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# Surface Modeling - VI

The tutorial introduces an advanced mode to describe the shape of a sole of the sport shoe by associative and hybrid modeling. We suggest to follow the previously tasks to obtain the better usability and practicality with these commands.

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## 1. Step 1 - Generic shape of a shoe's sole

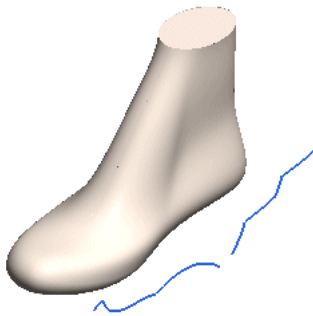
Typically, to create 3D geometry we need a series of raster images or generic curves that represent the general shape and behaviour of our object to replicate.

### NOTE.

With a double click on the exe file you can run the webtraining session. ThinkDesign will be open with the right model to start.

If request to open a file, you can find it in the C:\MyTraining path.

You'll find a model that contains all entities to follow this session. All entities have been taken to define the better shape of a bottom of the sport shoe. These, for a better usability, have been moved to different layers.



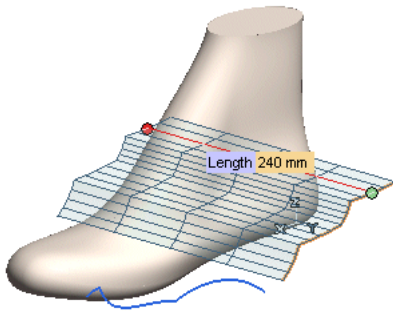
The first step is based to define the main shape respect the foot, scaled up of a factor to represent the external side of shoe, of the sole.

Start the Layers and set current layer 0 and active also Layer 10 and Layer 20. All new entities will be make on layer 0; you will use Hide-Unhide command to show or not these respect the part that we'll work.

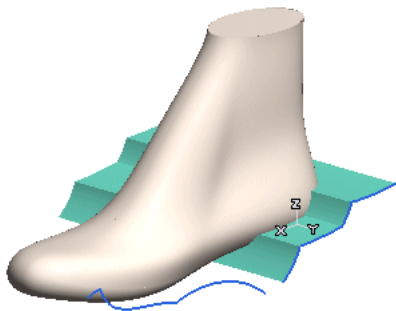
First: How split the foot entities in different sides by hybrid modeling.

- Start the **Linear Surface** command.

- Select one chain as curve. Impose the right direction; new surfaces have to intersect the foot solid.

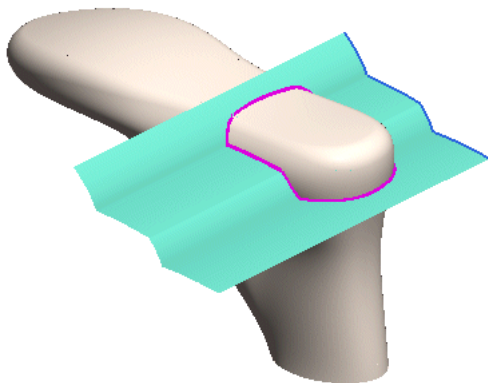


- Check  Associative Mode.



Using an other perspective, let's make the intersection curves from both.

- First click **Intersect Curve**.
- Select all linear surfaces as Surfaces A.
- Select all foot faces as Surfaces B.

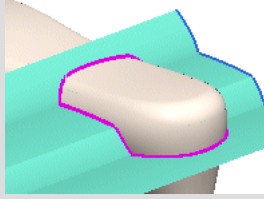


- Check  Associative Mode.
- Check  Insert Curve on Surface.

**Note: Associative**

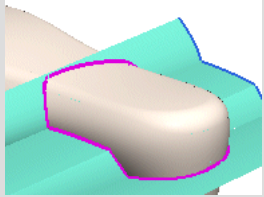
The importance to apply the associative mode, it could be much useful especially when need to change quickly

some parameters or behaviour without to replicate the modeling or use GSM commands.



In the history tree, select the **Linear Surface** with right button and hit **Redefine Feature**.

