

IRONCAD ROUTING 101

Routing hoses or cables using 2D Sketch, 3D Curve
and Extract Curve Tools

Joseph Olizon

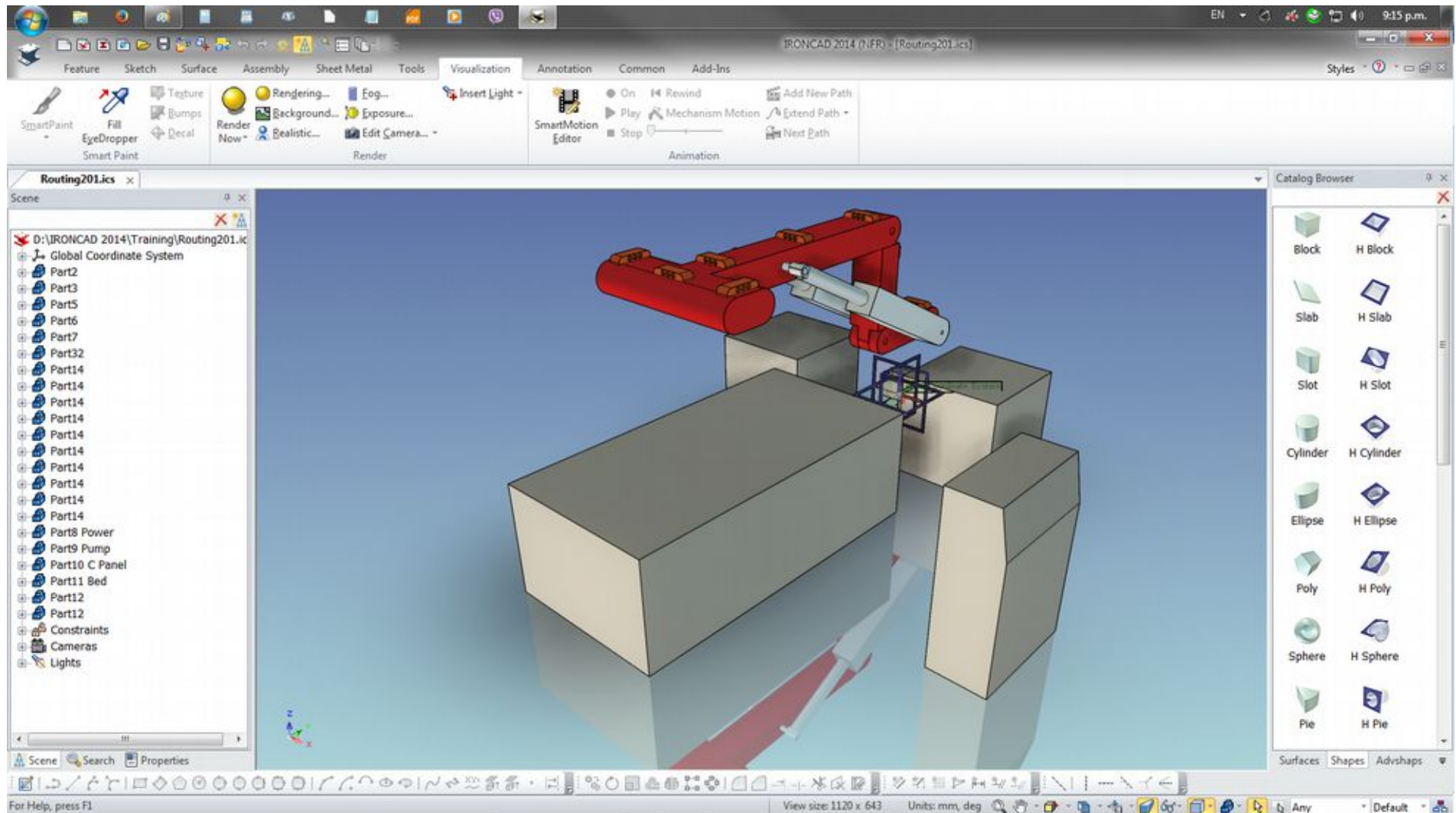
Thanks to:

Kevin Devoll, Dallas Hovatter, Tom Lehnhaesuer

Created with LibreOffice Impress 4.2.5.2

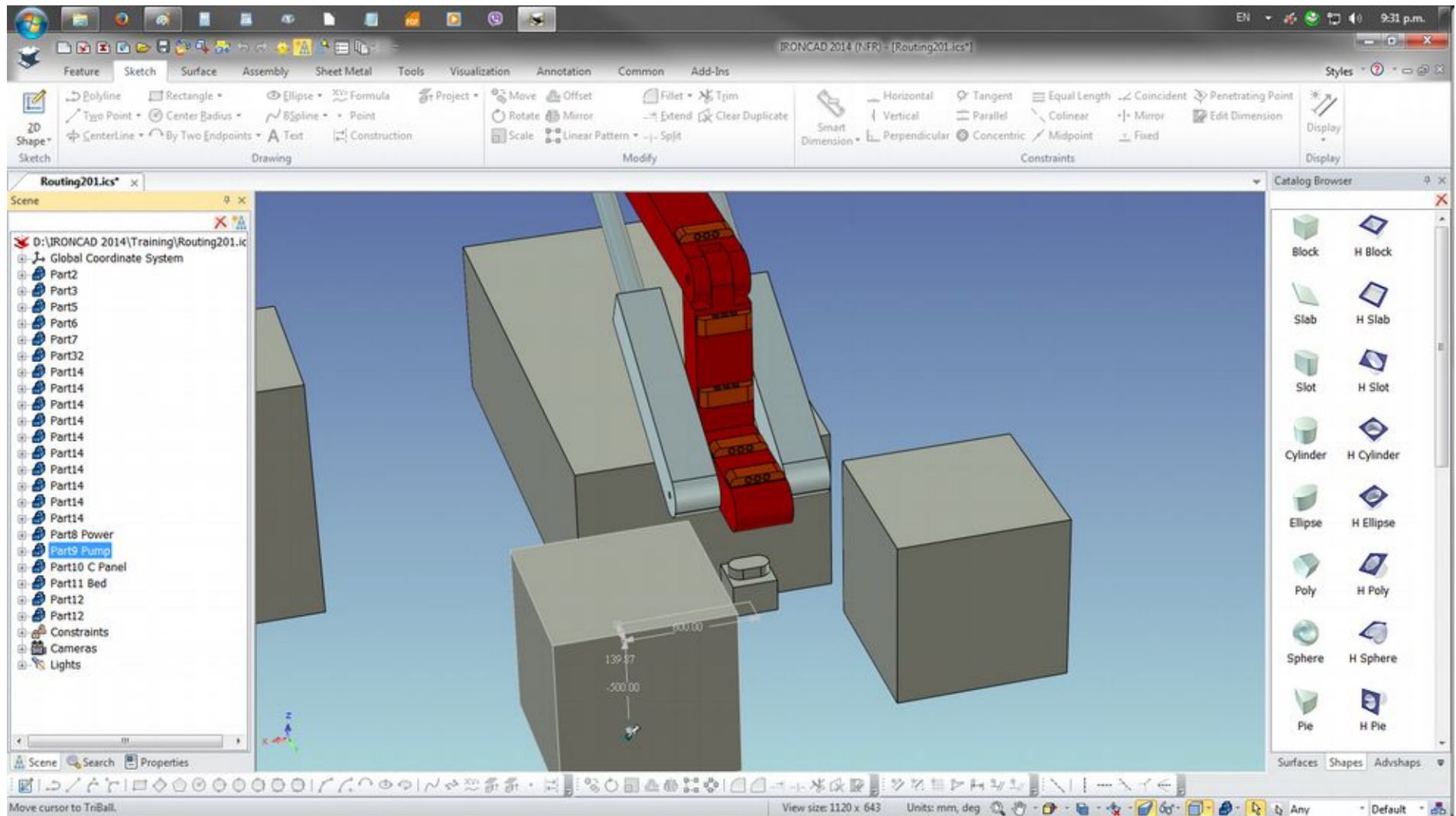


This is a step by step guide to route cable and hoses. On the scene are basic shapes with no actual fittings, using only points to start with as the objective is to create the path for the routing. Please note the items on the Scene Tree as it shows the created 2D profile and 3D curve parts. The images will be done on a whole scene image to provide a consistent guide flow. It may be repetitive but it will reflect what was actually done on the screen. Angle Bracket or Greater Than symbol is used to denote Next.

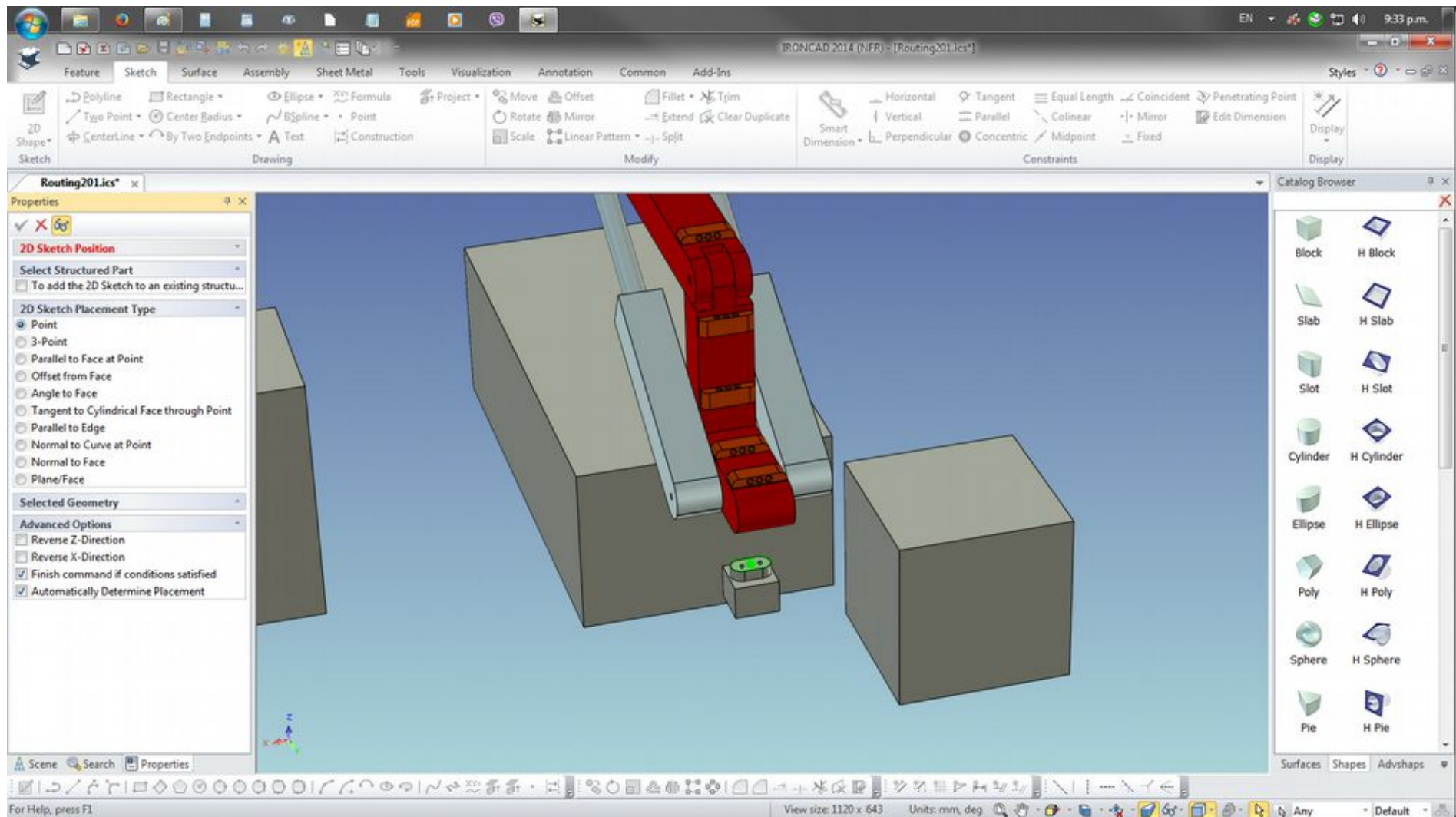


On the Scene Tree, select and suppress Part9 Pump so it will not be obstructive to the view during this part of the guide.

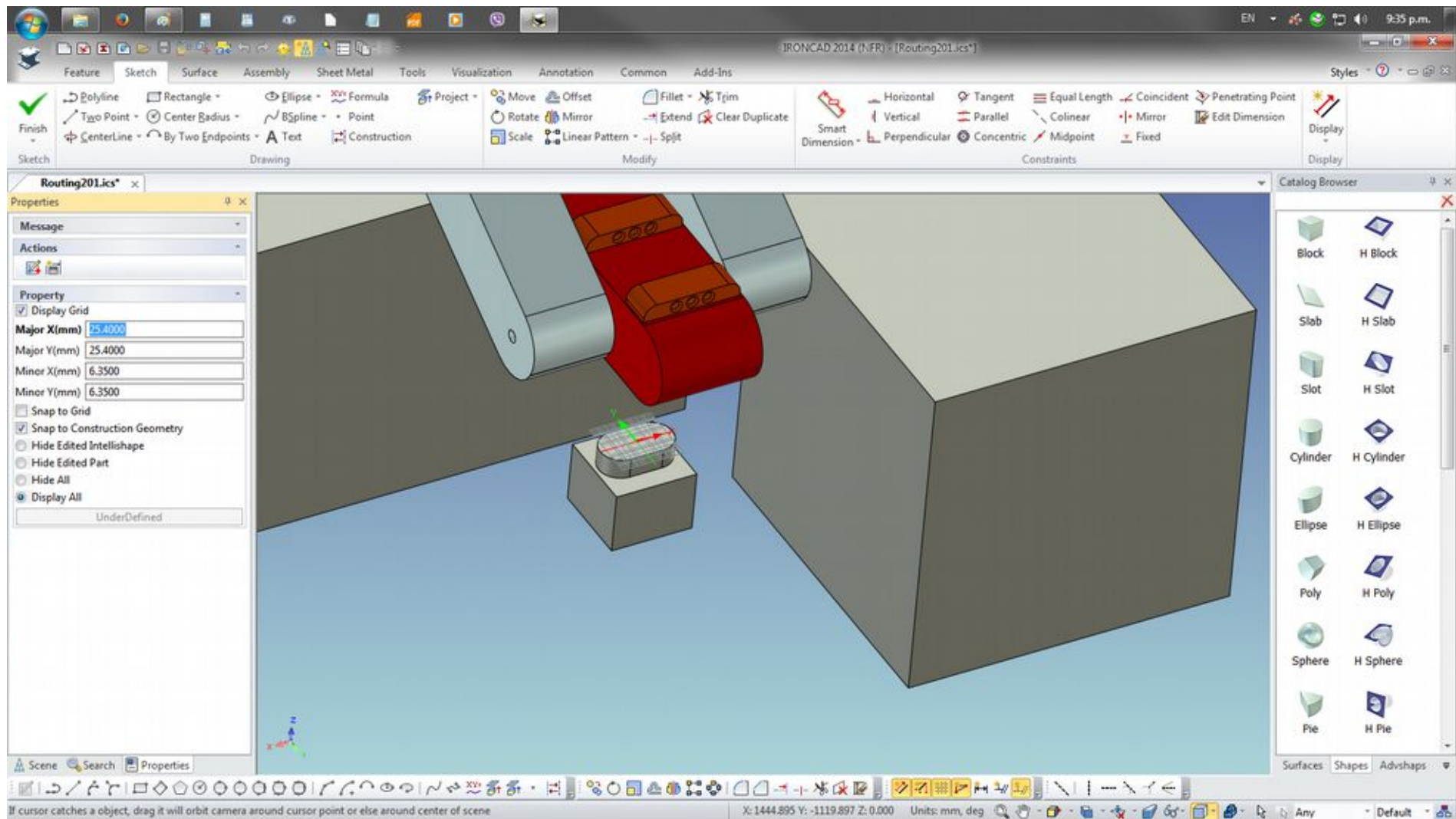
Please note on this working scene properties what is ticked to show are: Position Dimension, Sizebox Dimensions, Coordinate System, World Coordinate Axes and Datum Plane/Axis/Point. Coordinate System can be turn on or off by the A key



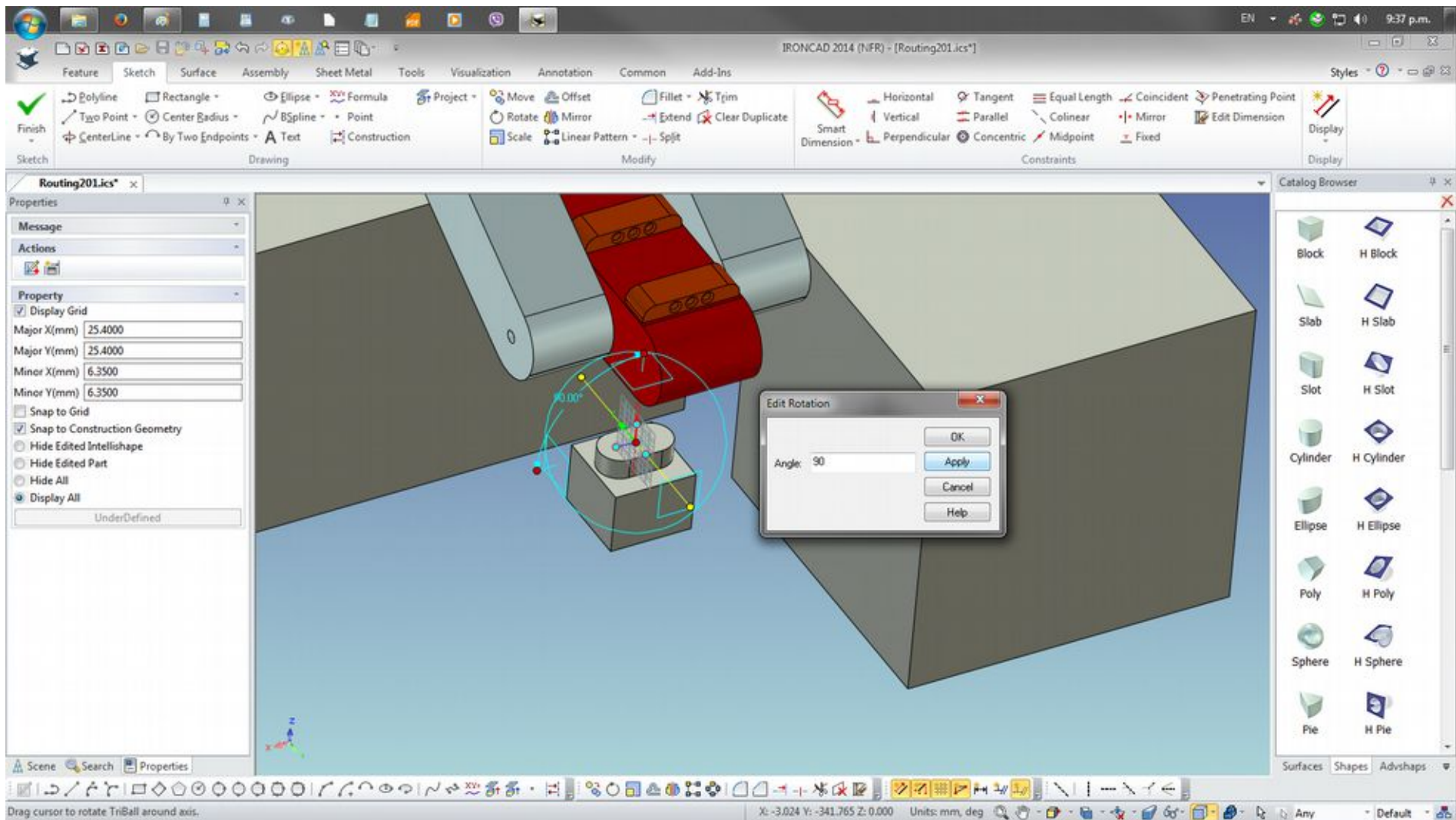
Click the 2D Shape Sketch button from the Sketch Tab. Tick the Point from the 2D Sketch Placement Type dialogue pane. This will create the first 2D Profile11 or Line A on the center point of the slot surface.



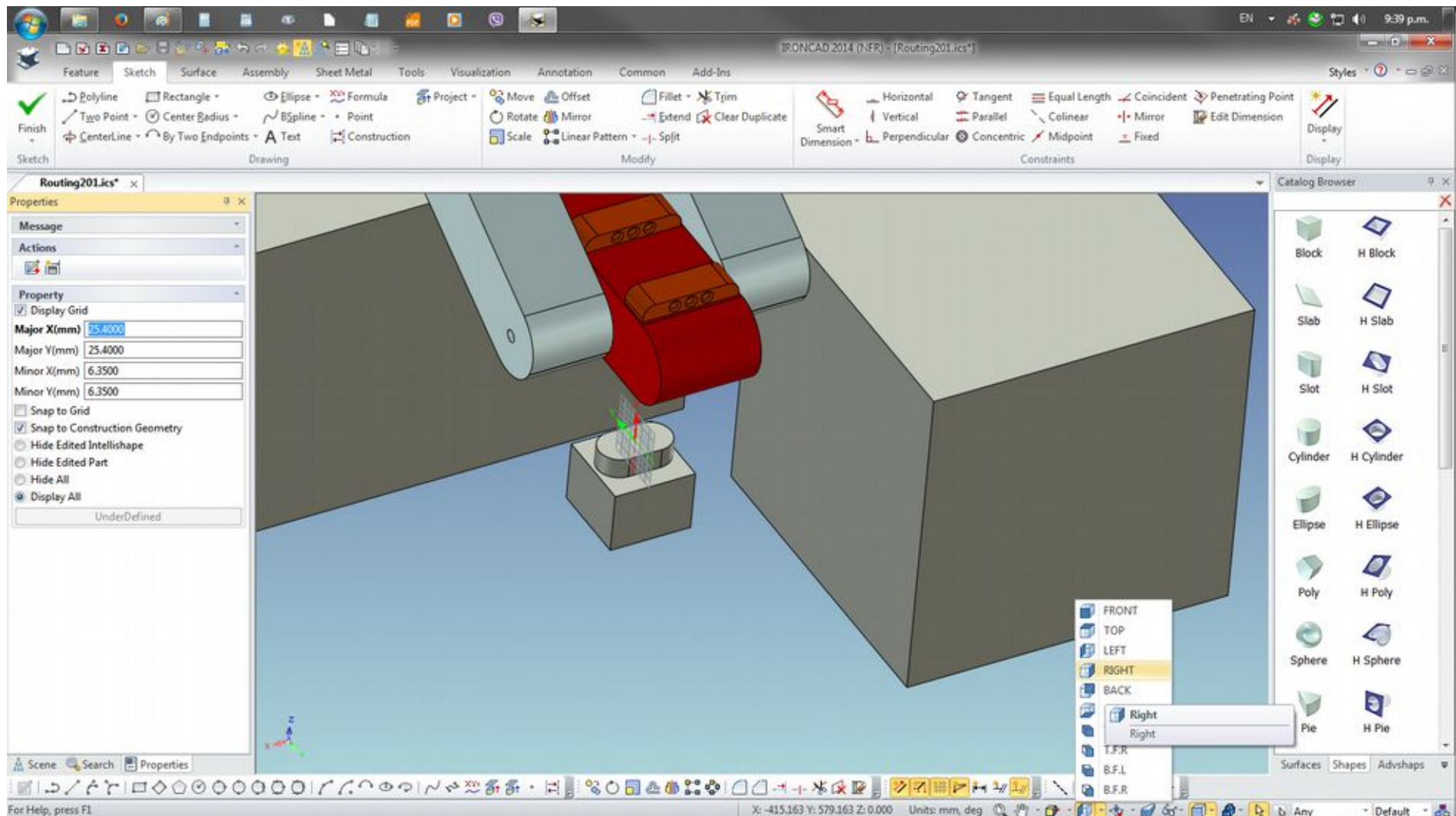
Use the scroll wheel to zoom in or the key F5 and F3 to orbit the view from the scene.



