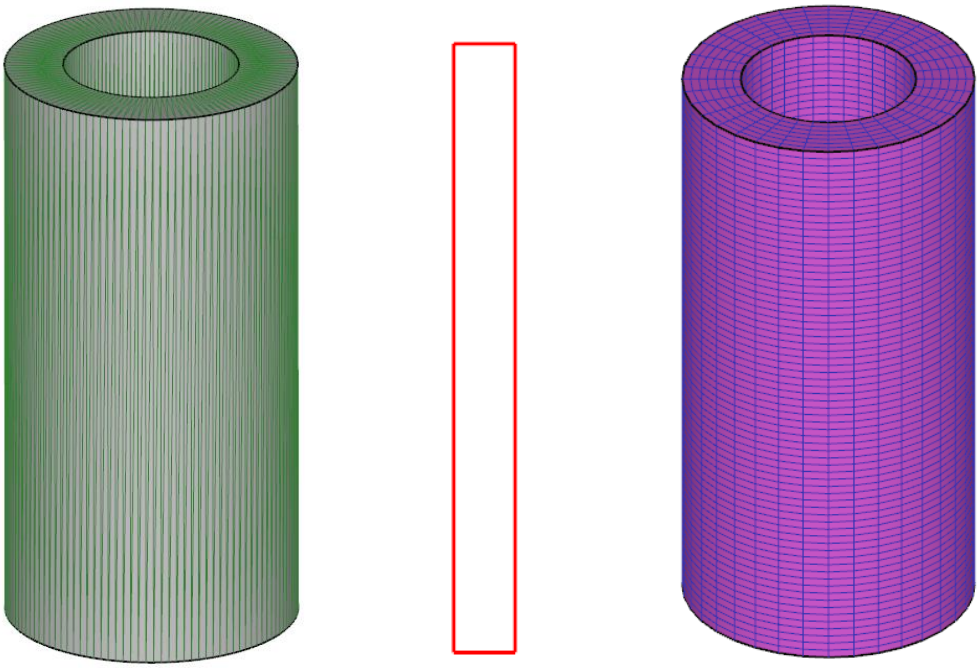
Geometry Cross-section Brick mesh

Revolved brick mesh

A hollow cylinder could also be meshed using a revolved brick mesh. To mesh it that way, in **Geometry → Setup brick mesh** specify the rotation axis and center.

Go to the Mesh dialog and select **Brick mesh**. In the **General** tab, specify the # **of layers** of elements you want around the perimeter of the part. Typically it is desirable to have at least one element every 10 degrees of rotation. For a full 360 degree part, you would specify 36.

In the **2D Cross Section** tab, specify the number of elements and size ratio of the mesh to be generated on the radial cross-section. When ready to generate the brick mesh, click **Generate Mesh**. The resulting brick mesh is shown below.



Geometry Cross-section Brick mesh

It is also possible to generate a revolved brick mesh on a solid cylindrical object. When the mesh gets generated at the centerline, the elements are generated so that they are valid 8-noded bricks.