- Insert a draft angle, about 5 degrees with sharp transition and Rebuild.

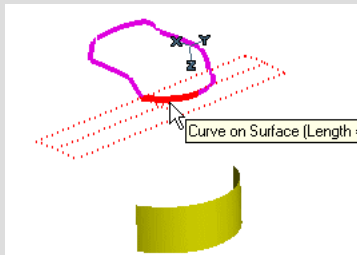


All curves will be computed again to satisfy your change.

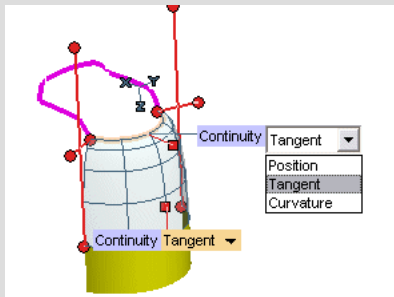
- Remove the draft angle.
- Use **Hide Entities** for the linear associative surfaces and their main curves. Keep the foot solid and intersection curves.

**Note: Curve on Surface**

The importance to apply the COS (Curve on Surface), it could be much useful especially when need to keep the surface parameterization in a 3D curve.

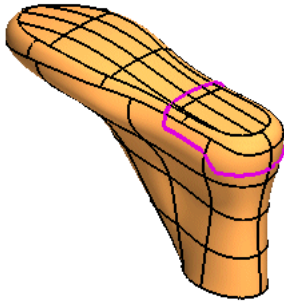


Respect at one Generic Curve, using COS entities, you have the possibility to use and impose commands to make surface with continuity different at the position.

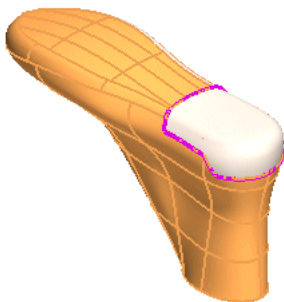


Let's split the solid in two sides.

- Start **Split faces**.
- Select the foot solid as Solid A.
- Set Curves as Split with and select the COS and Associative curves.

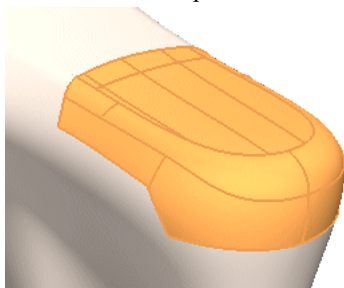


This command permit you to split the faces in the solid without to break, trim and make solid with generic surface modeling.

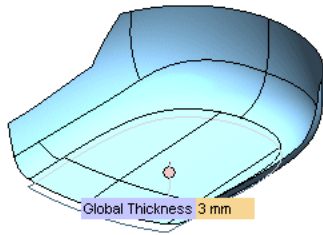


Now we have the preliminary shape to describe the rear behaviour of the sole. Let's use them to make a duplicated solid.

- Start **Solid From Faces**.
- Select the highlighted faces as Faces.
- Hit Linked copies.

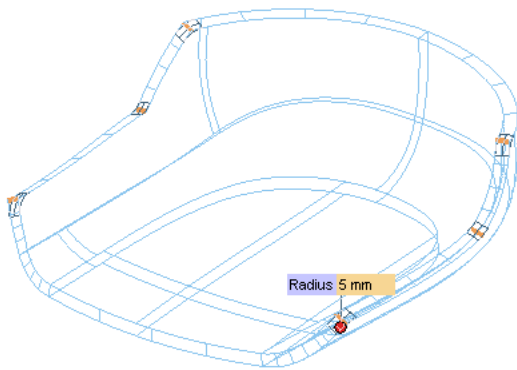


- **Hide Entities** for the main solid.
- Start **Solid Shell**.
- Add thickness 3 mm in the outside.