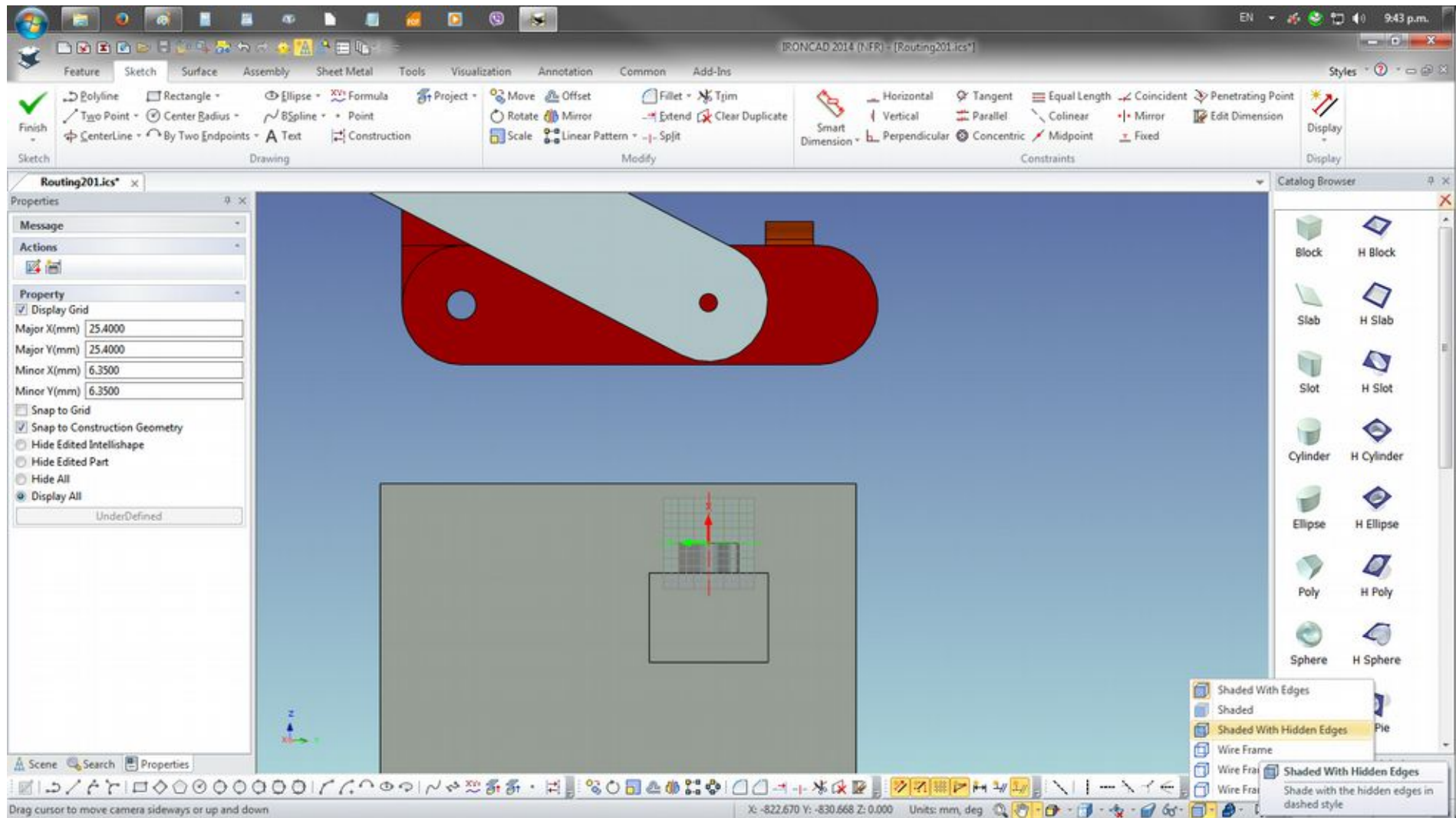
Using the F10 key to activate the TriBall, select the Y axis handle to rotate 90°



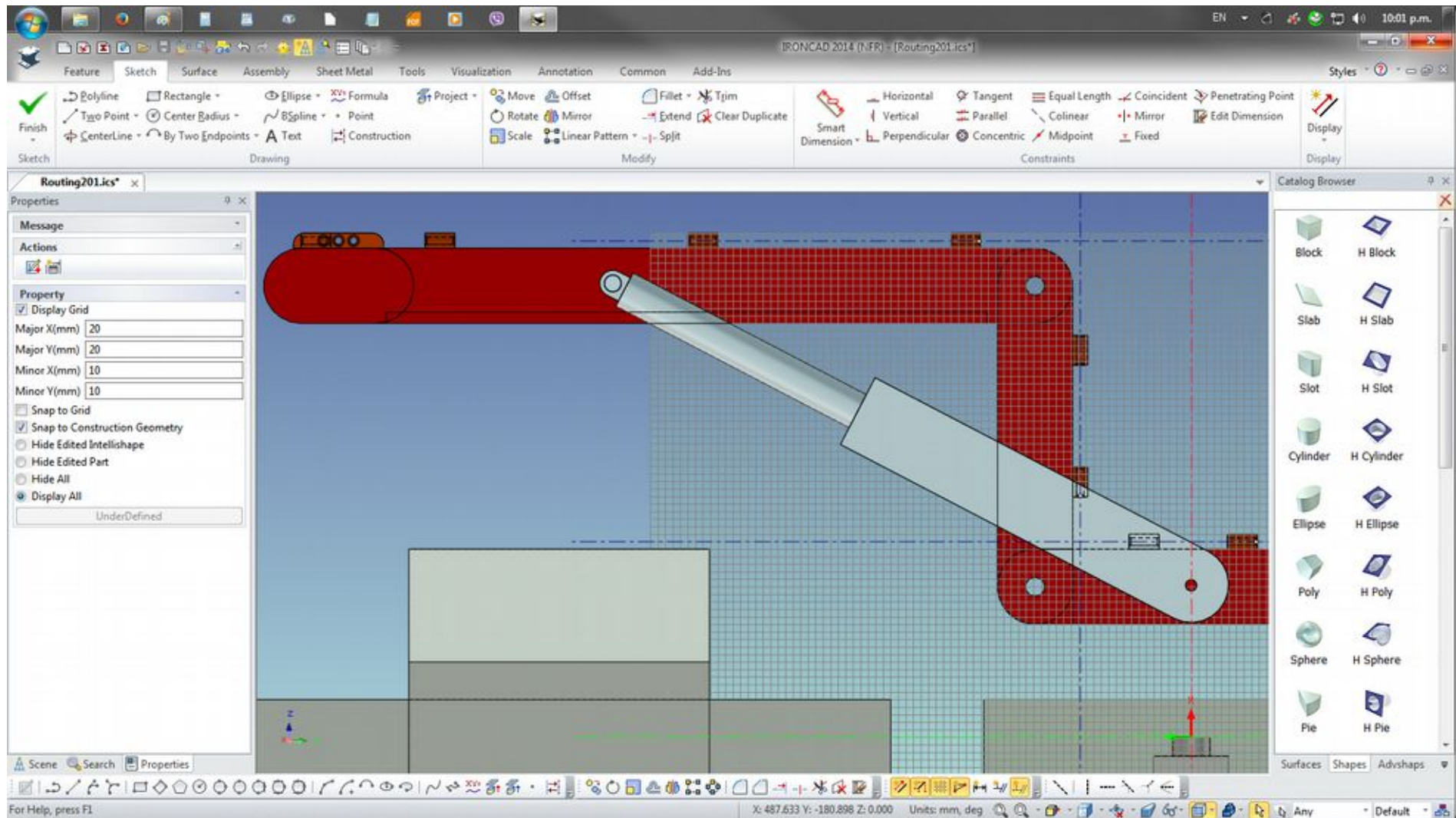
Select and tick Right from the Camera Picker at the Screen Navigation Tool. This is done so when start drawing the polyline it will be on the consistent horizontal upright view, please note the only drawback is that the Horizontal (L) Construction Line and Vertical (W) Construction Line are switched or oriented differently than letting the default 2D sketching view on a vertical mode. This maybe resolve by rotating X axis on the drawing grid with Triball earlier but this will be an extra step to do.



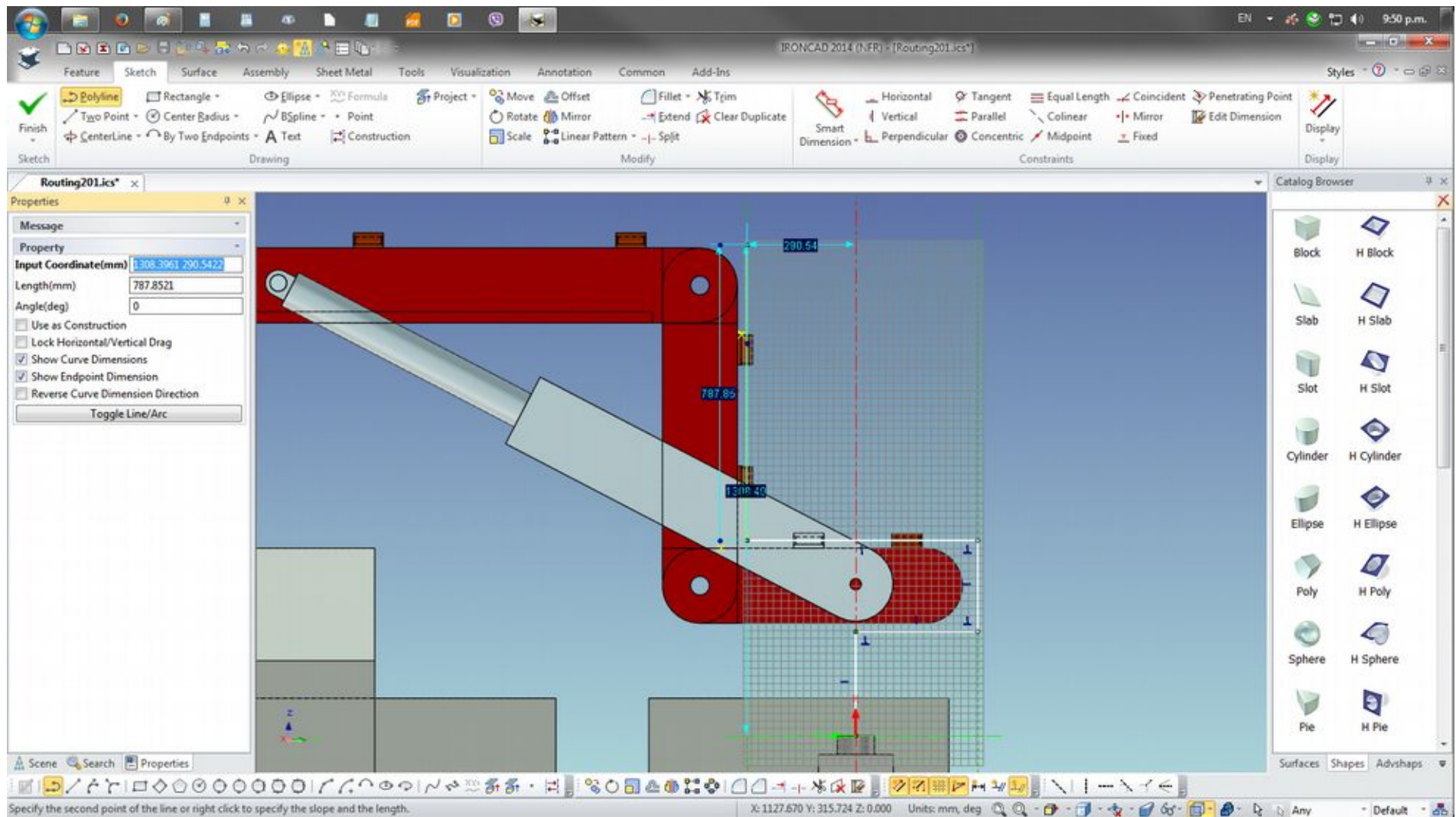
Select and click Shaded With Hidden Edges from the Screen Navigation Render Tool



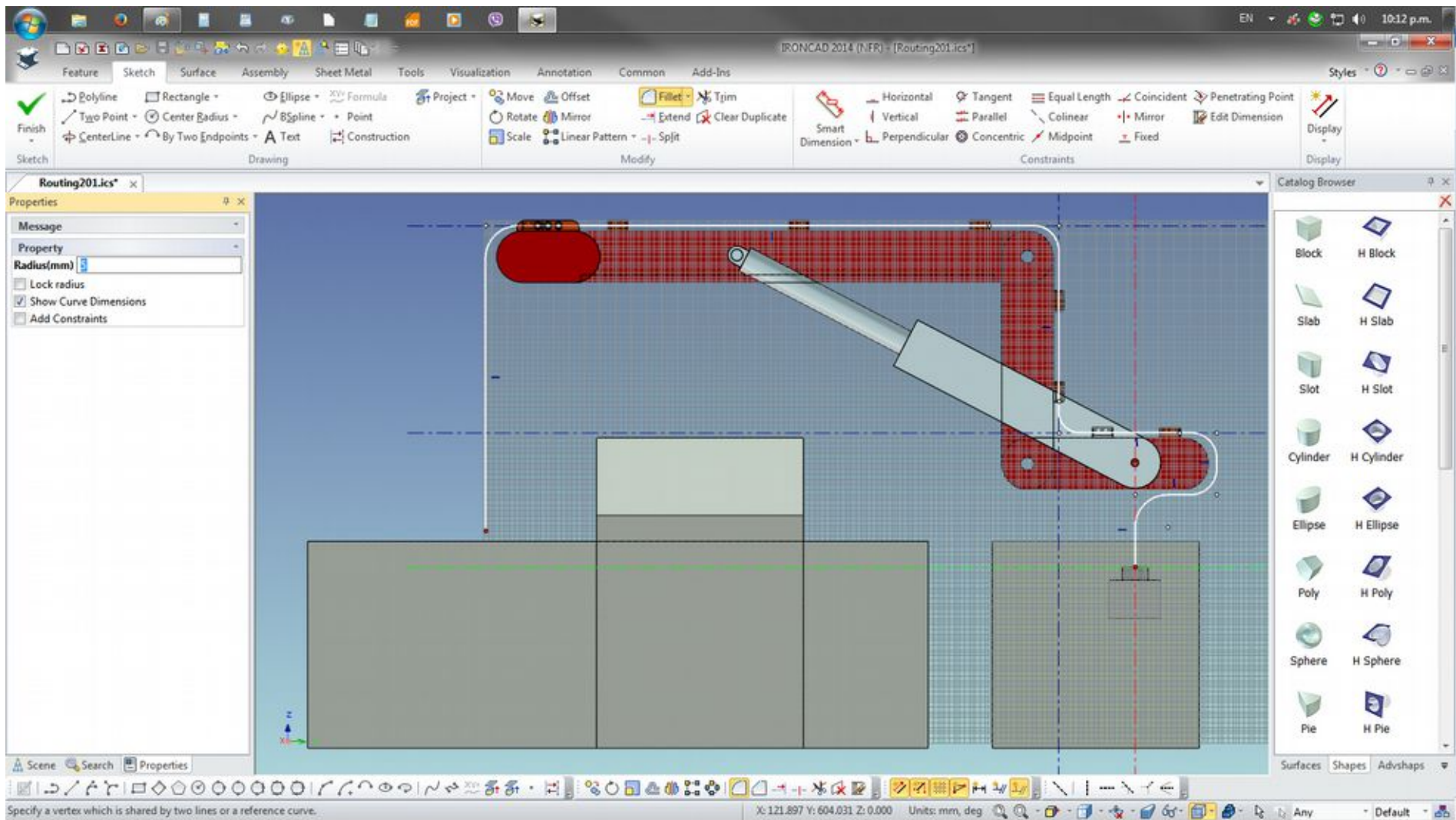
Set the construction lines as it goes to the center of the holding blocks.



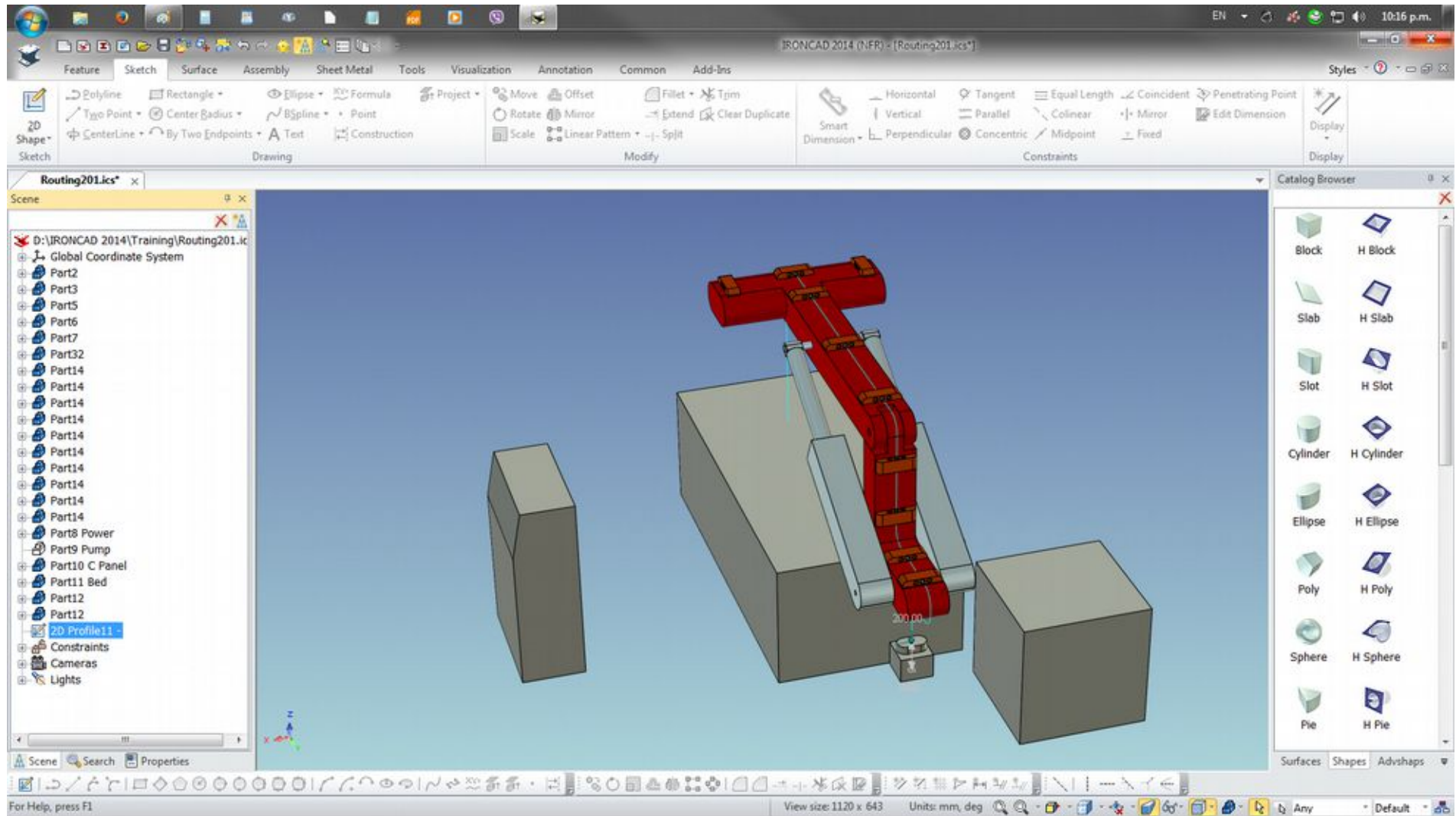
Select and draw with the polyline.



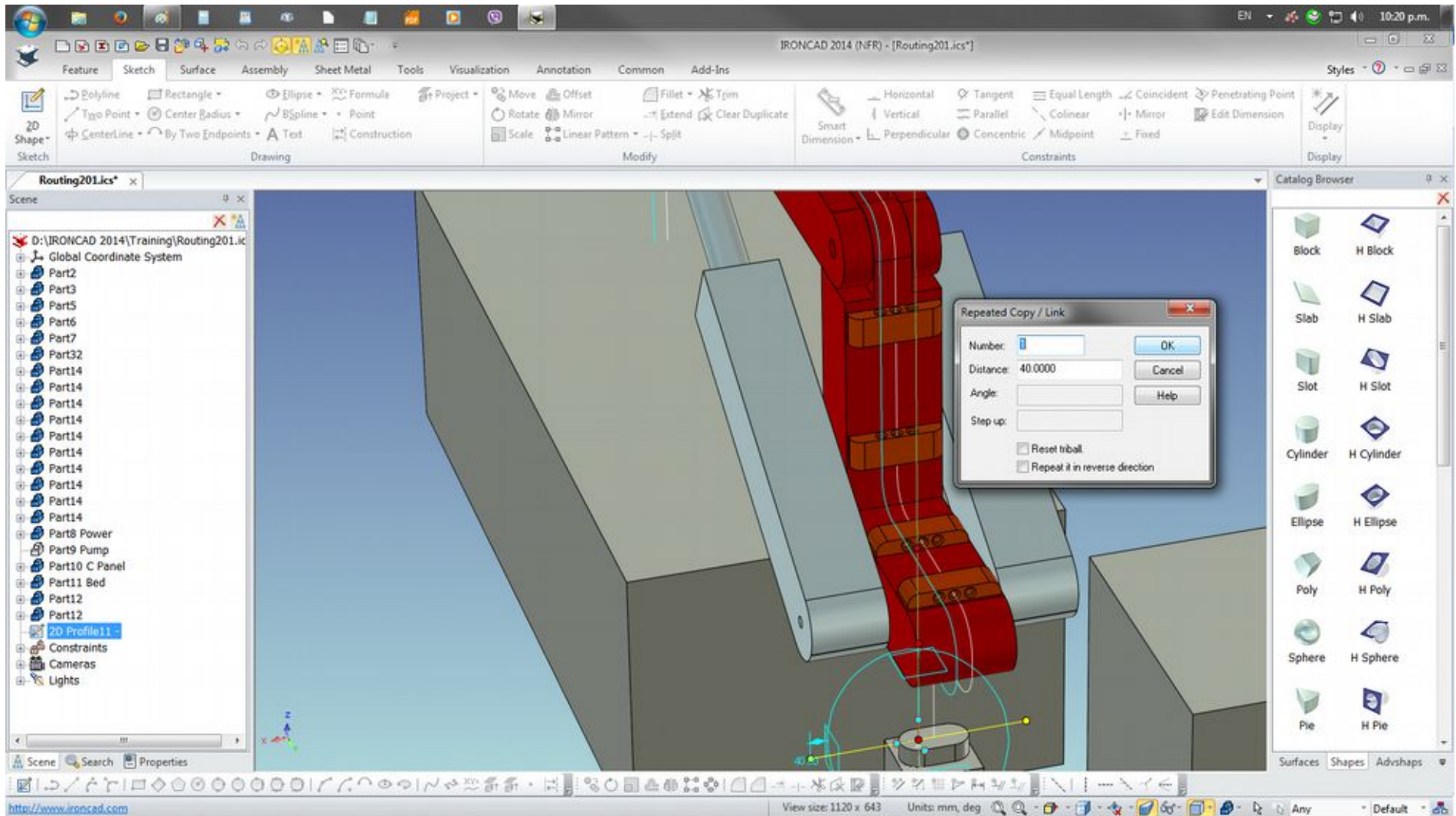
Apply the fillets on the corners of the polyline and select click Finish



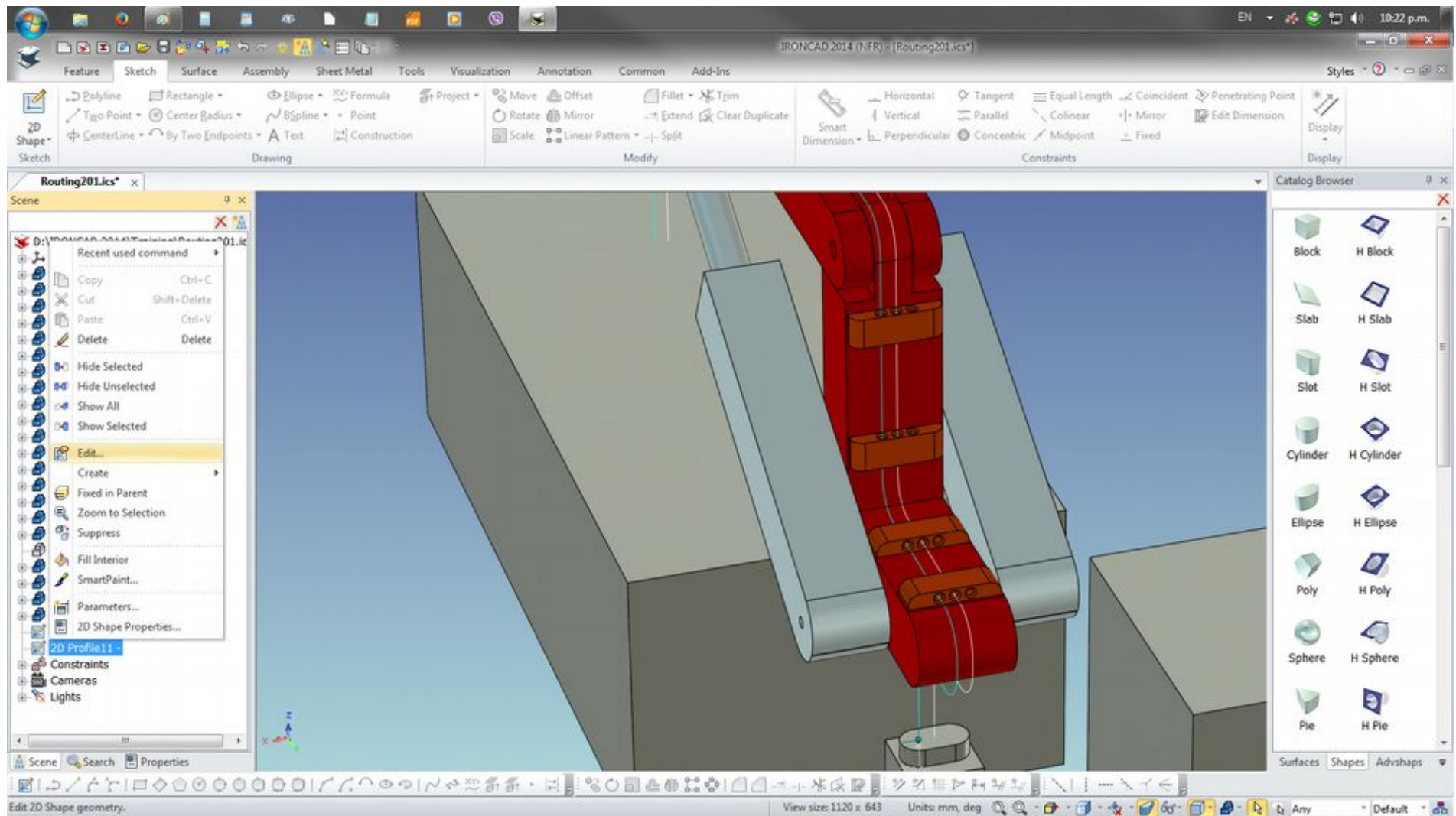
The first 2D Profile11 or Line A path. It is a 2D line path in the Y and Z axis. This Line A path will be copied to the left and edited so it goes from the Y, Z, and X axes.



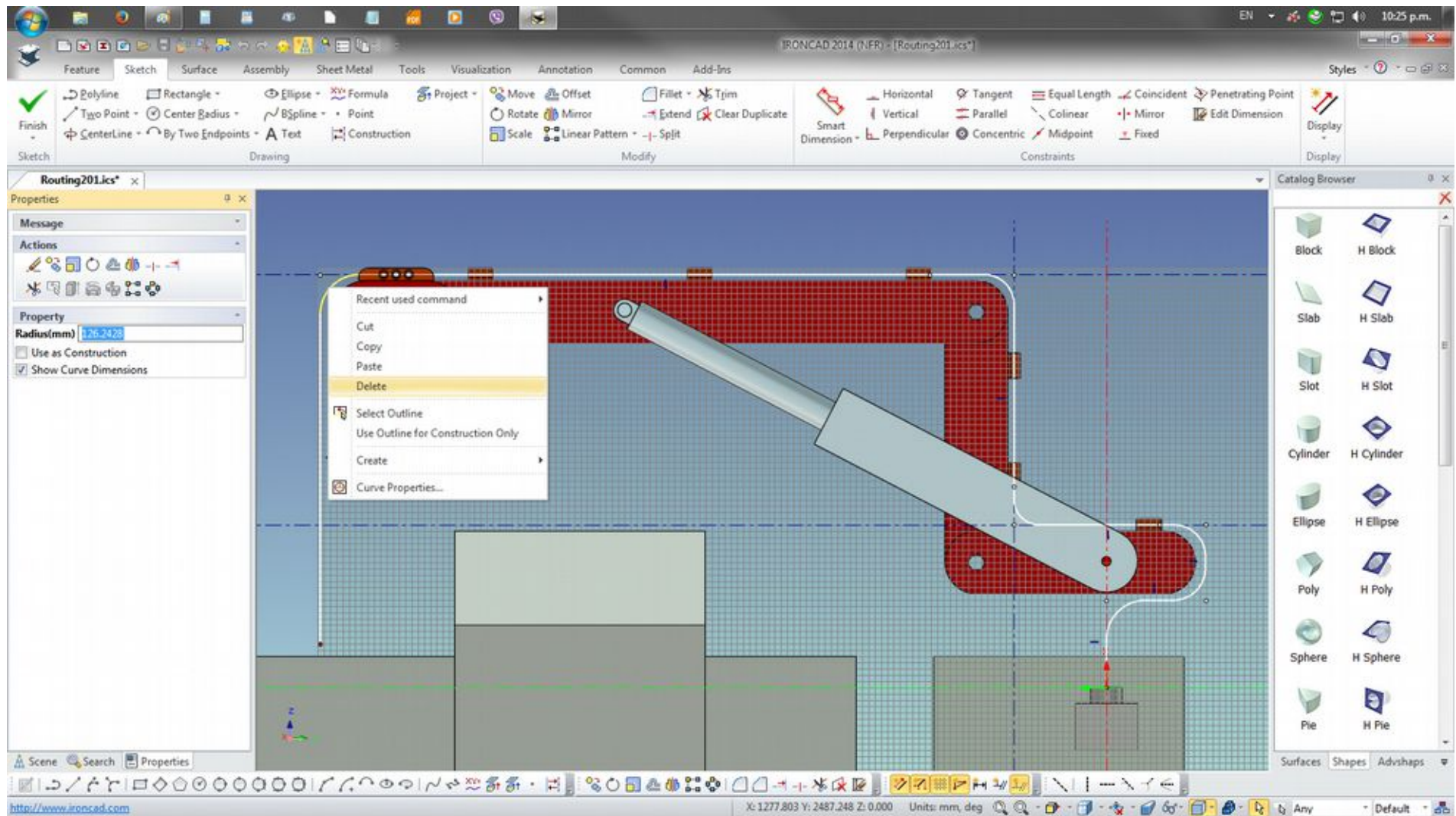
Select the 2D Profile11 > F10 > click the X axis handle for the TriBall > click and hold right mouse button > drag to the left till it picks the point of the radius center of the slot arc. Select copy and it will display the information on the dialogue box.



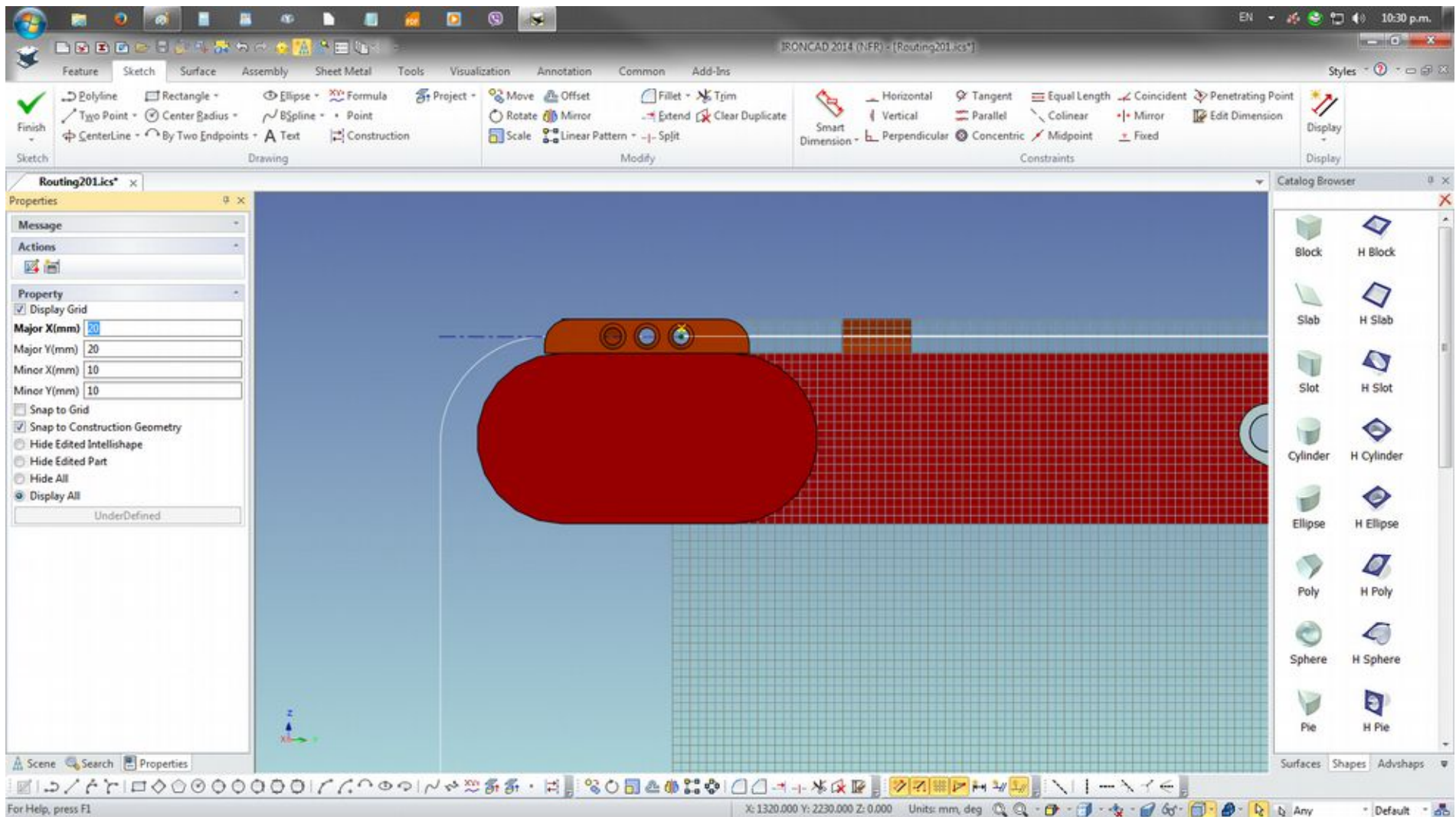
Select the second 2D Profile11 or Line B and go to Edit. This will involve deleting a fillet, a line and editing a length.



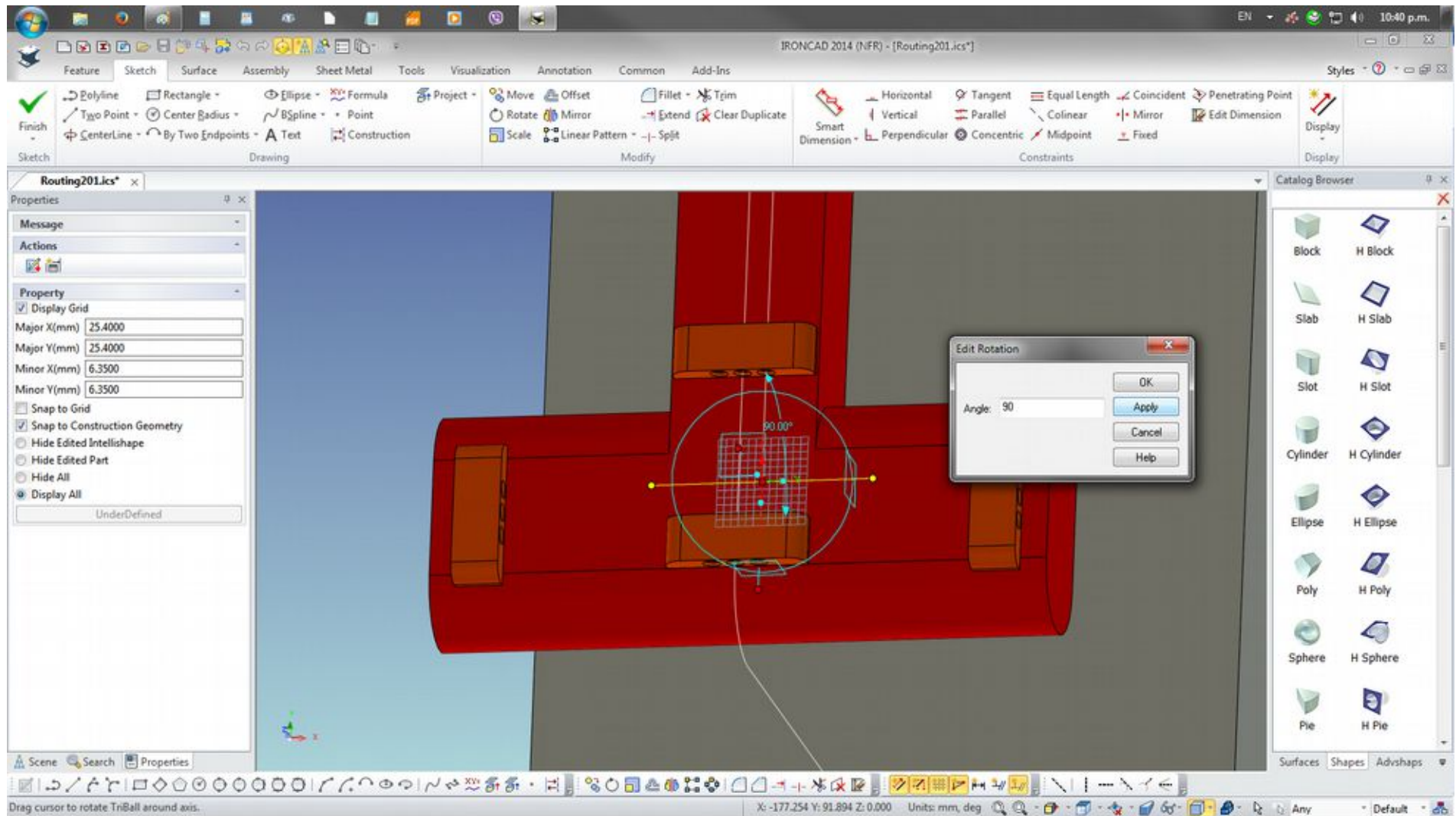
On the 2D editing screen, select the fillet and delete. Likewise, also delete the vertical line on the left.



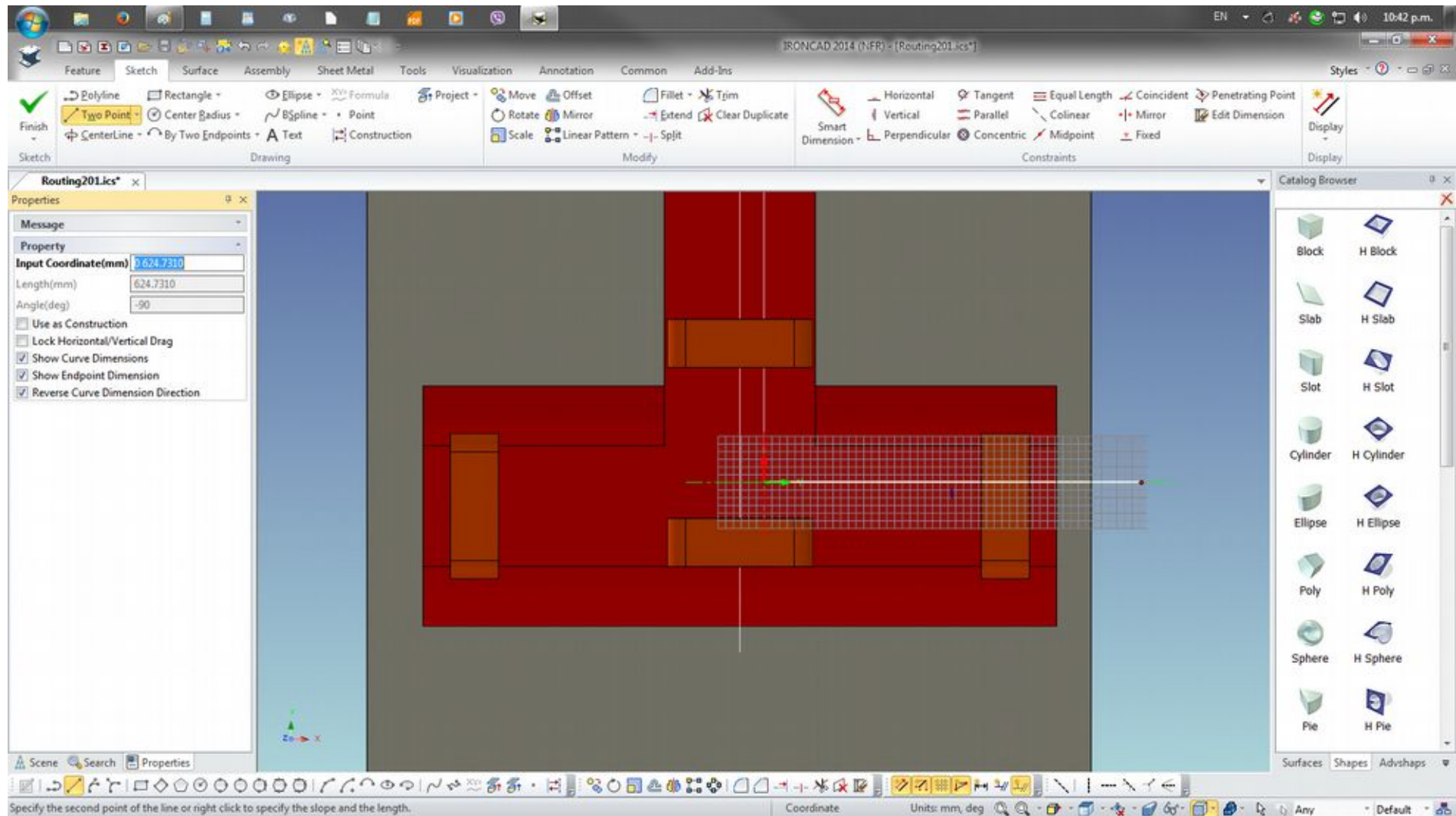
Move the remaining endpoint to the center of the third cable block hole.



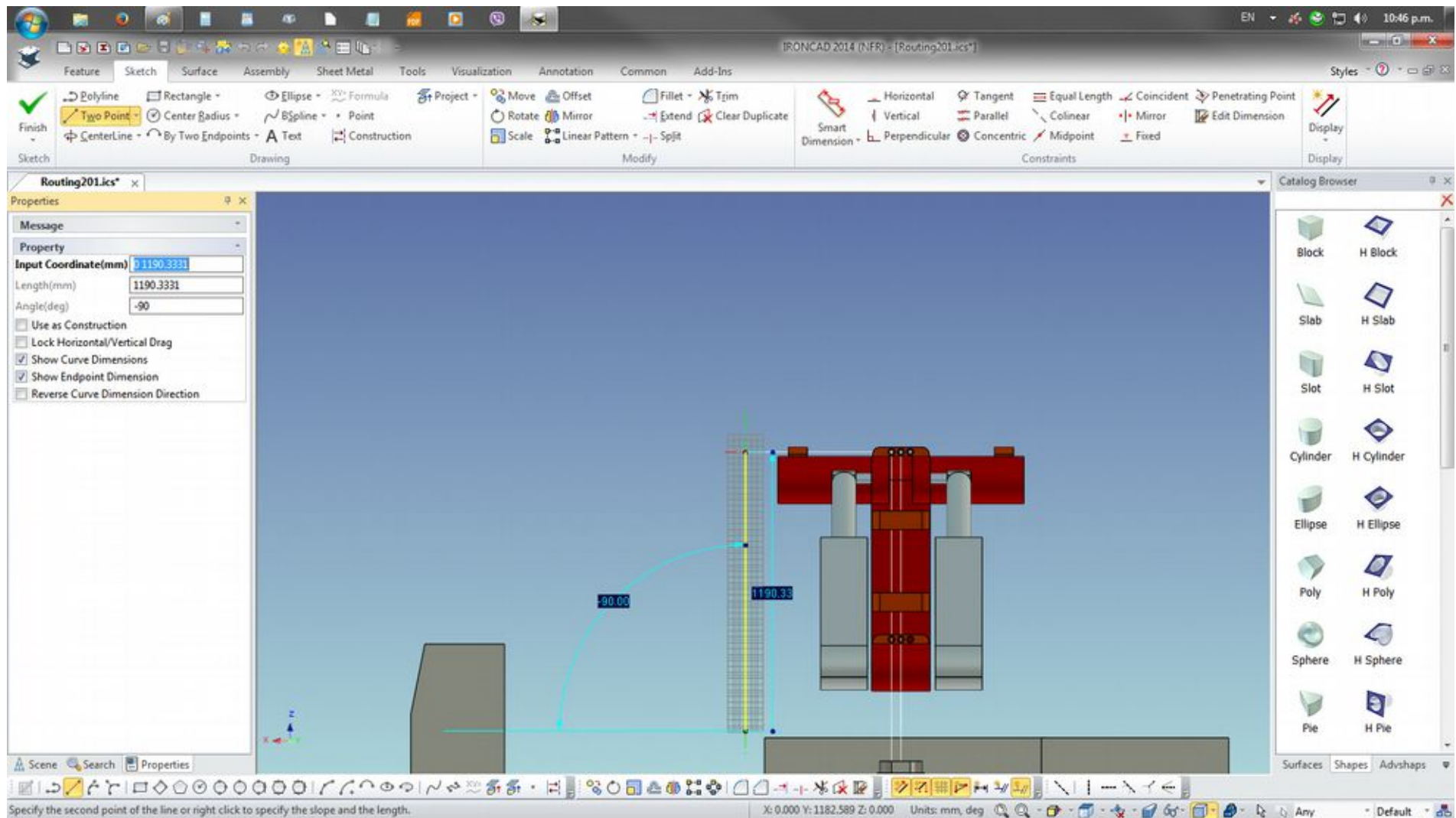
Select 2D Sketch and pick the endpoint of the line. Key F3 to Orbit or rotate the scene and activate the TriBall (F10) to orient the drawing grid flat to the surface.