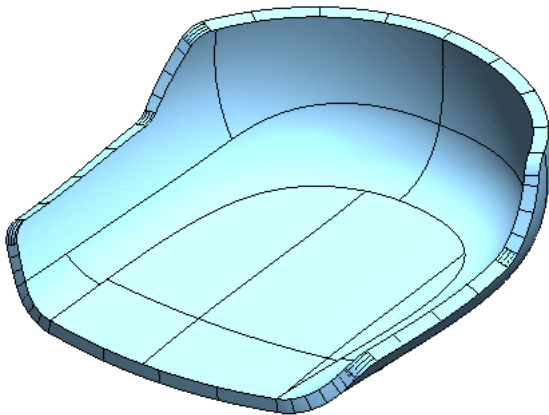
Let's remove some tangent discontinuity in the thickness shape.

- Start **Fillet Solid**.
- Select the 6 edges shown and assign 5 mm as radius.



- Run **Rebuild All** to check the right behaviour of modeling.

Here the result about first step.



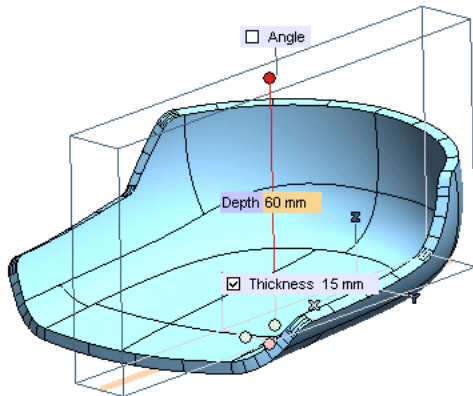
## 2. Step 2 - Complete the hybrid modeling

The second step describes how to complete with other hybrid features the rear part of our plastic sole.

Set current layer 0 and active also Layer 40.

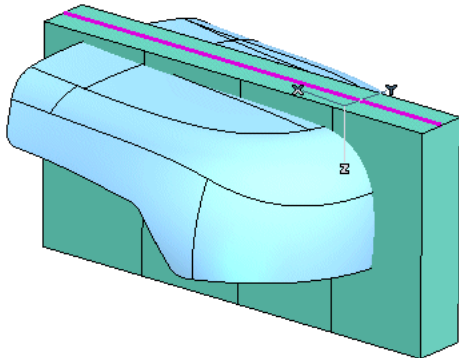
- Click on **Linear Solid**.
- Select the magenta line, it's lies on layer 40, and double click with left button to make a solid using an open profile.

- Impose a Thickness of about 15 mm with symmetrical condition.
- Assign a depth just to cover completely the previously solid.

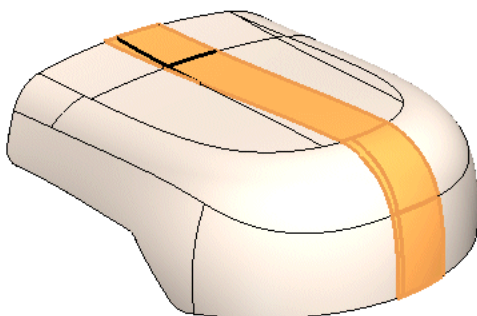


Let's do the three last features made in Step 1, to split other faces.

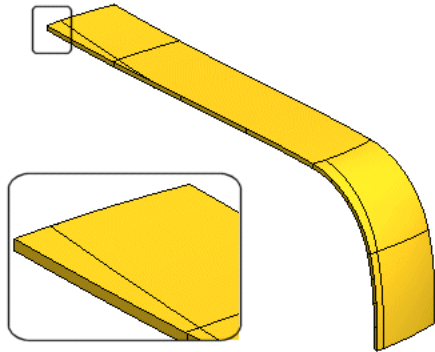
- Start **Split faces**.
- Select the rear sole solid as Solid A.
- Select the linear solid as Split with Solids B.



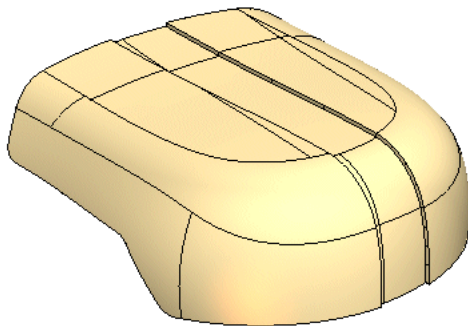
- Start **Solid From Faces**.
- Select the highlighted faces as Faces.
- Hit Linked copies.