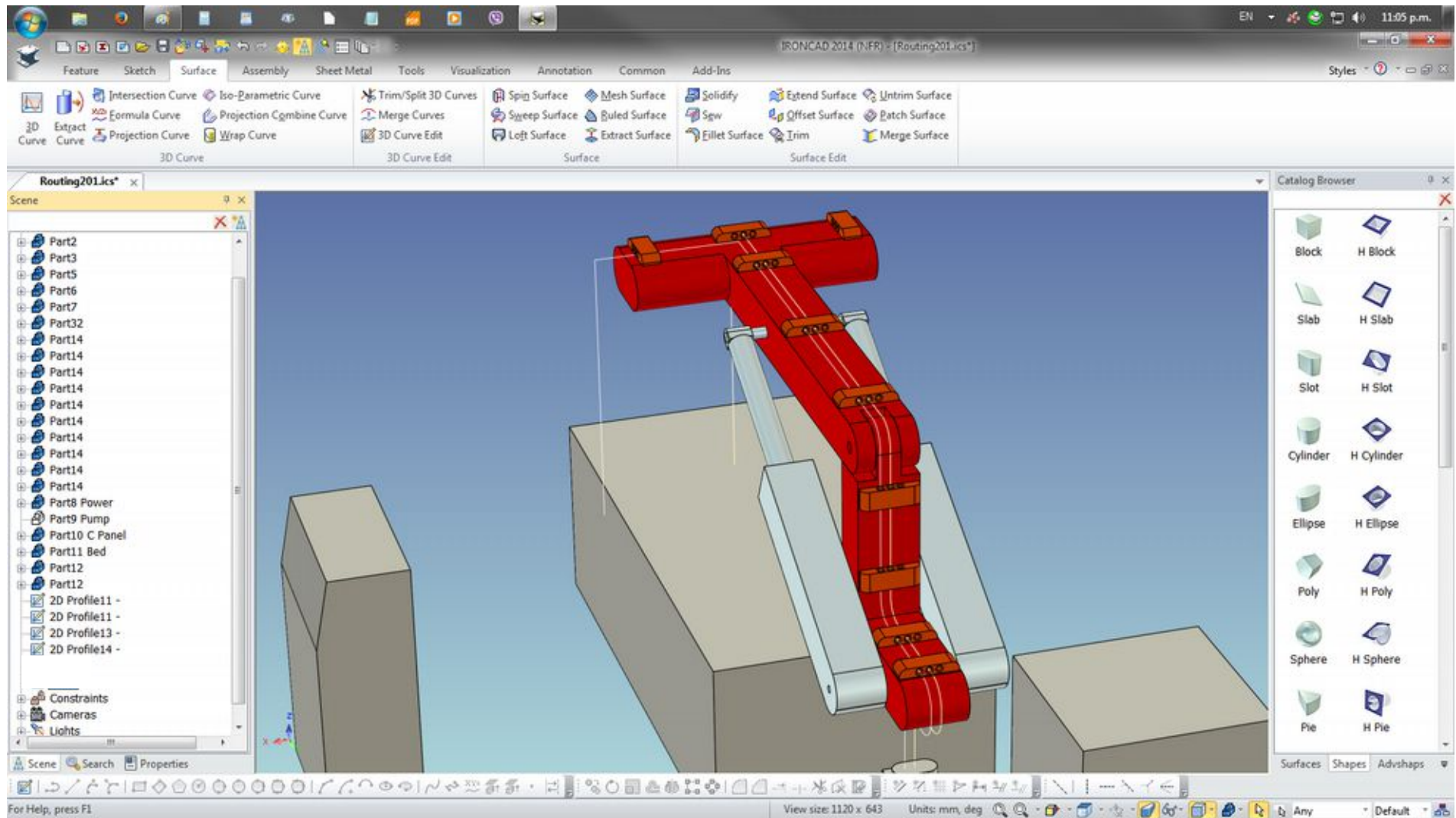
Draw the 2 point line on the Y axis of the grid as shown



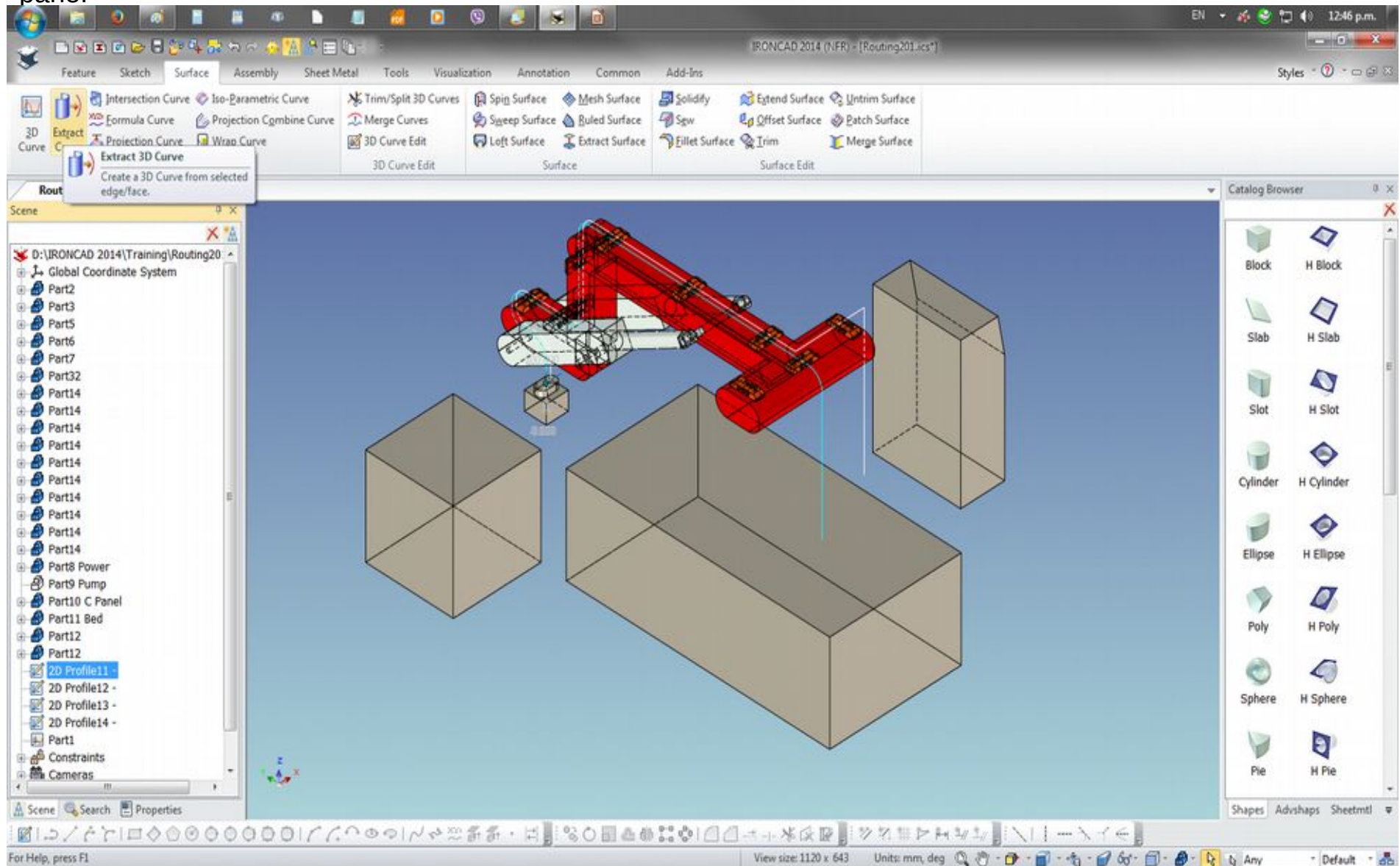
Select 2D Sketch and pick the endpoint of the line and draw a 2 point line as shown on the vertical Y axis of the drawing grid.



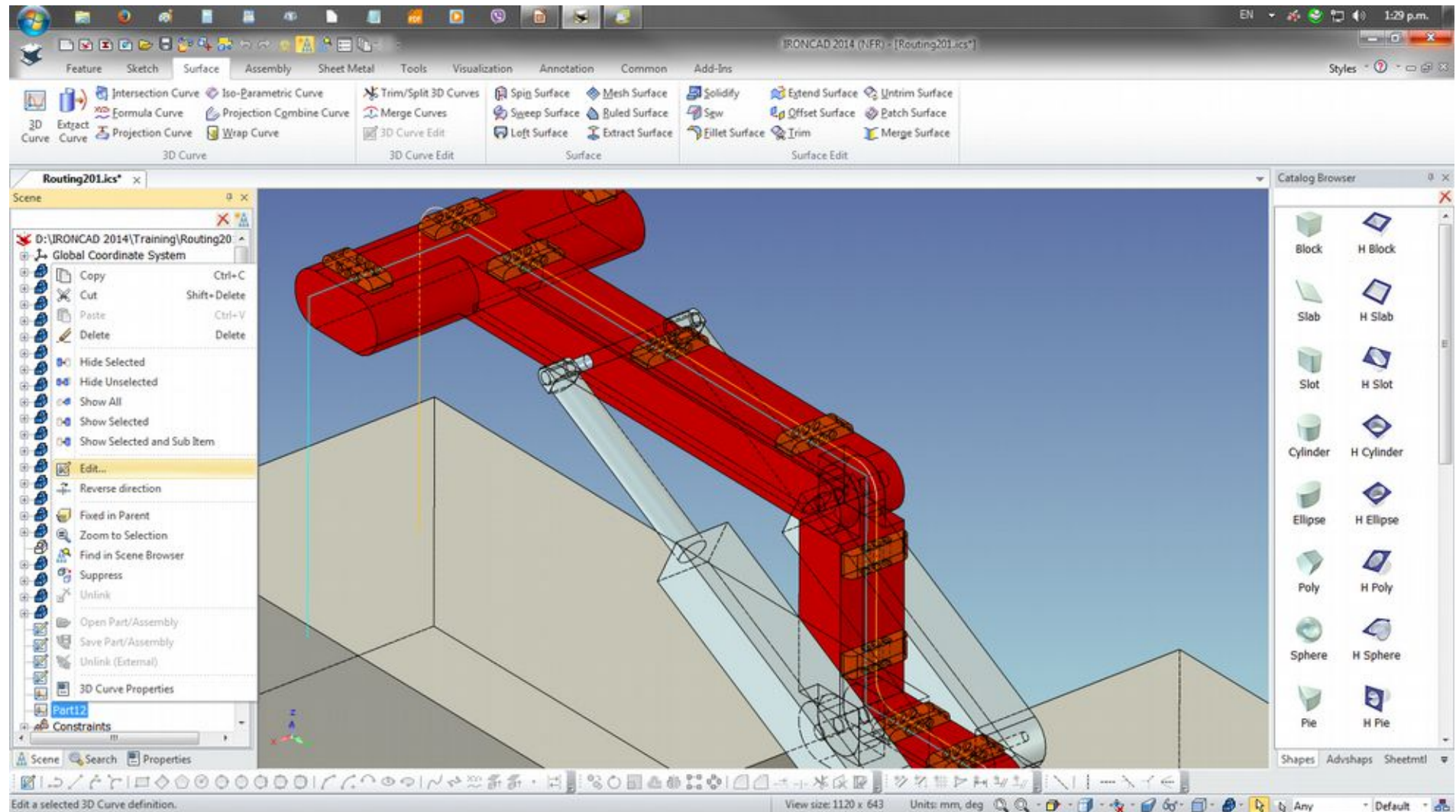
The created 3D sketch guide for Line B that is composed of: 2nd 2D Profile11, 2D Profile13 and 2D Profile14



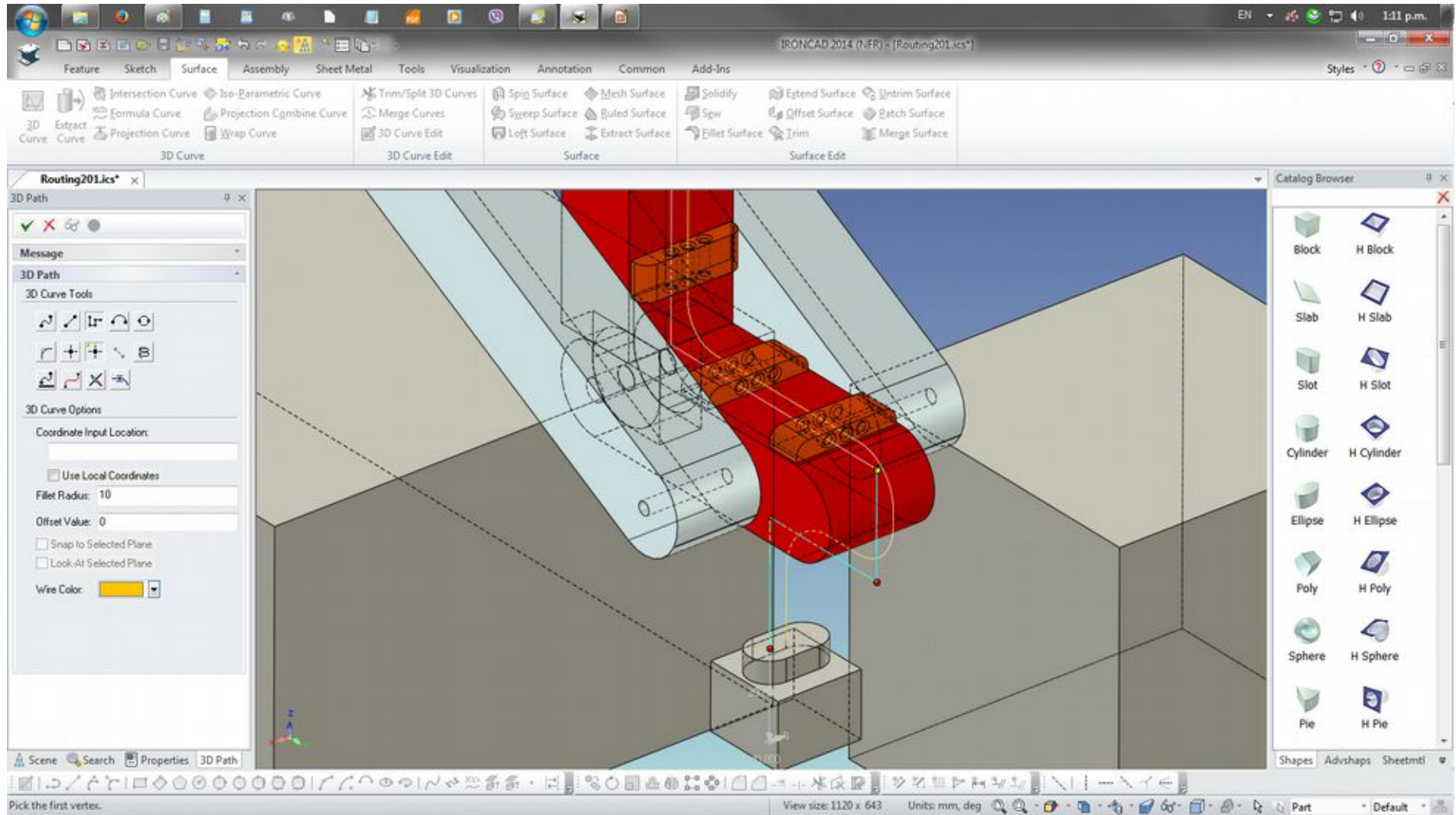
I have renamed the 2nd 2D Profile11 to 12 to avoid confusion. To extract a 3D Curve Part for 2D Profile11 go to the Surface tab > select 2D Profile11 from the Scene tree > click Extract Curve. On the Scene Tree there is a Part1 3D curve created. For Line B or the following 2D Profile 12,13,14 extracting the 2D profiles will not create a 3D Curve part it is not registered as a single profile even when selected from the Extract Curve Geometry Selection pane.



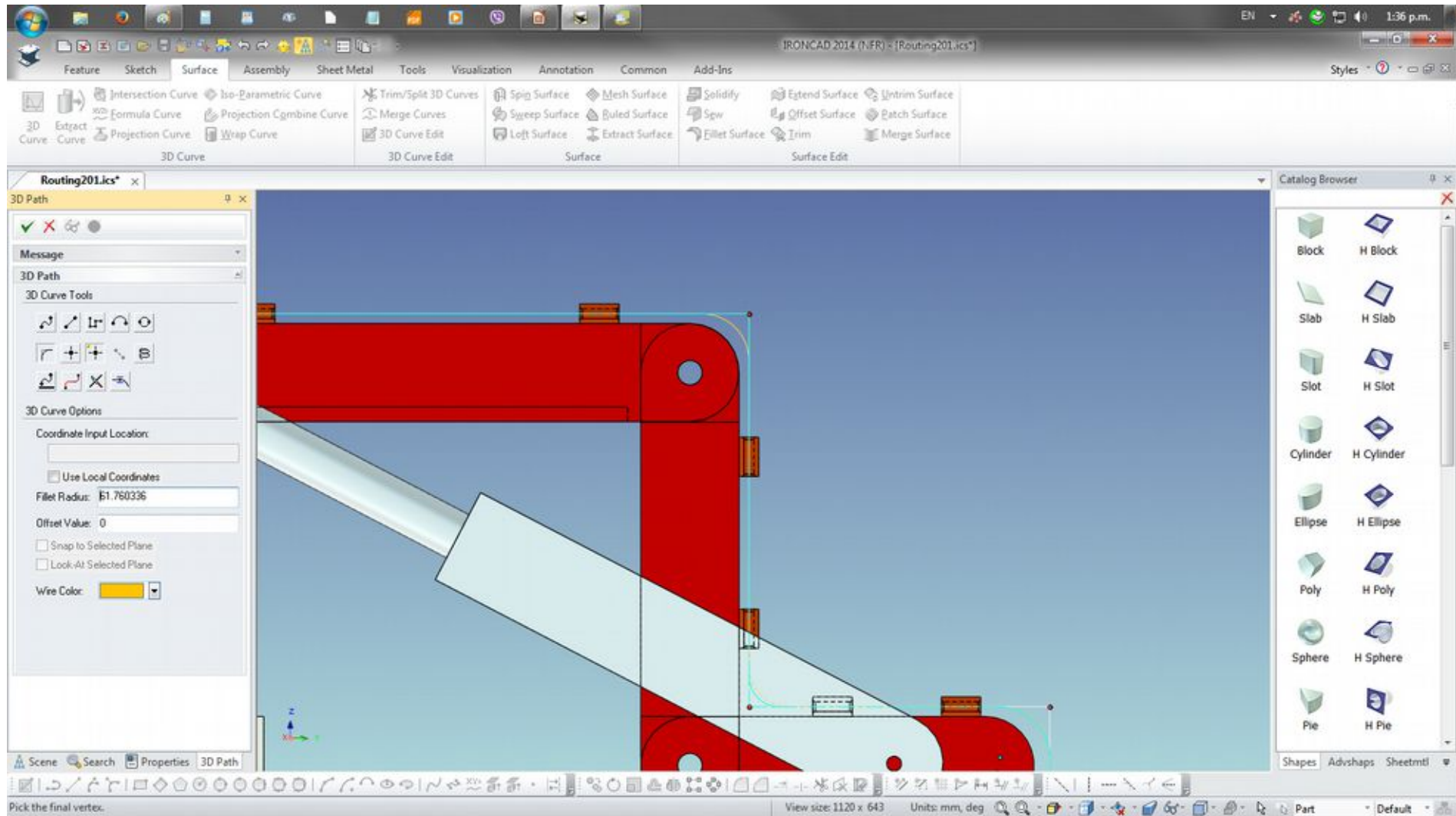
Again, I've used F3 to Orbit/orient the scene. I have edited 2D Profile12 to remove fillets so it easier to use as a guide for creating a new 3D Curve.