- Start **Solid Shell**.
- Add thickness 1 mm in the inner side.

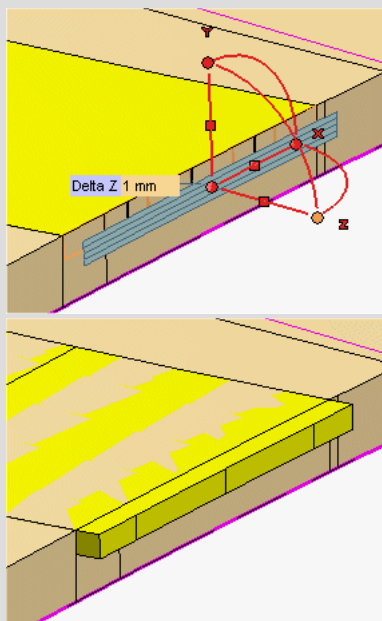


- Use **Solid Difference** to remove it from the sole solid.



**Note: Open Solid?**

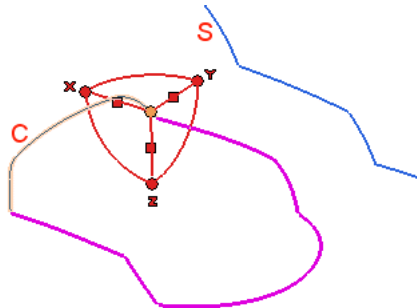
By the command Modify -> Interactive Modeling -> Move Faces you can extend a yellow faces to obtain a right intersection.



- Run **Rebuild All** to check the right behaviour of modeling.

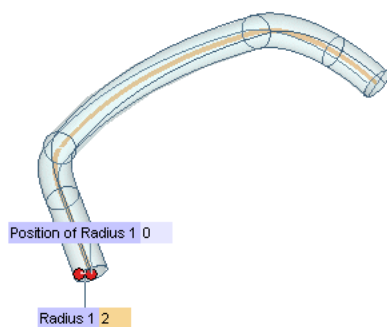
Now let's arrive to insert some slot for to give a personal style factor.

- Use **Hide Entities** for the solid and **Unhide Entities** to take visible the intersection curves.
- Start **Move Copy Entities**.
- Select all C curves made with S curve.
- Take as reference the below image, move them of about Z -4.7 and X -5.
- Hit Copies and insert 1.
- Hit Linked copies.
- Hit Associative Transformation



You'll use a pipe solid with these new curves by Pipe.

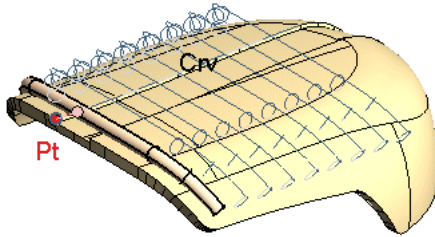
- Start Pipe command.
- Select the moved curves as Drive Curves.
- Hit Preview button.
- Set radius with 2 mm.
- Hit With Endcaps.
- Hit Associative Mode.



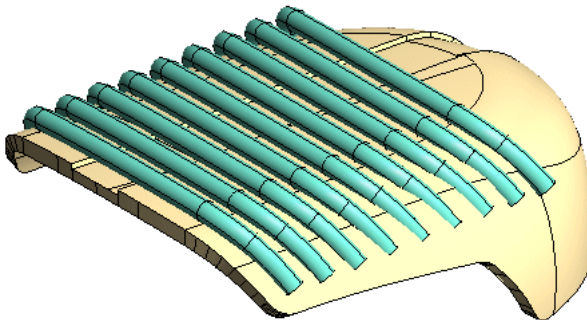
This solid needs to replicate to obtain lot slots. The enhancement of the **Pattern Solid** now permits to replicate features along curves.



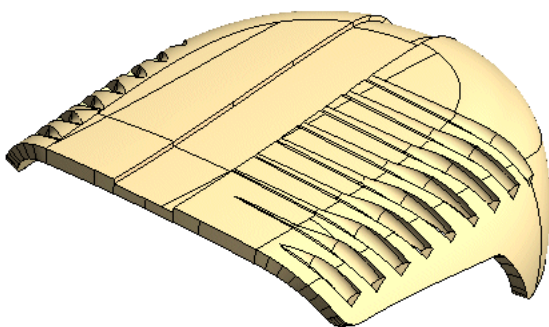
- Start **Pattern Solid** command.
- Select the associative pipe solid as Base Entities by history tree.
- Set Curves in the Type and select the bottom slot edge in the 1st Curves condition.
- After to have checked that Curve Alignment Mode is in Curve based, indicate, in the same edge, the limit point as Curve Start Point.
- Hit Joined Copies.



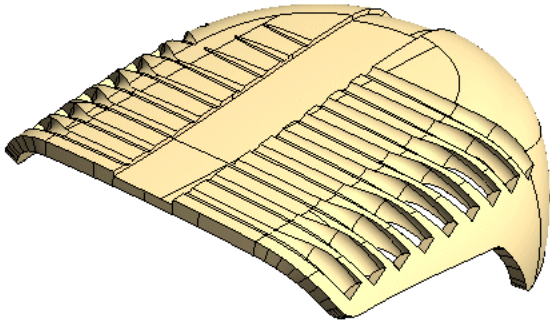
- Placement - Fixed
- 1st Step 7 mm
- 1st No of Copies 9 .



Here the current status after a **Solid Difference** command.

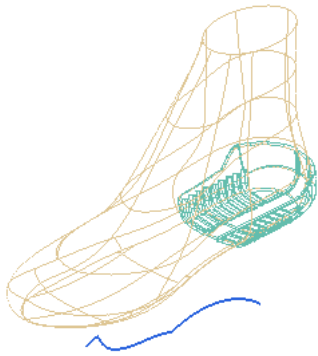


- By history tree, redefine the Advanced Pipe feature and assign radius with 2,5 mm.
- **Rebuild Model** to see an automatic change of the shape.

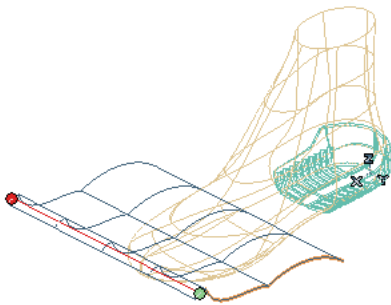


### 3. Step 3 - Front shoe's sole

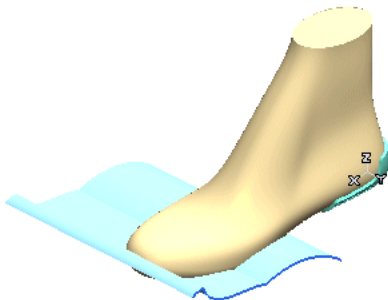
Now let's replicate the same Step1, used to define the main shape of the rear side of the sole, to make the front.



- Start the **Linear Surface** command.
- Select front chain as curve. Impose the right direction.

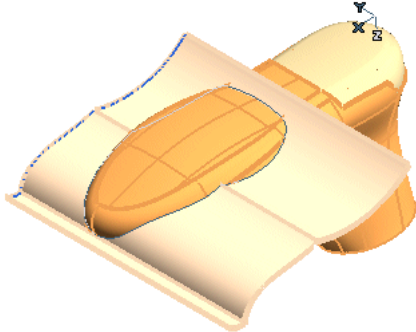


- Check  Associative Mode.



Using an other perspective, let's make the intersection curves from both.

- First click **Intersect Curve**.
- Select all linear surfaces as Surfaces A.
- Select all front foot faces as Surfaces B.



- Check  Associative Mode.
- Check  Insert Curve on Surface.

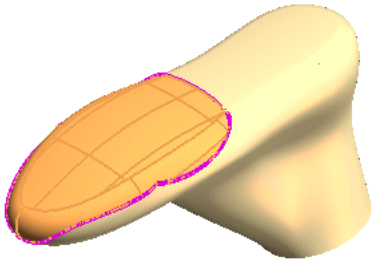


Let's split the solid in two sides.