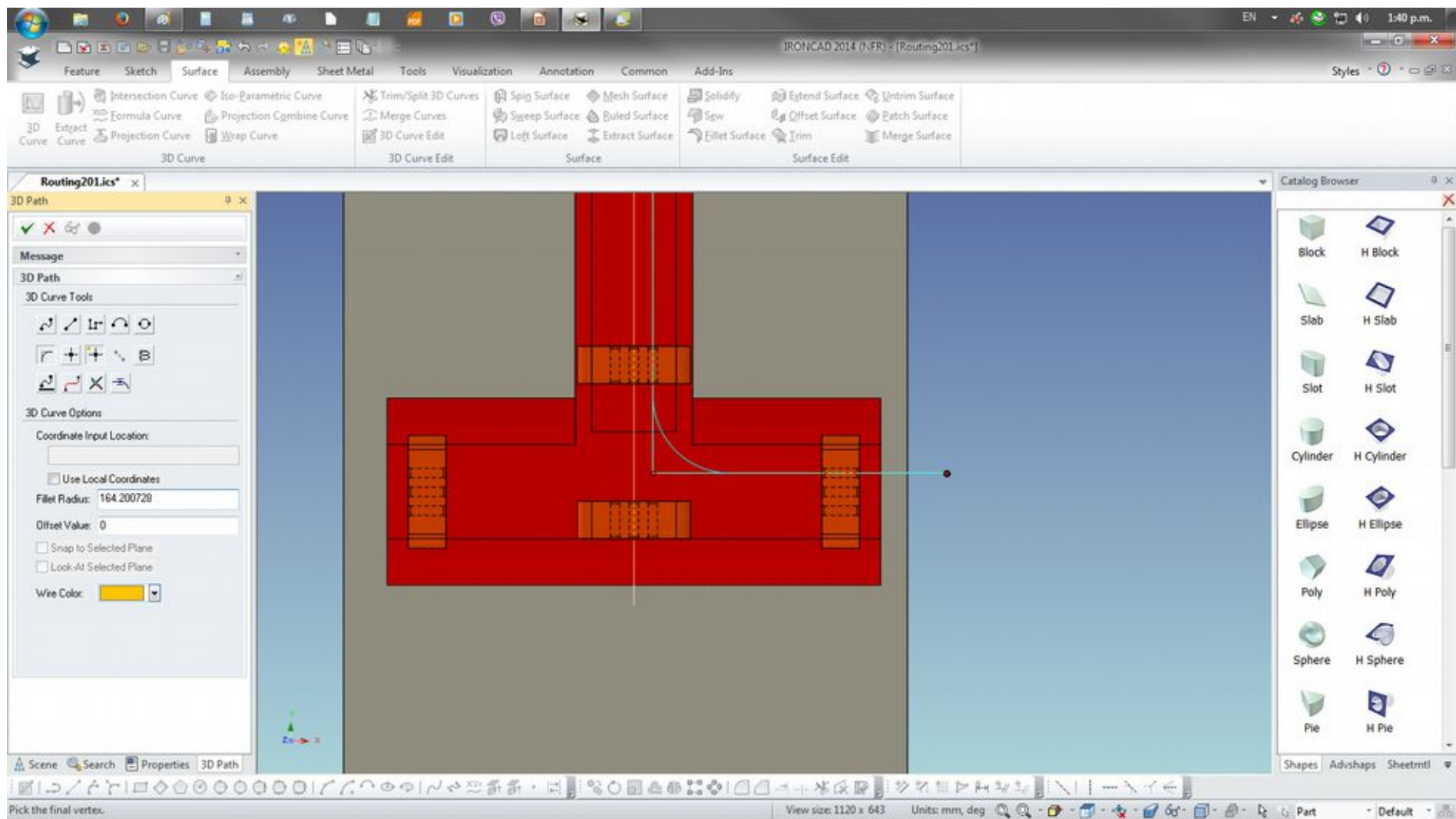


Select 3D Curve and use Polyline and follow the Line B 2D drawing path.

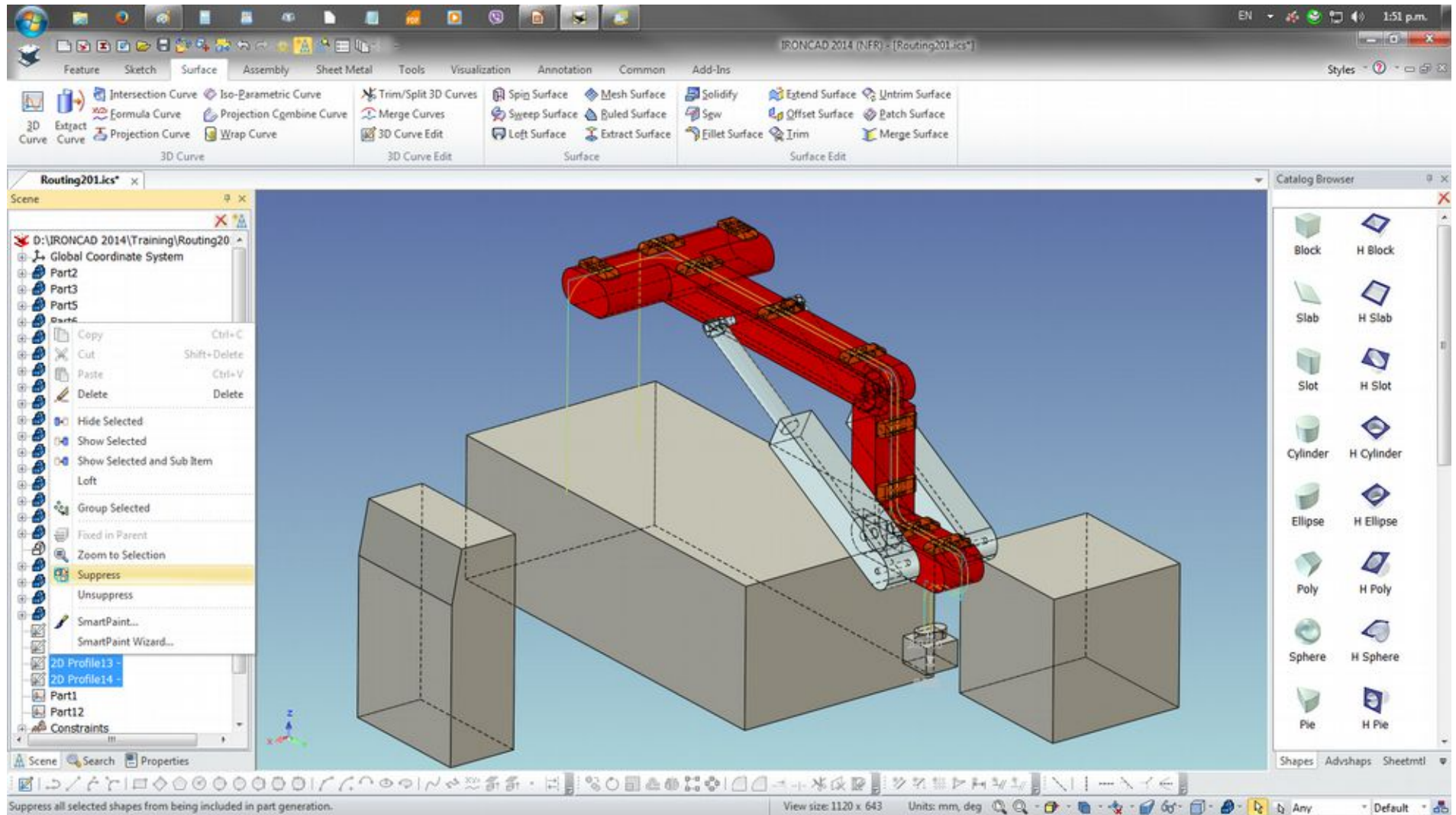


Apply the necessary fillets on the corners after creating the 3D Polyline.

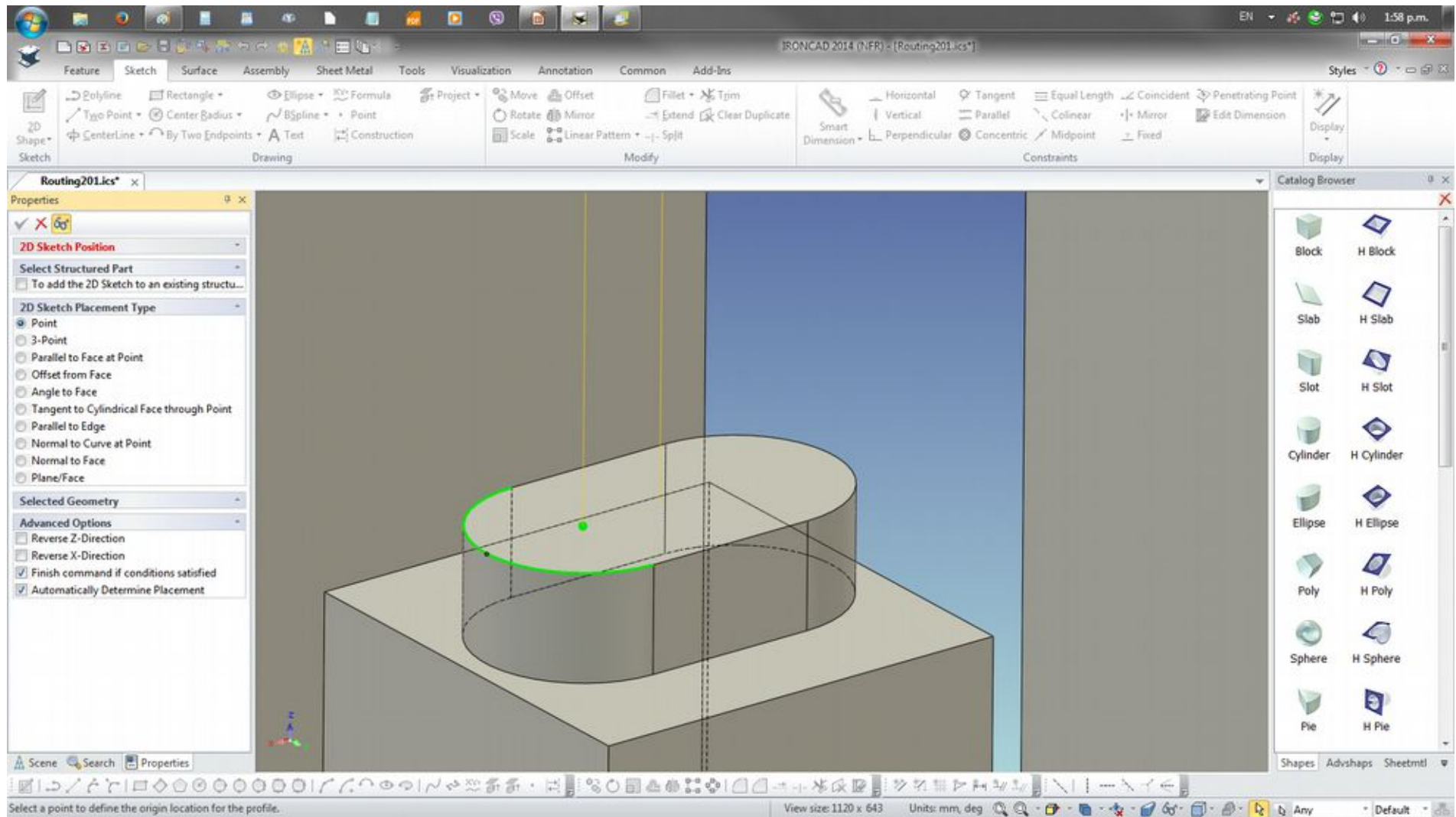




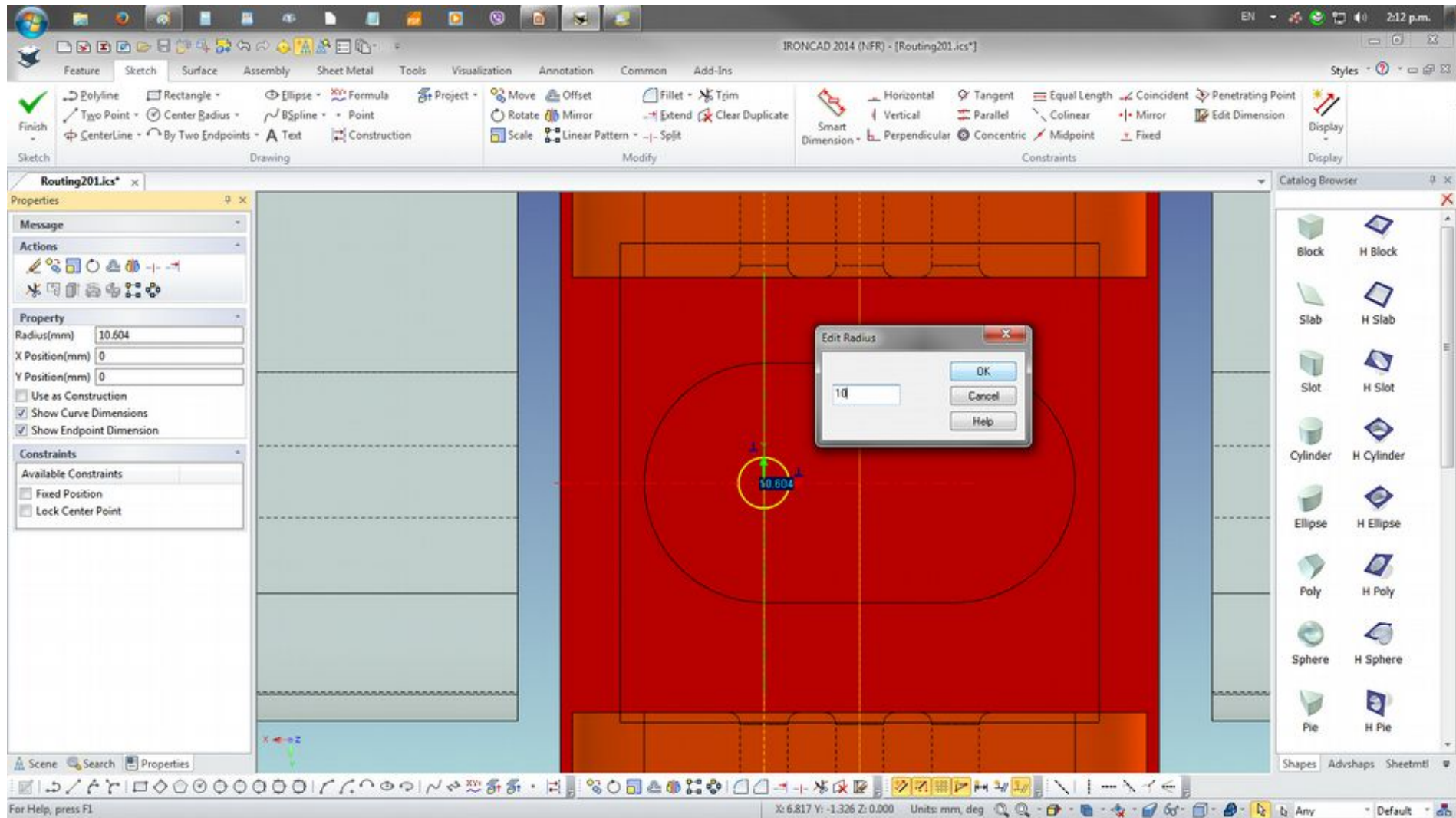
3D Curve with the applied corner fillets



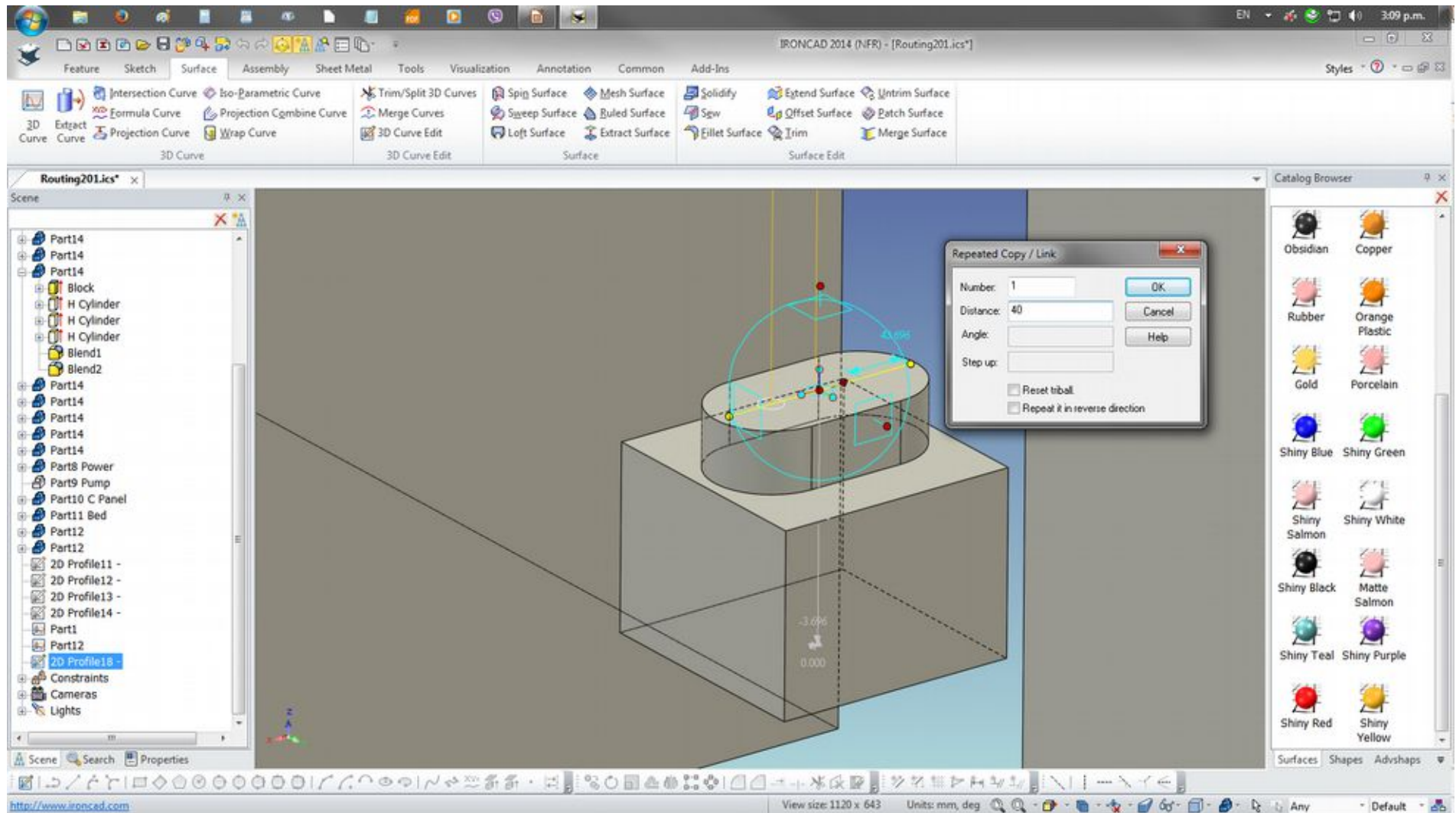
Create 2D Sketch profile for the cable to be created with Sweep. Select the center point of the diameter of the slot



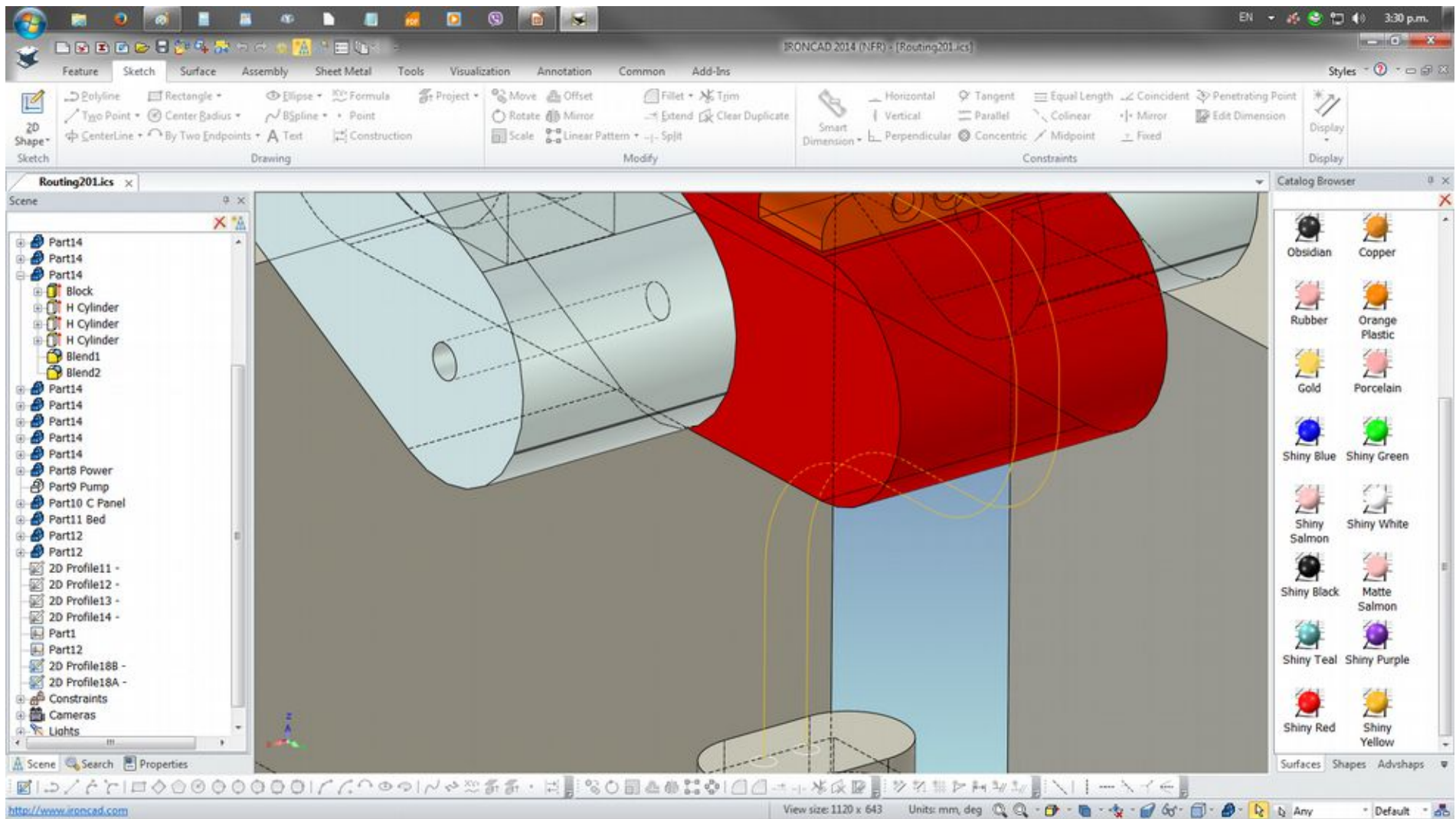
Draw a 20 mm diameter cable reference. Note the view goes on Top View of the drawing grid however the grid was covered by the part on top of the slot



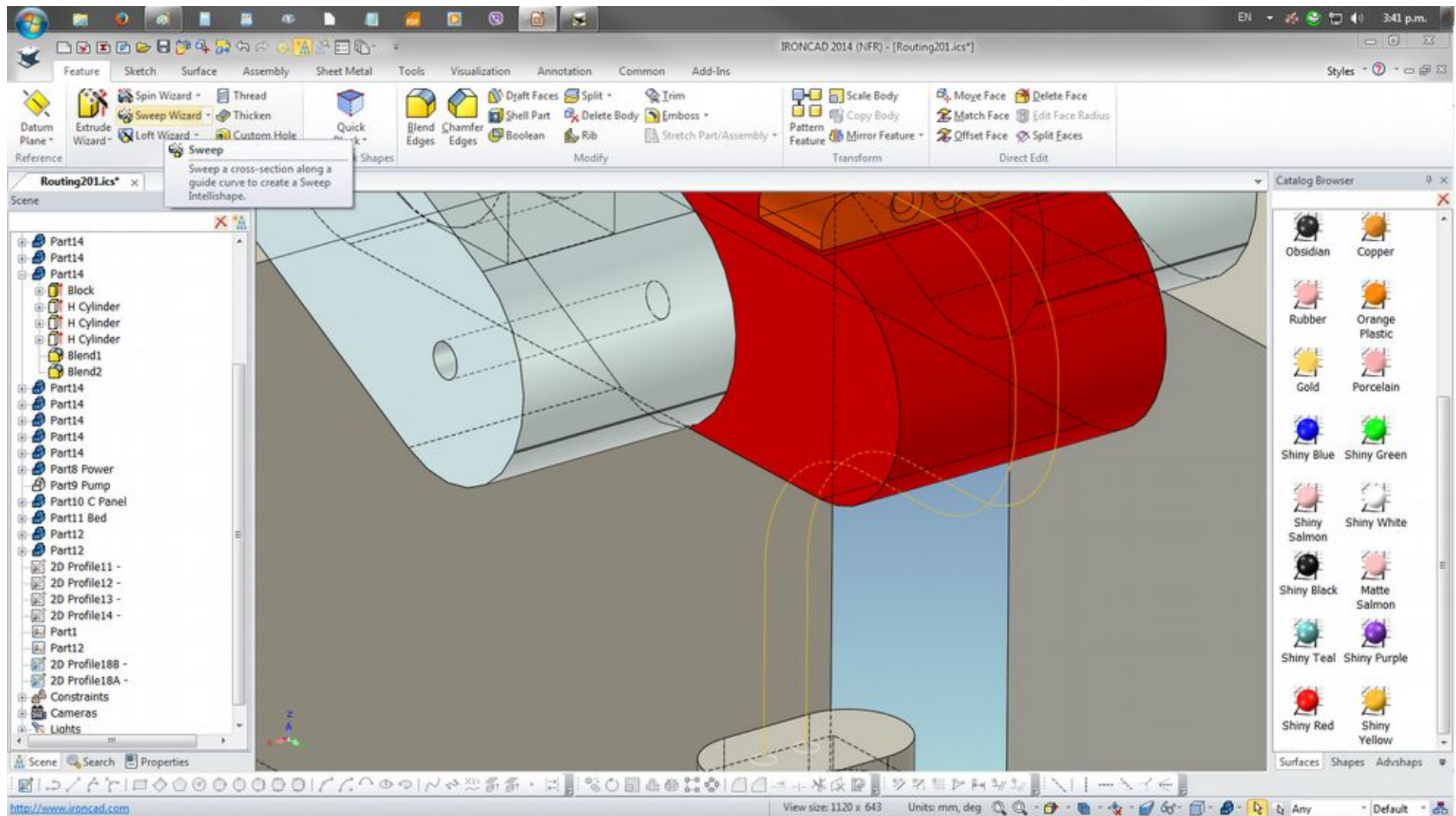
As on the Scene tree, the 2D Shape Sketch created 2D Profile18. This copied via the TriBall (F10) click the X axis handle and right click hold and drag 40 mm to the right.