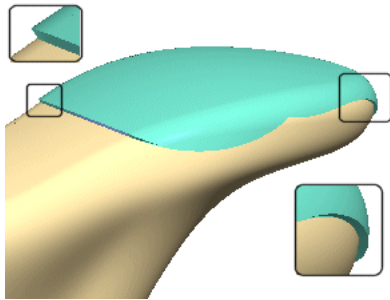
- Start **Split faces**.
- Select the foot solid as Solid A.
- Set Curves as Split with and select the COS and Associative curves.

Let's use them to make a duplicated solid.

- Start **Solid From Faces**.
- Select the highlighted faces as Faces.
- Hit Linked copies.

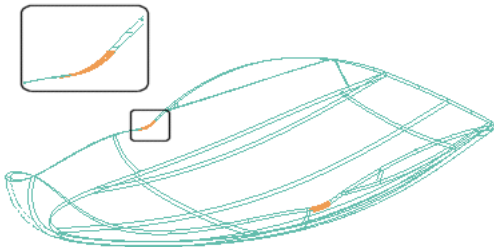


- Start **Solid Shell**.
- Add thickness 1.5 mm in the outside.



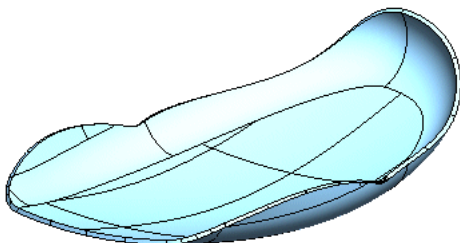
Let's remove some tangent discontinuity in the thickness shape.

- Start **Fillet Solid**.
- Select the 2 edges shown and assign 10 mm as radius.



- Run **Rebuild All** to check the right behaviour of modeling.

Here the result.

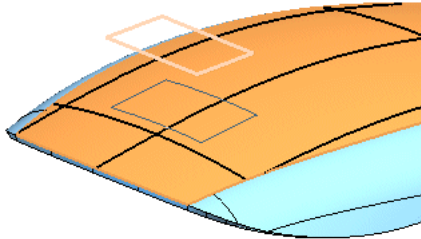


## 4. Step 4 - Complete the hybrid modeling

The last step describes how to complete with other hybrid features the front part of our plastic sole.

Set current layer 0 and active also layers 30.

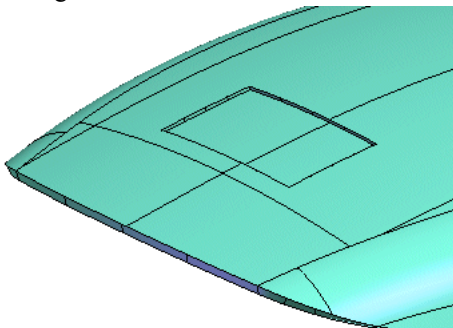
- Click on **Project Curve**.
- Project the rectangle on the highlight face.
- Impose the right projection direction. You may try to set the workplane to world, Press F8 and use View direction.



- Check  Associative Mode.
- Check  Insert Curve on Surface.

The sole needs of an area to place a Logo.

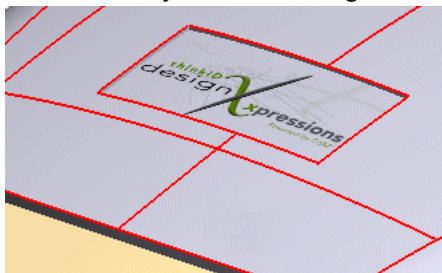
- By **Split faces**, **Solid From Faces**, **Solid Shell** (0.5 mm) and **Solid Difference**, let's remove the material for the Logo.



**Note: Slot**

By the command Modify -> Interactive Modeling -> Offset Faces you can make same slot given an inner 0.5 mm thickness and set Side Faces to All .

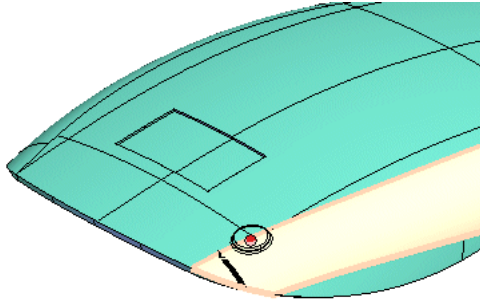
You can use Dynamic Rendering to add an image in this face and obtain a real effect.



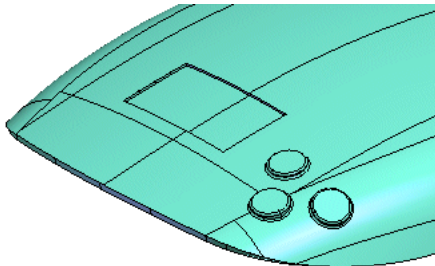
- Run **Rebuild All** to check the right behaviour of modeling.

This side needs of some little heels for a better impression and stability on the ground. We'll use it by a Smart Object and replicated with **Pattern Solid** to cover completely the front sole.

- Click on **Insert Smart Object** and search the file "heel 2008.sf".
- Indicate a point on external skin in the position as shown below.



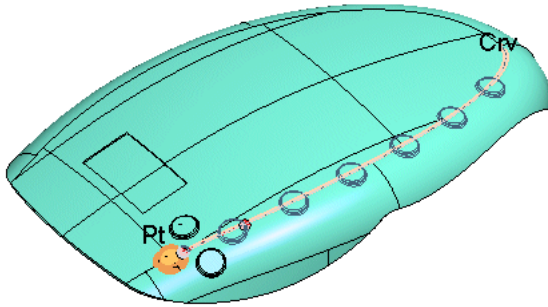
- Hit Apply and insert other two heels.



**Note: Problem with Smart Object**

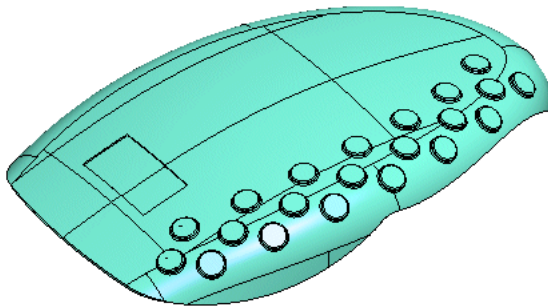
If SO fails, you need change the value of height or radius by Redefine Feature - Show Parameters All to compensate for the different behaviour of faces.

- Start **Pattern Solid** command.
- Select one face on the first smart object inserted as Base Entities.
- Set Curves in the Type and select the face's boundary in the 1st Curves condition.
- After to have checked that Curve Alignment Mode is in Curve based, indicate, in the same boundary, the limit point as Curve Start Point.
- Hit Joined Copies.

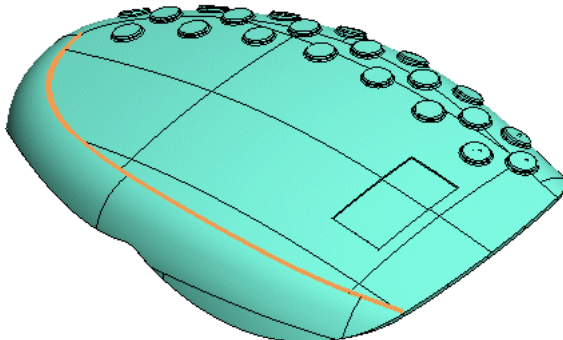


- Placement - Fixed
- Set 1st Step 20 mm
- Set 1st No of Copies 7 .

To duplicate the other two smart objects use the same **Pattern Solid** but now by Placement - Inherit.