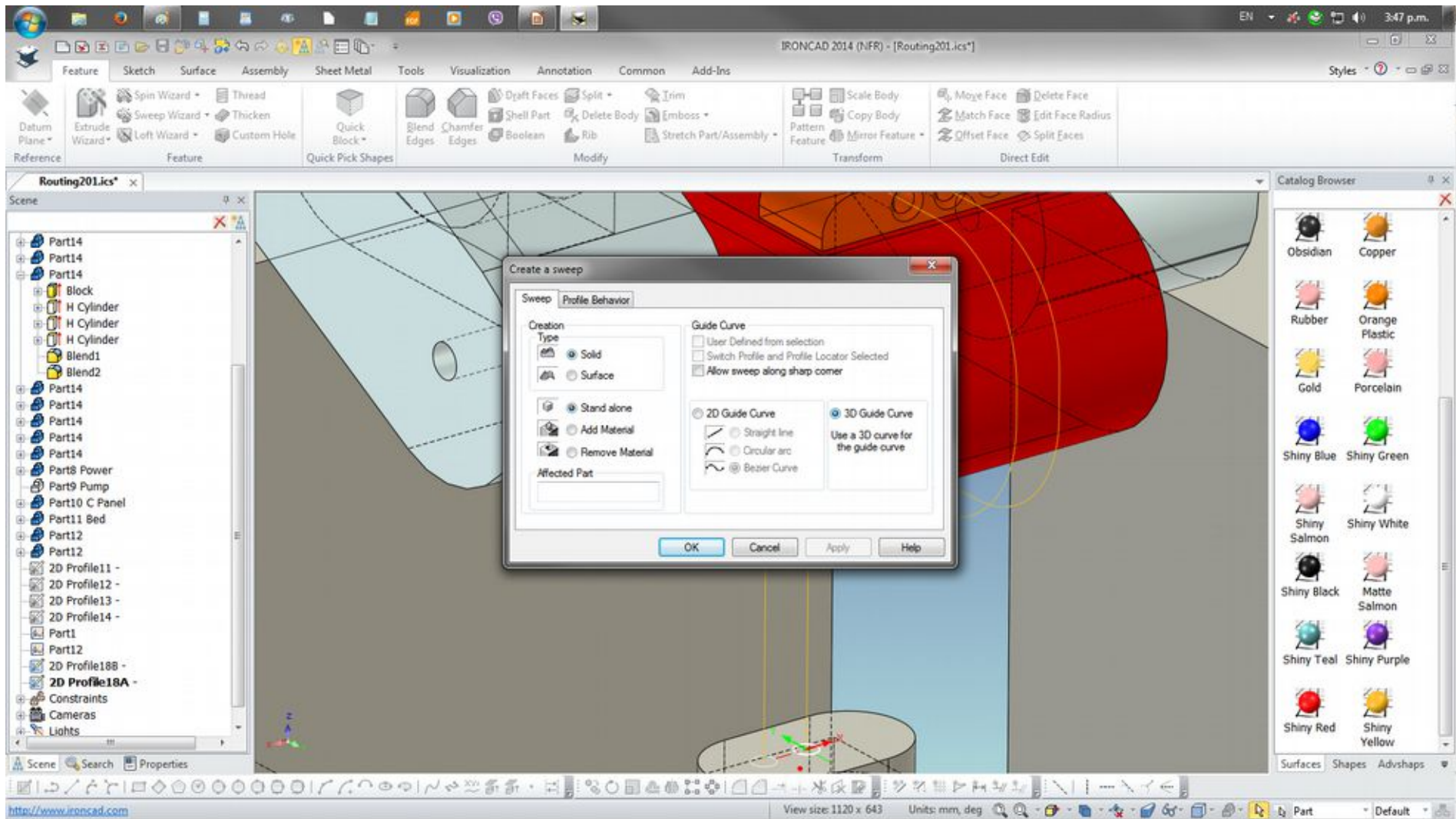
2D Profile18 is renamed to 2D Profile18B and 2D Profile18A accordingly.

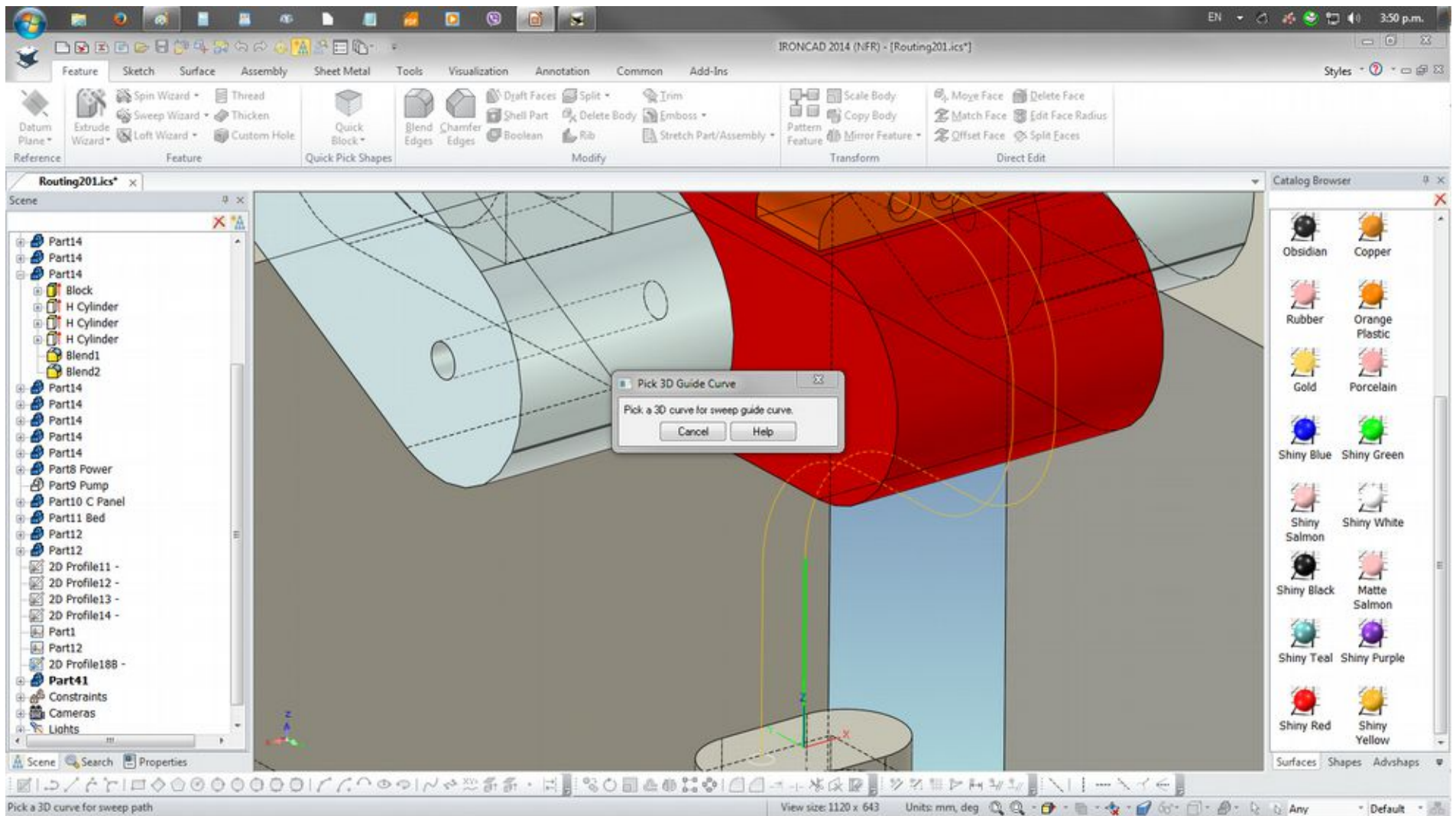


To Sweep this 3D Curves, use Sweep from the Feature tab

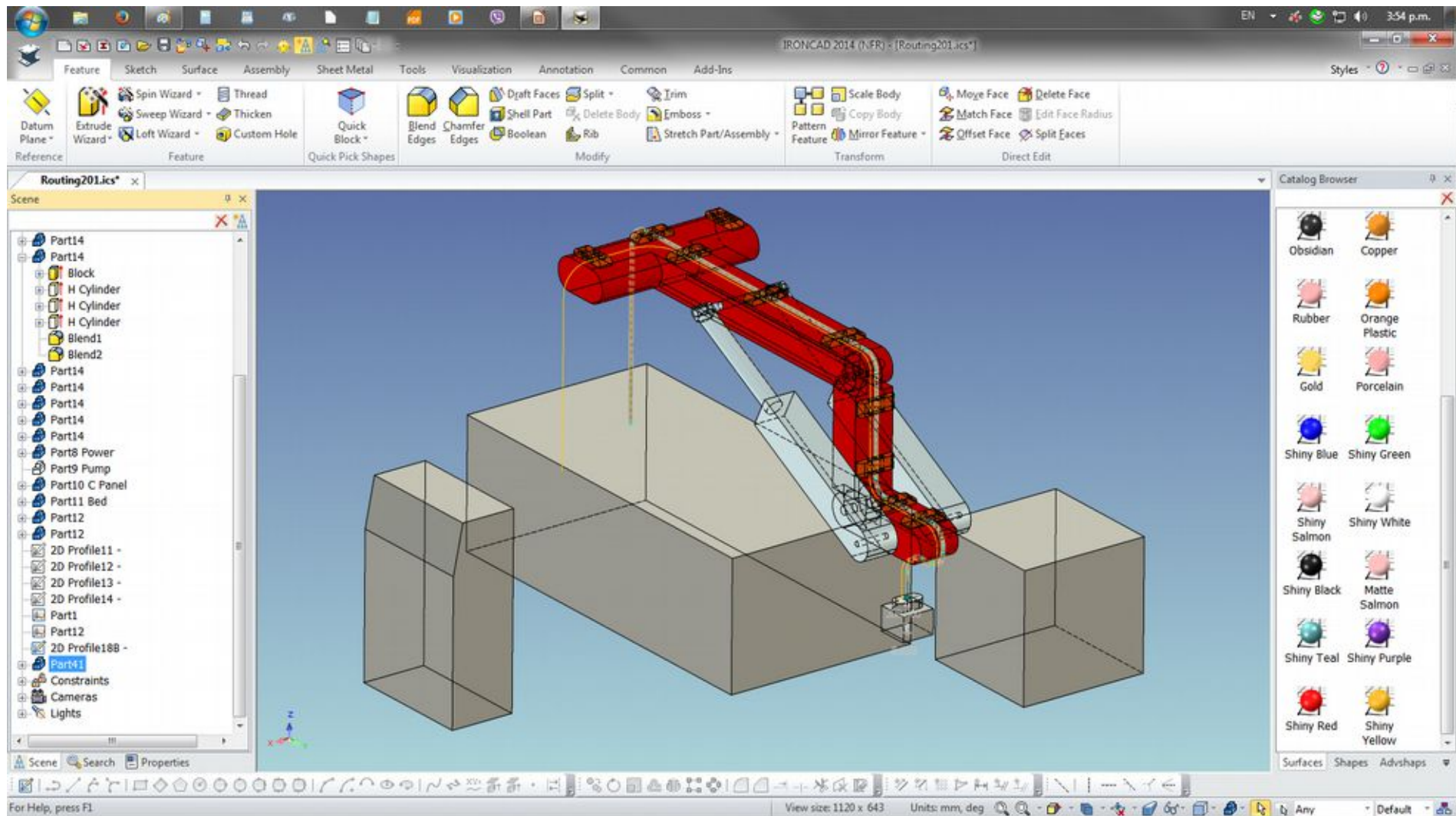


As a drawn profile was created as reference for the Sweep, this type of Create a sweep window is displayed. Note that the Create a sweep window without a profile looks different from this one.

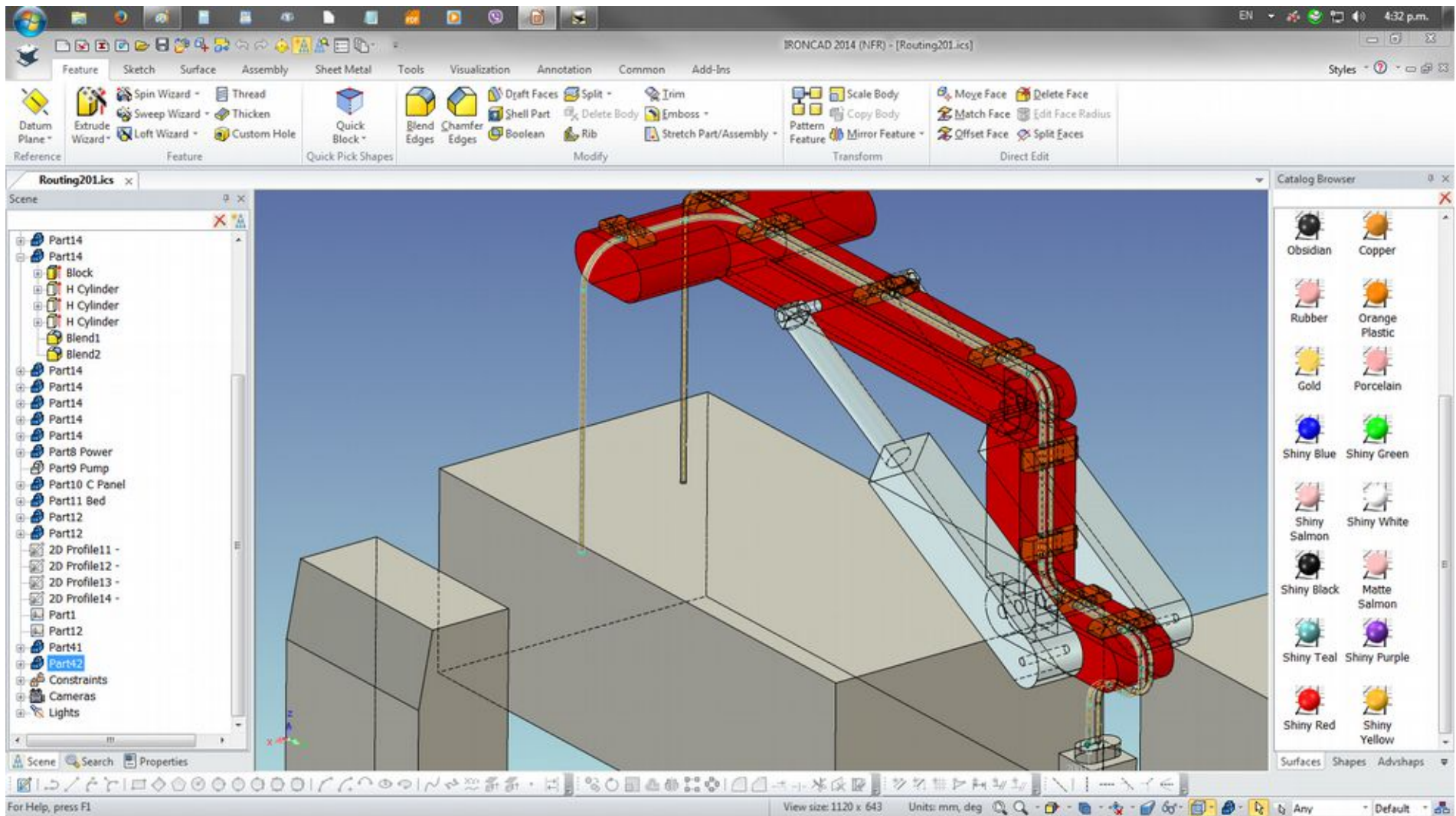




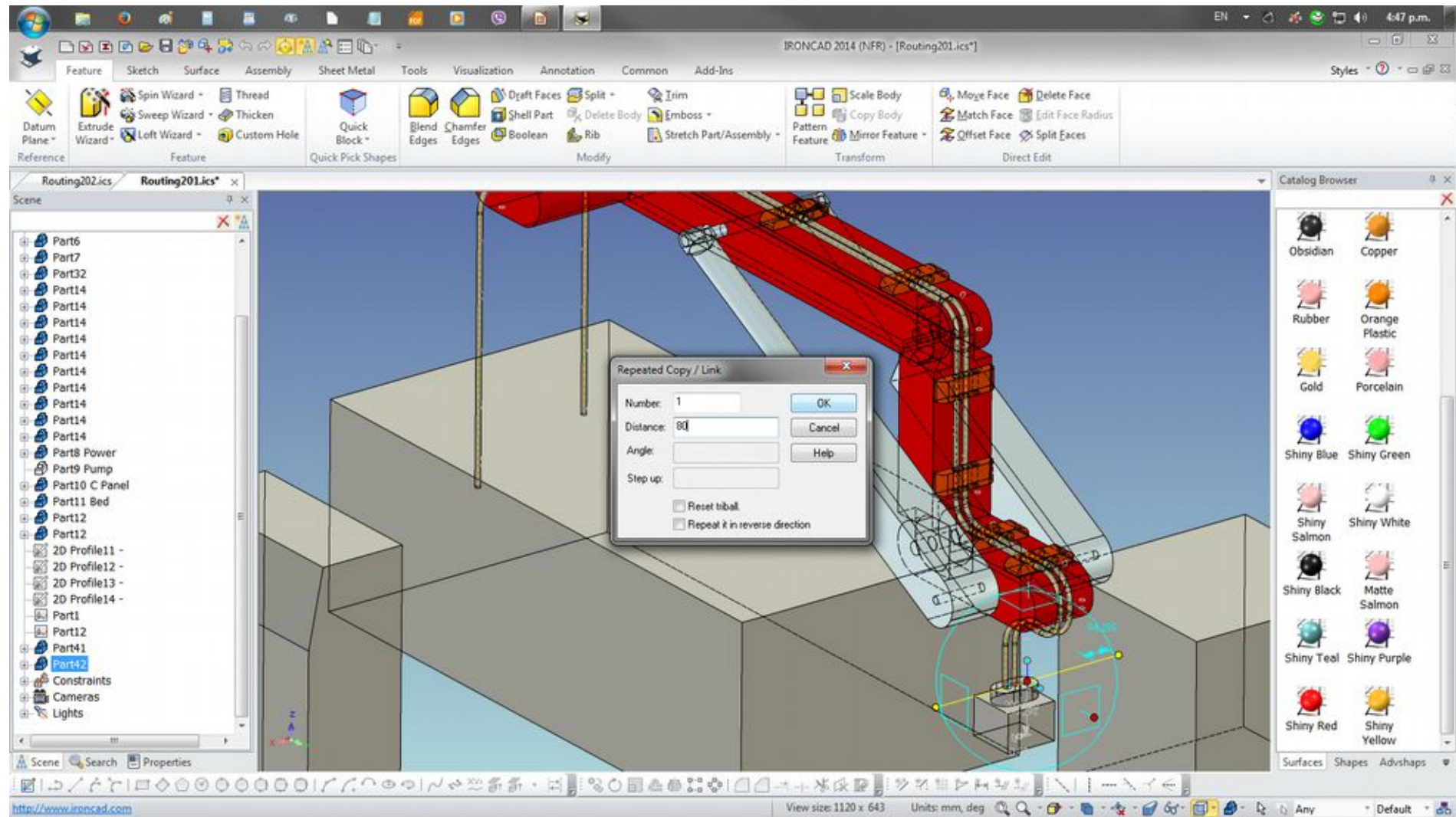
Part41 is the created Sweep from 2D Profile18A. Repeat the same process for 2D Profile 18B



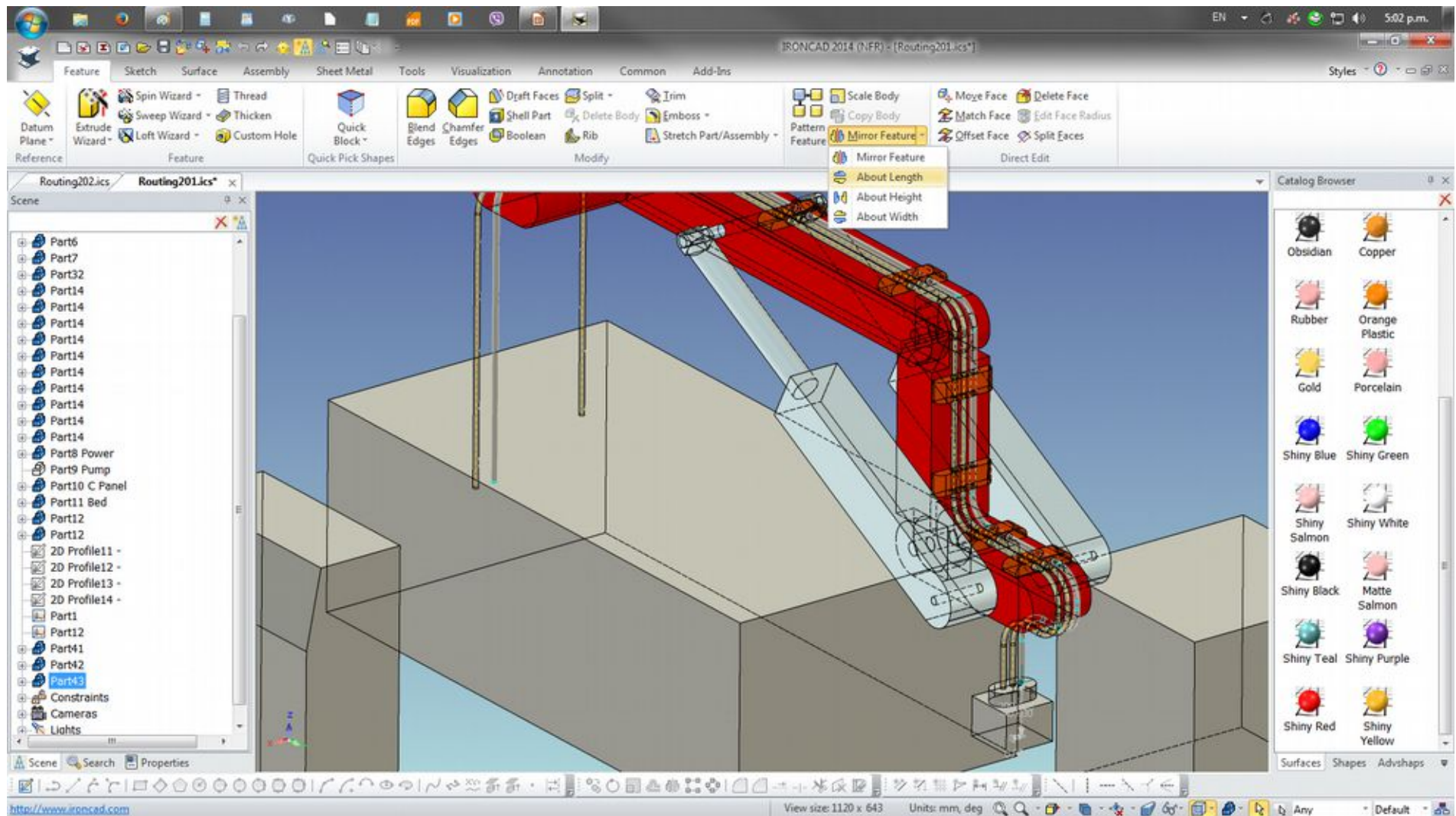
Part42 is the created sweep. The difference from Part41 is that the Sweep travels to Z, Y and X axes.