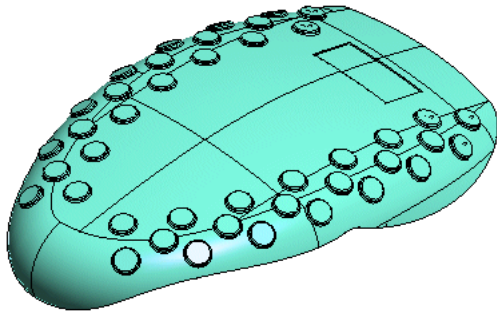
Replicate the same last features, **Insert Smart Object** and **Pattern Solid**, for opposite side. Let's use this boundary and its end point as reference.



For the **Pattern Solid** use these parameters.

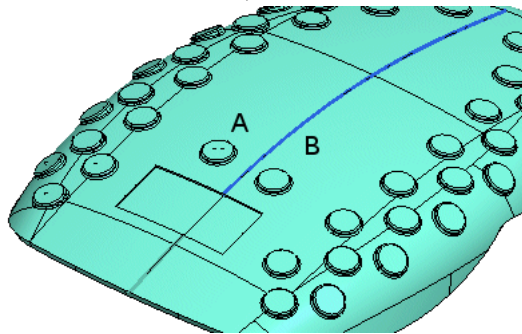
- Placement - Fixed
- Set 1st Step 20 mm
- Set 1st No of Copies 7 .

To duplicate the others use the same **Pattern Solid** but now by Placement - Inherit.



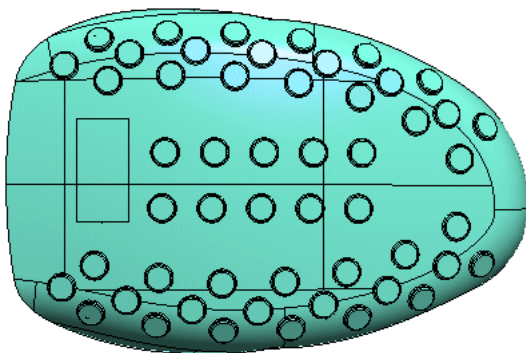
Let's apply other two smart object in the middle and replicate them by one curve made with **Isoparametric Curve**.

Also for this command, check both  Associative Mode and  Insert Curve on Surface.

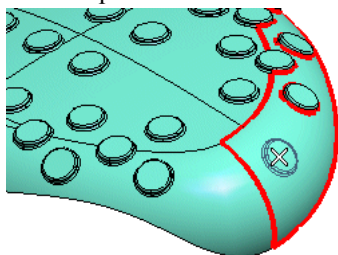


For the **Pattern Solid** use these parameters.

- Placement - Fixed
- Set 1st Step 15 mm
- Set 1st No of Copies 5 .

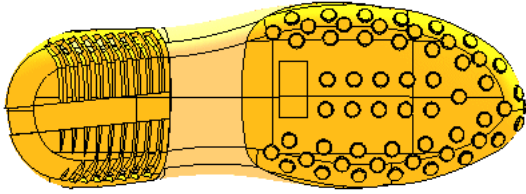


Insert at pleasure some other smart object features on the tiptoe side.

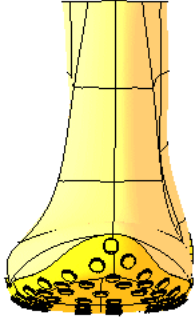




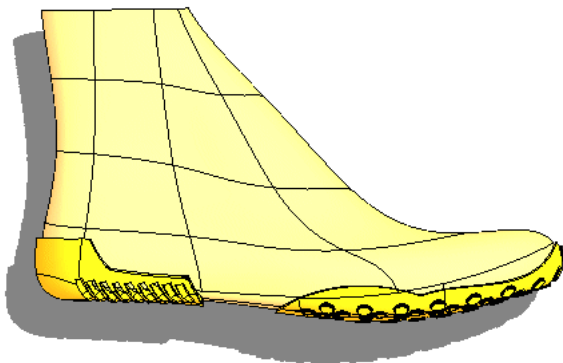
- **Rebuild Model** to revise and check all hybrid modeling.



The modeling is finished. Here, let's see the end shapes in different representations.



Front and lateral.



The model is ready to apply some textures by Dynamic Rendering and High Quality Shaded View.