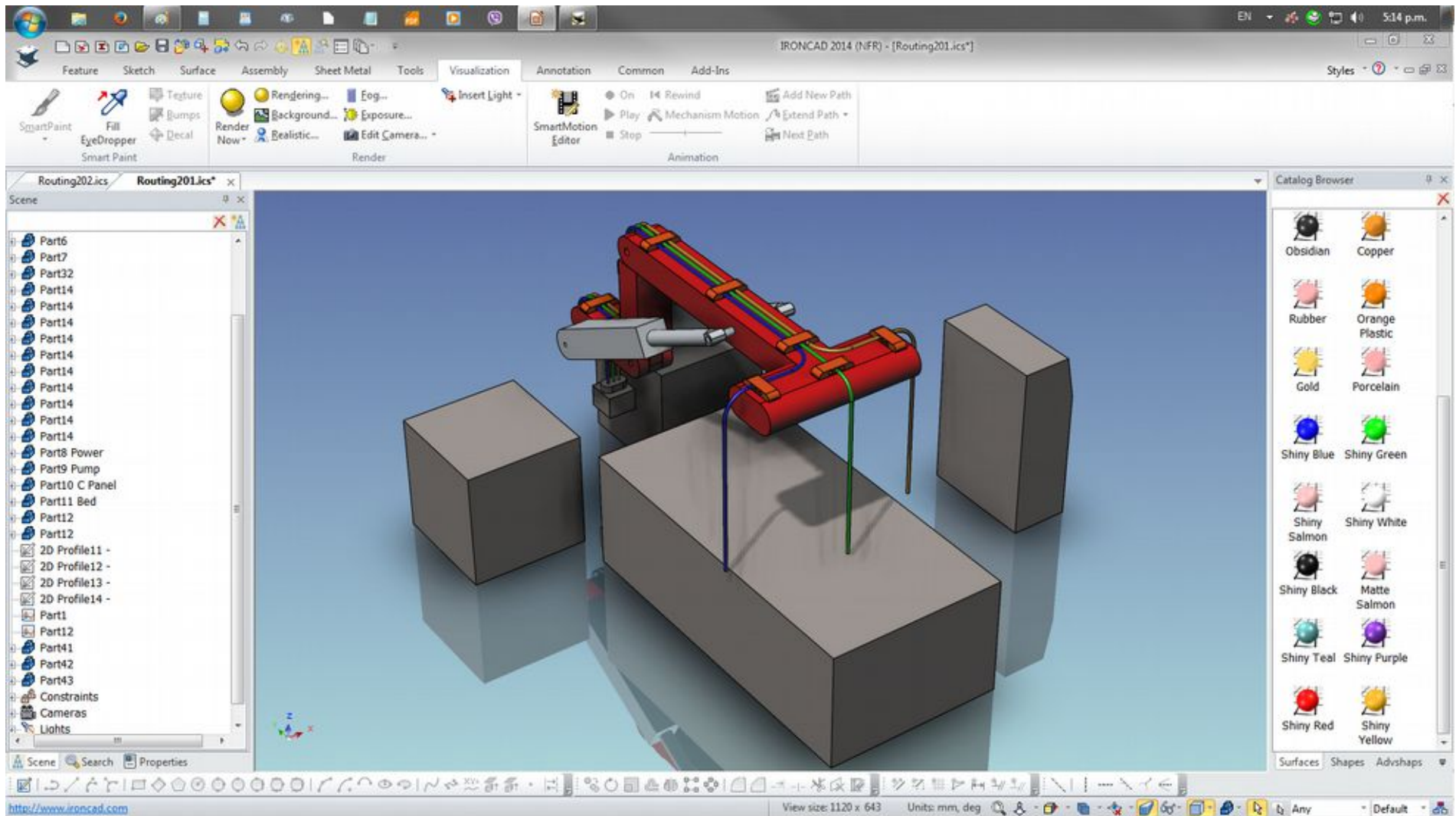
For the next routed part, select Part42 > TriBall(F10) > click on X axis handle > right click and hold mouse button move to the right at 80 mm.



Rename the copy of Part42 to Part43. Select Part43 from the Scene Tree > Feature > Transform > Mirror Feature > About Length

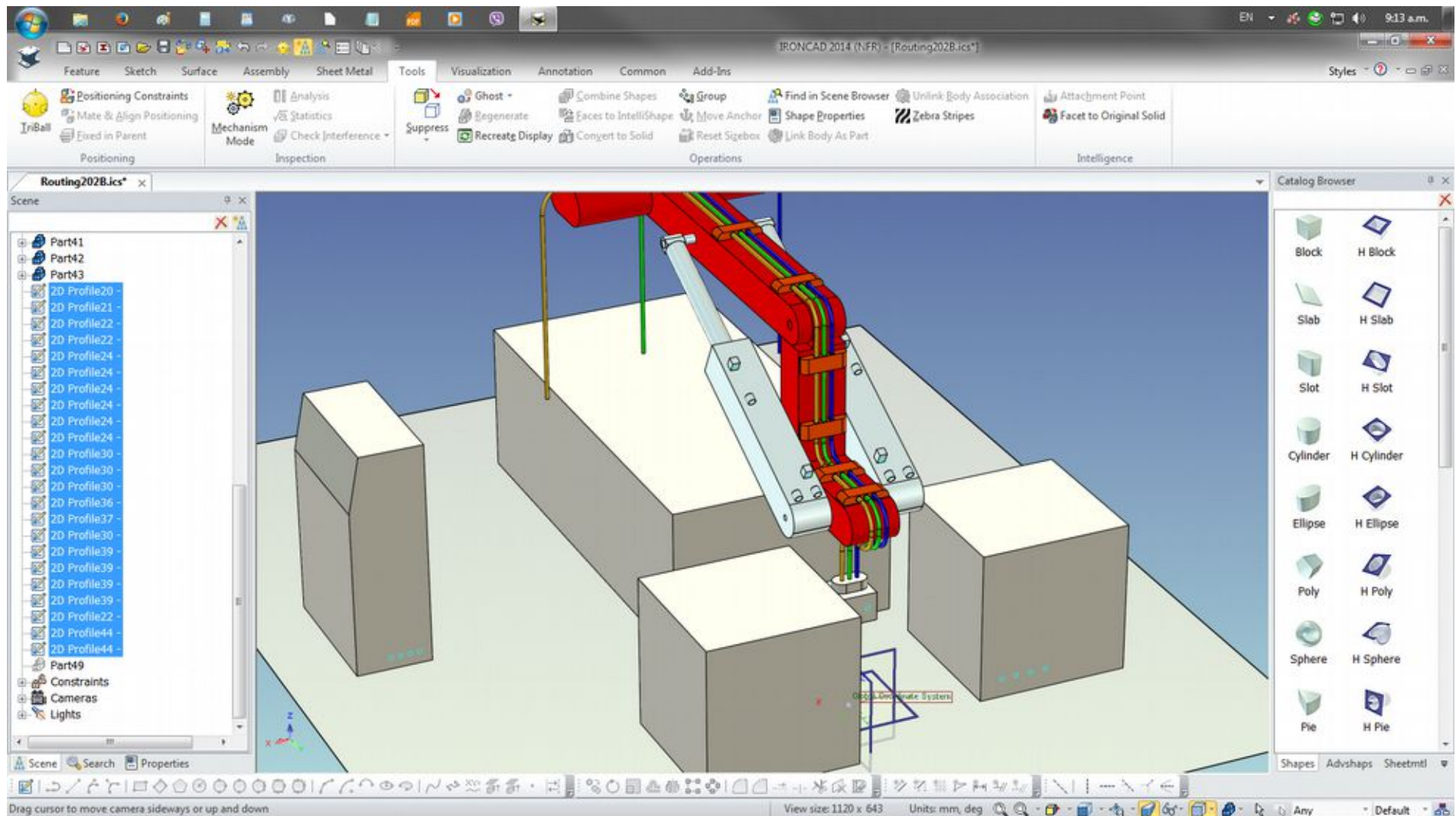


Surfaces was applied to the cables

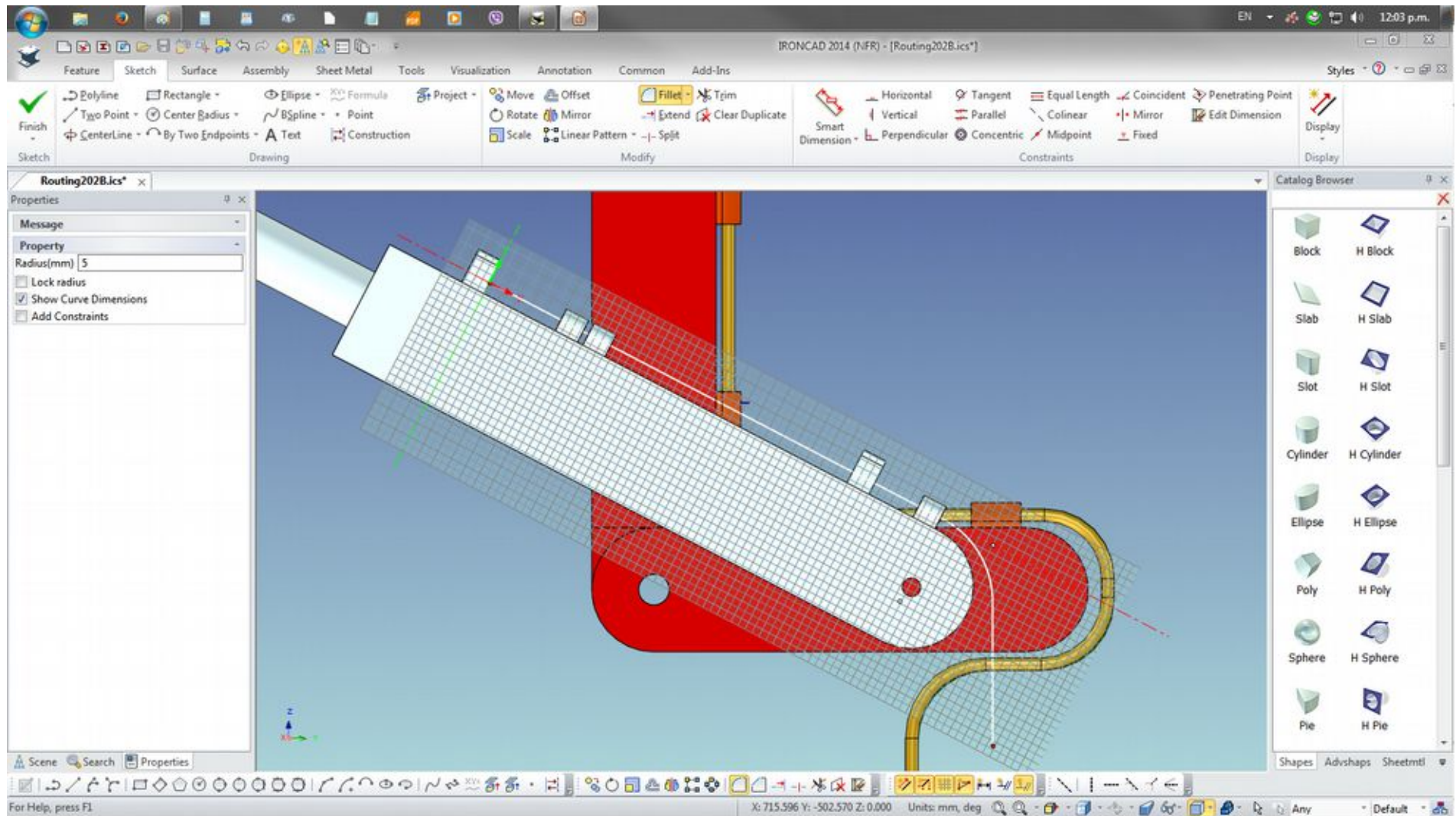


Hydraulic hose and power cables will be created using 3D Curve Tools. On the scene image, a floor slab was placed as reference to the work area. On the Scene Tree, a list of 2D profile created for connection points.

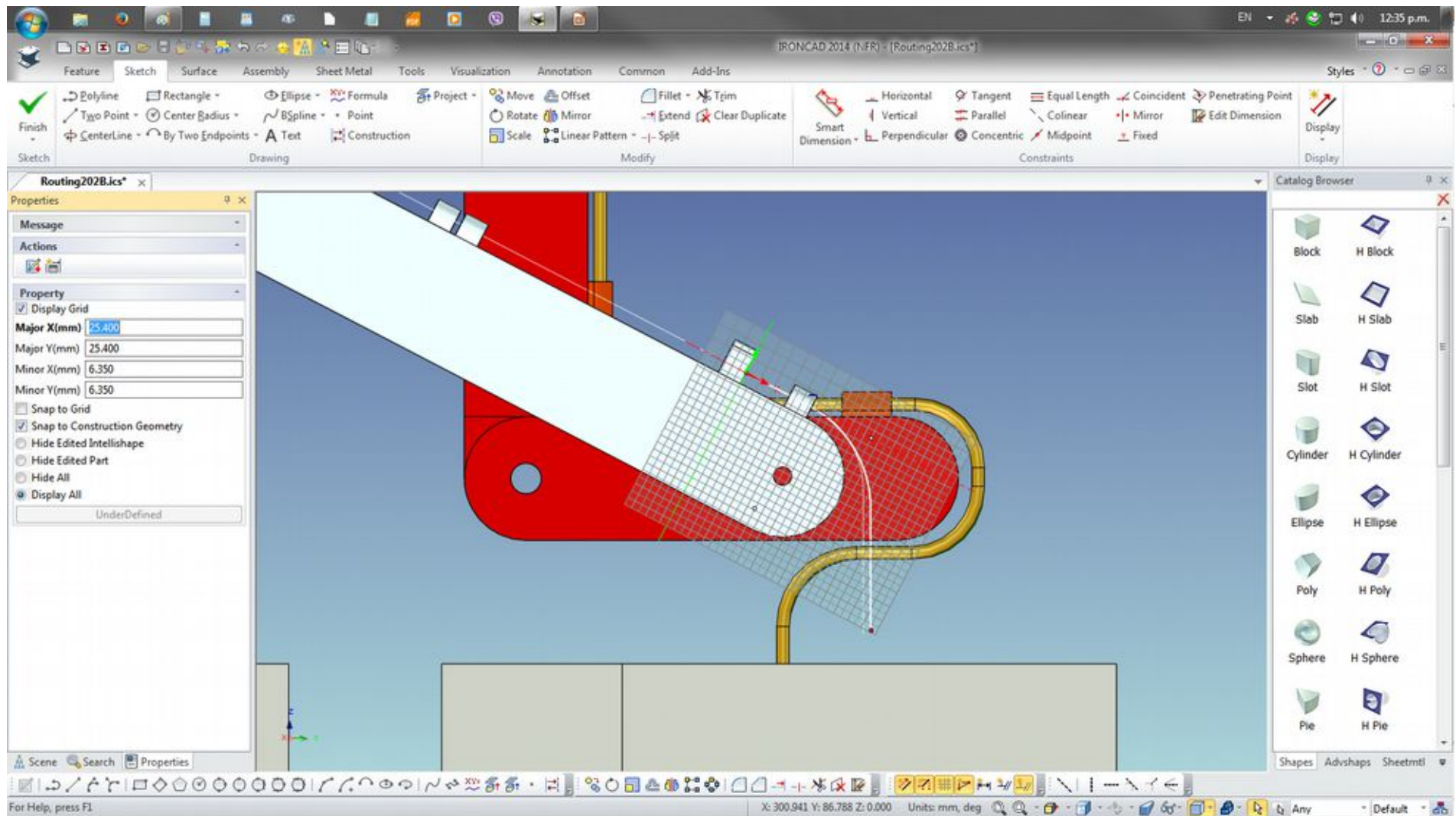
Note that when placing a 3D curve on existing geometry, by default it will extend in any direction from the selected geometry. Depress the Shift key prior to clicking on the geometry to enable it to extend perpendicular from the selected geometry – IRONCAD help



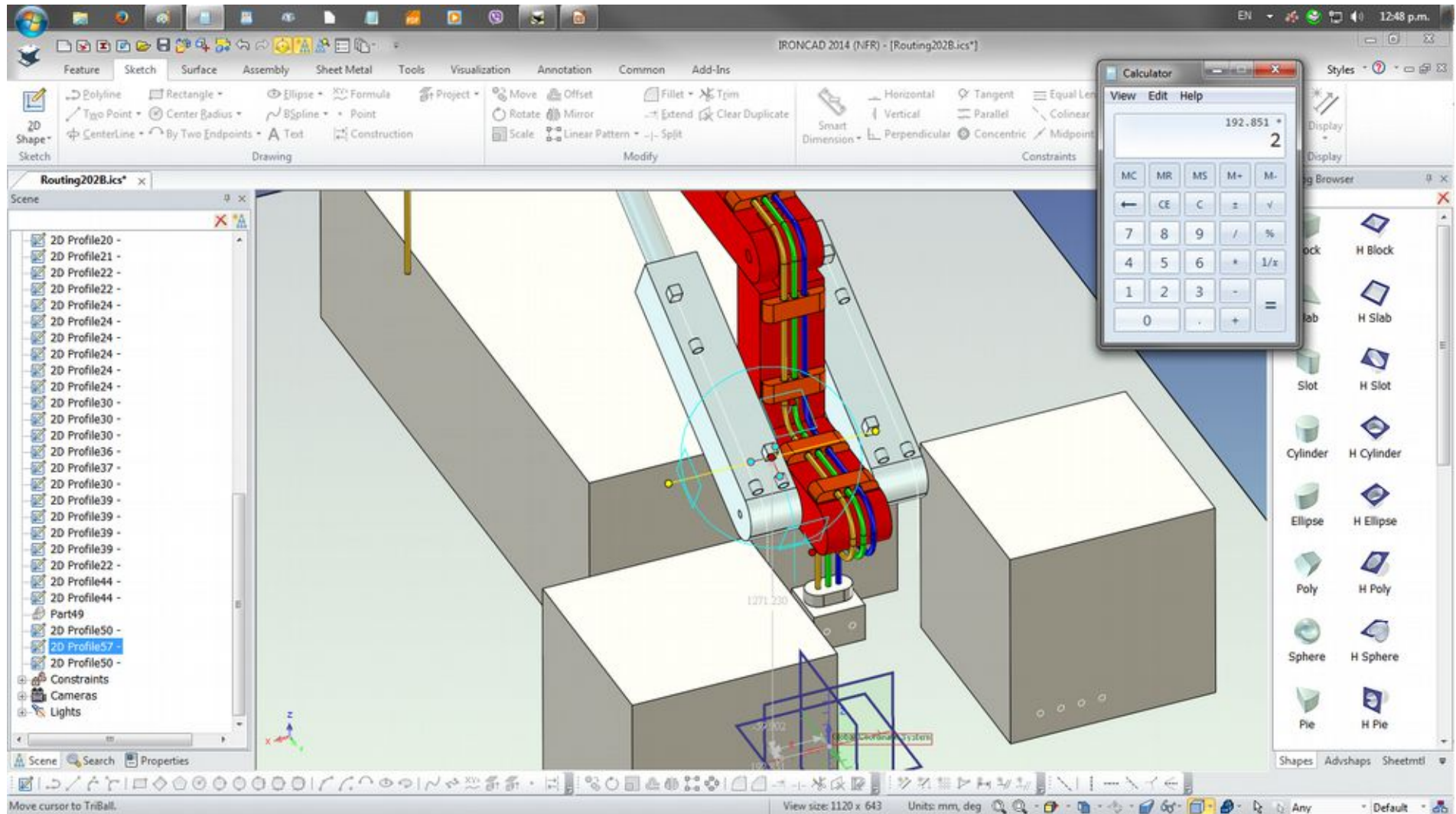
It is easier to manage making 2D Shape for the hoses from the hydraulic cylinder as it is on the Y and Z axes before it drops of the porximity of that part and connects to the pump block. A 2D Polyline Sketch and fillet was applied in this 2D scene



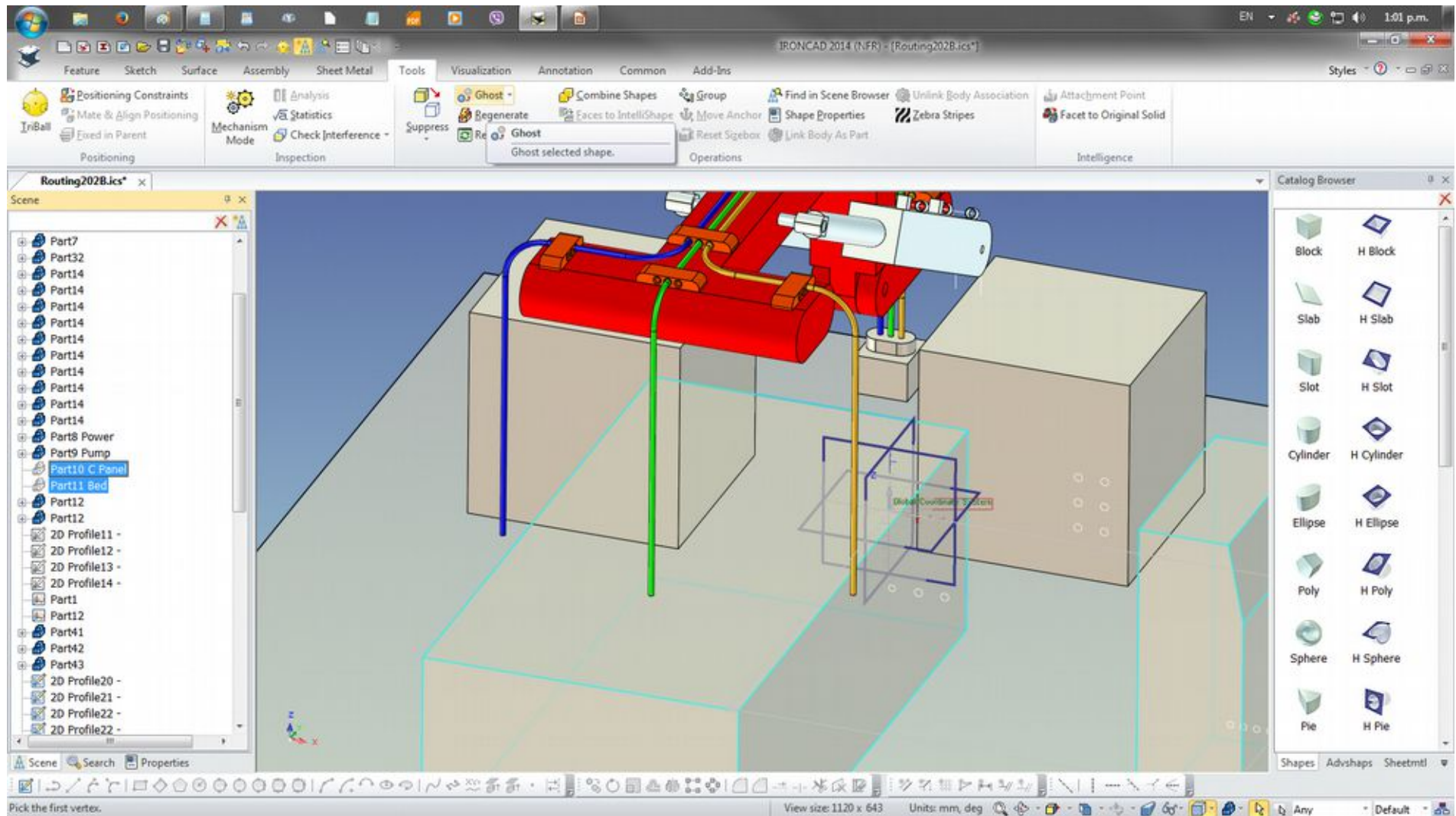
Do the same for 2D Profile21 / Hose A.



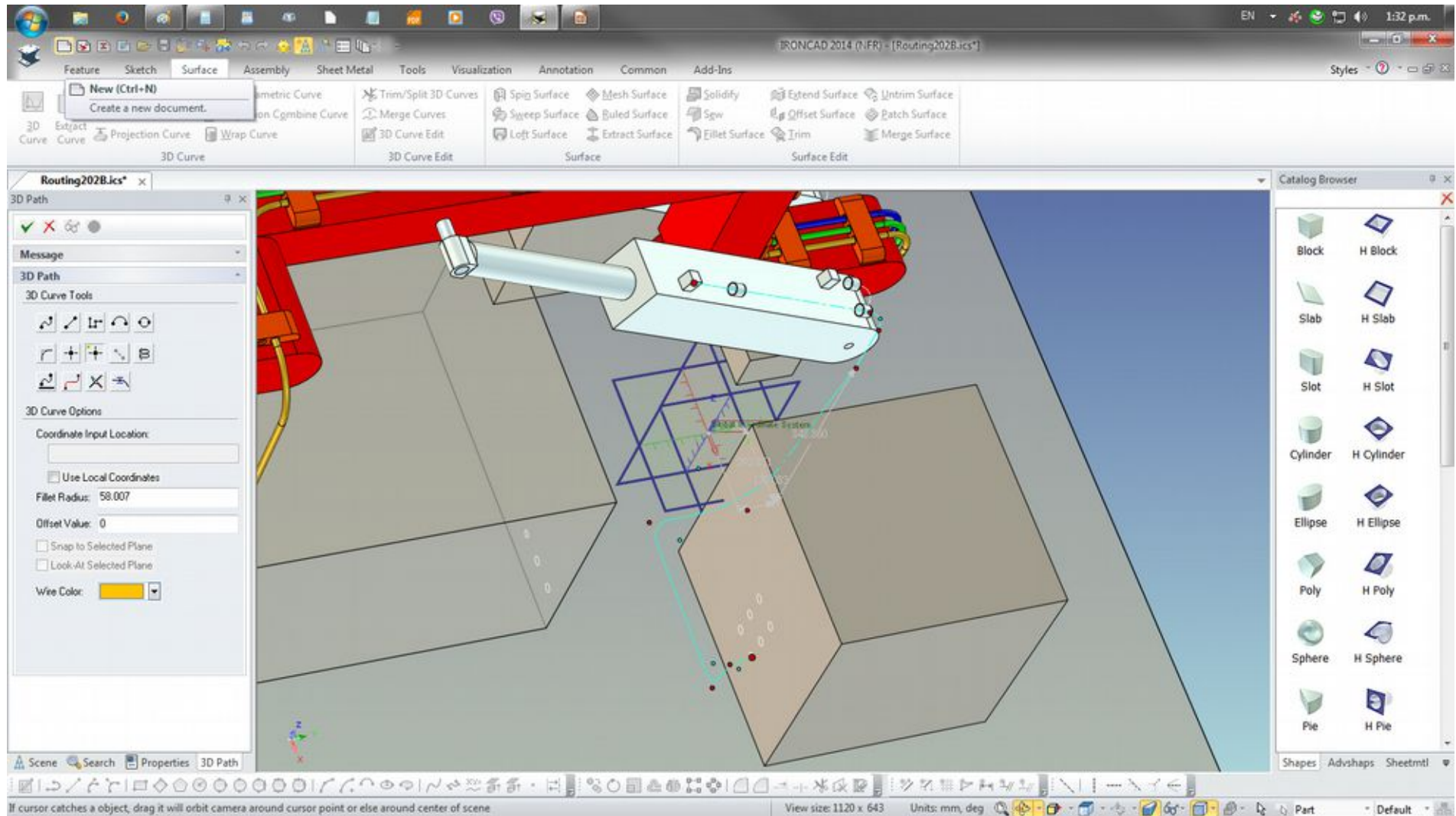
Copy and position the created 2D Profile 50 and 57 accordingly. Notice that the Position Dimensions is activate on the scene it can precisely placed



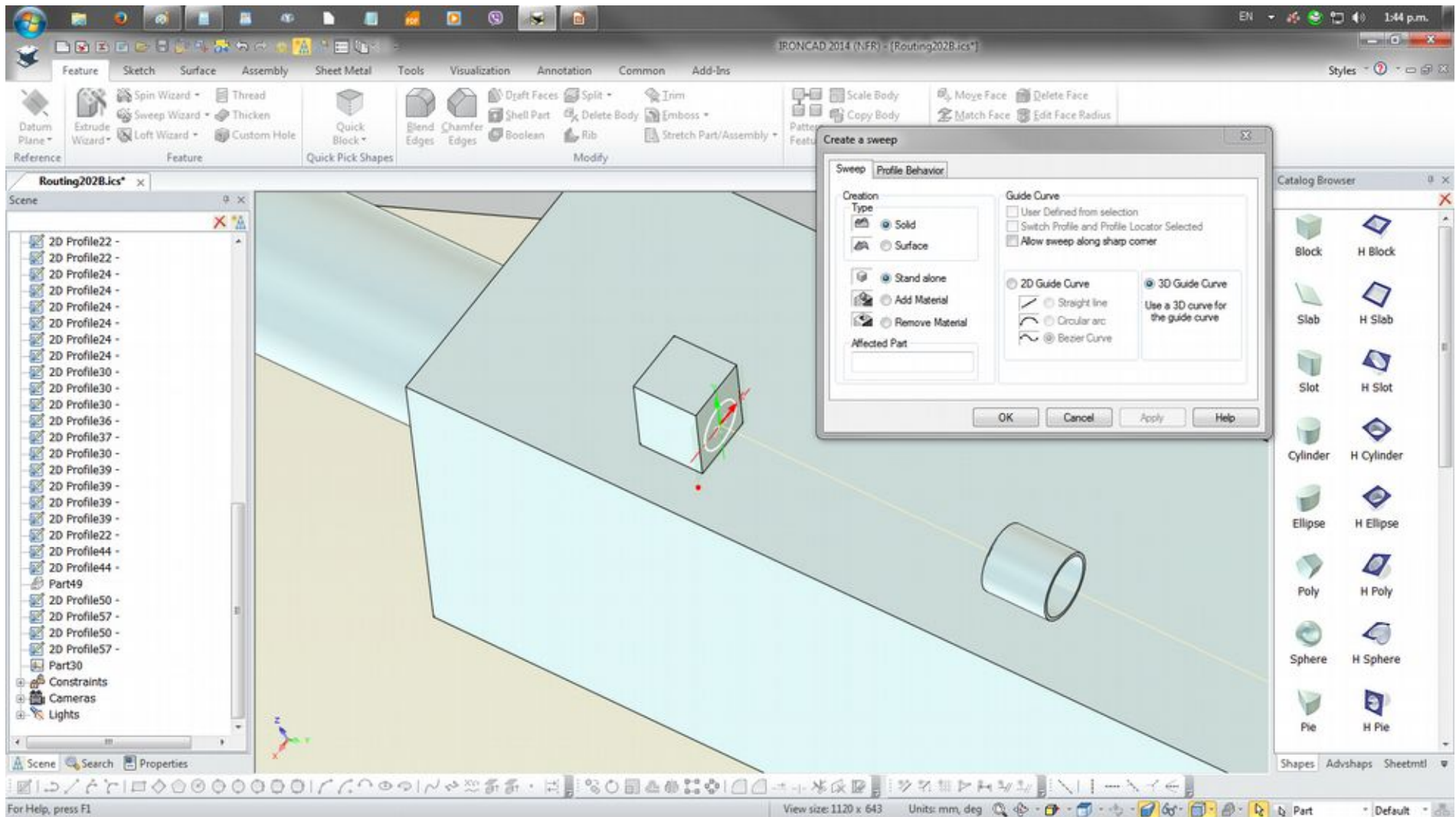
Select Part10 C Panel and Part11 Bed and apply the Ghost feature from the Tools tab so it is easier to use the 3D Curve Tools to create the 3D path connections



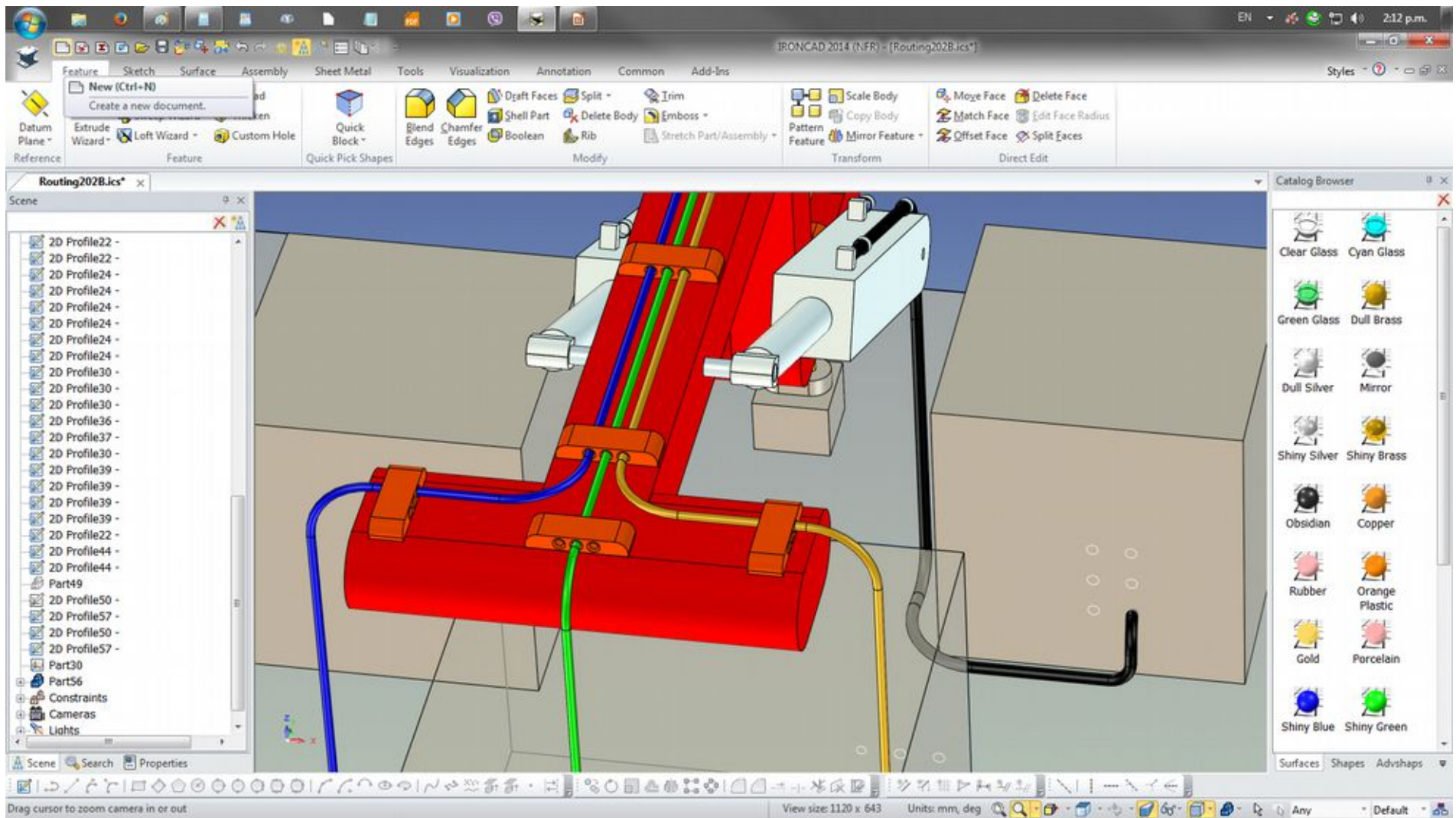
Trace the 2D Profile50 path with Insert Line, Inset Arc, Insert Polyline to create the 3D path. Using the Triball to move the points preceding the polyline after the arc onwards till the final corner to attach the end on the 2D Profile drawn on the Part9 Pump. This created 3D Curve Part30



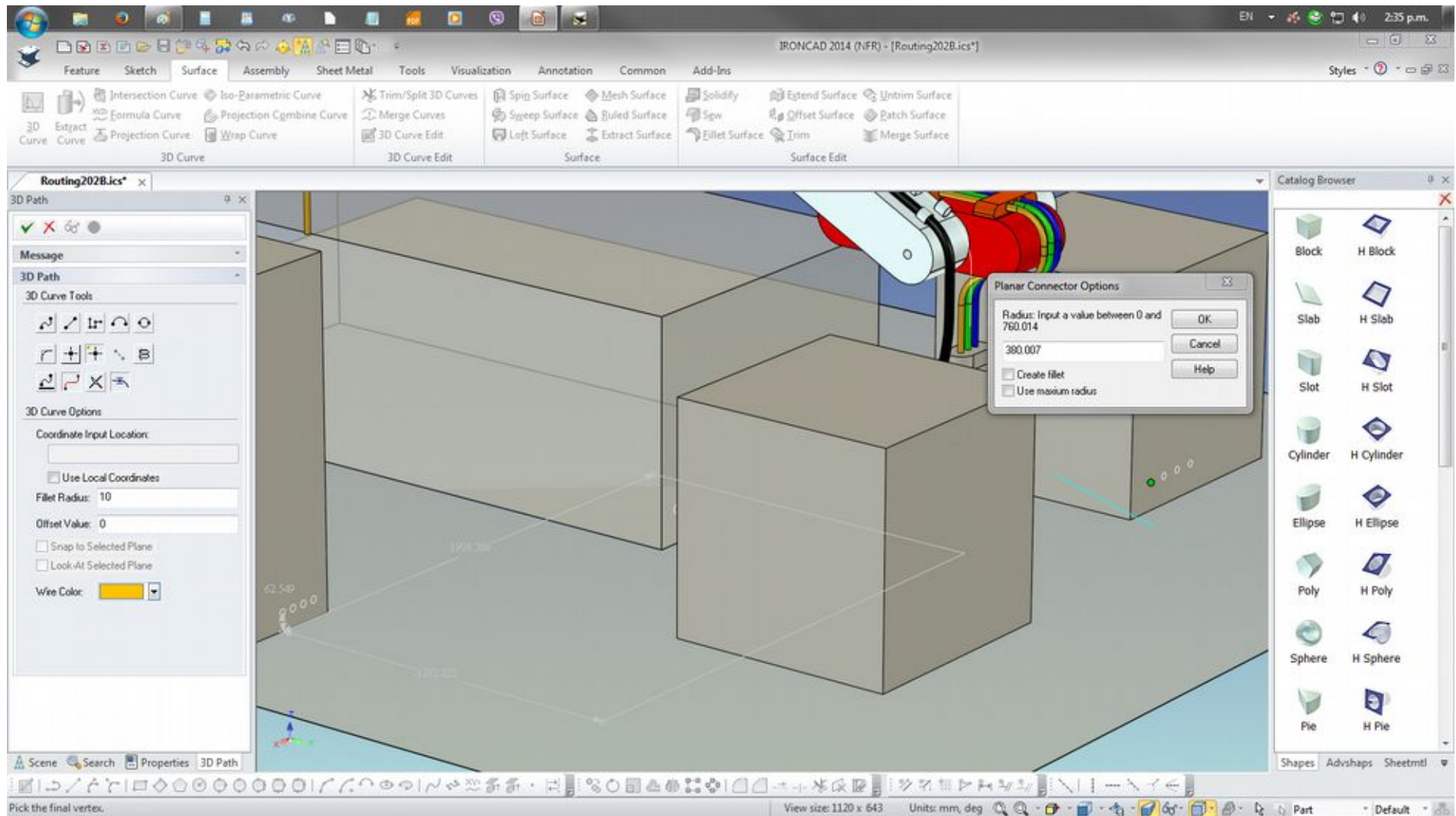
Suppress the 1st 2D Profile50 from the Scene Tree. Create a Sweep from the Feature tab and select the point and the 3D Guide Curve

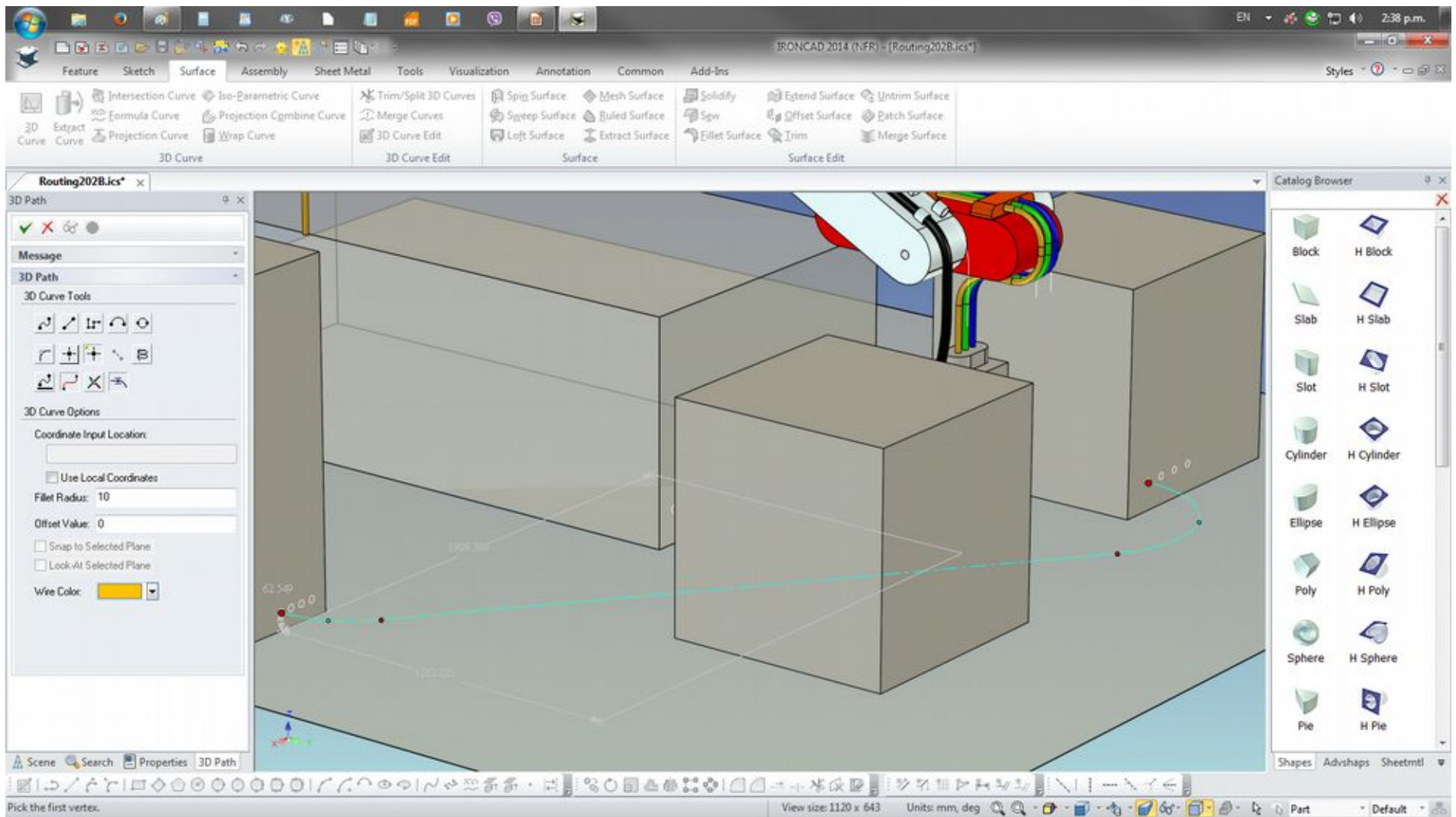


Part56 Hose created

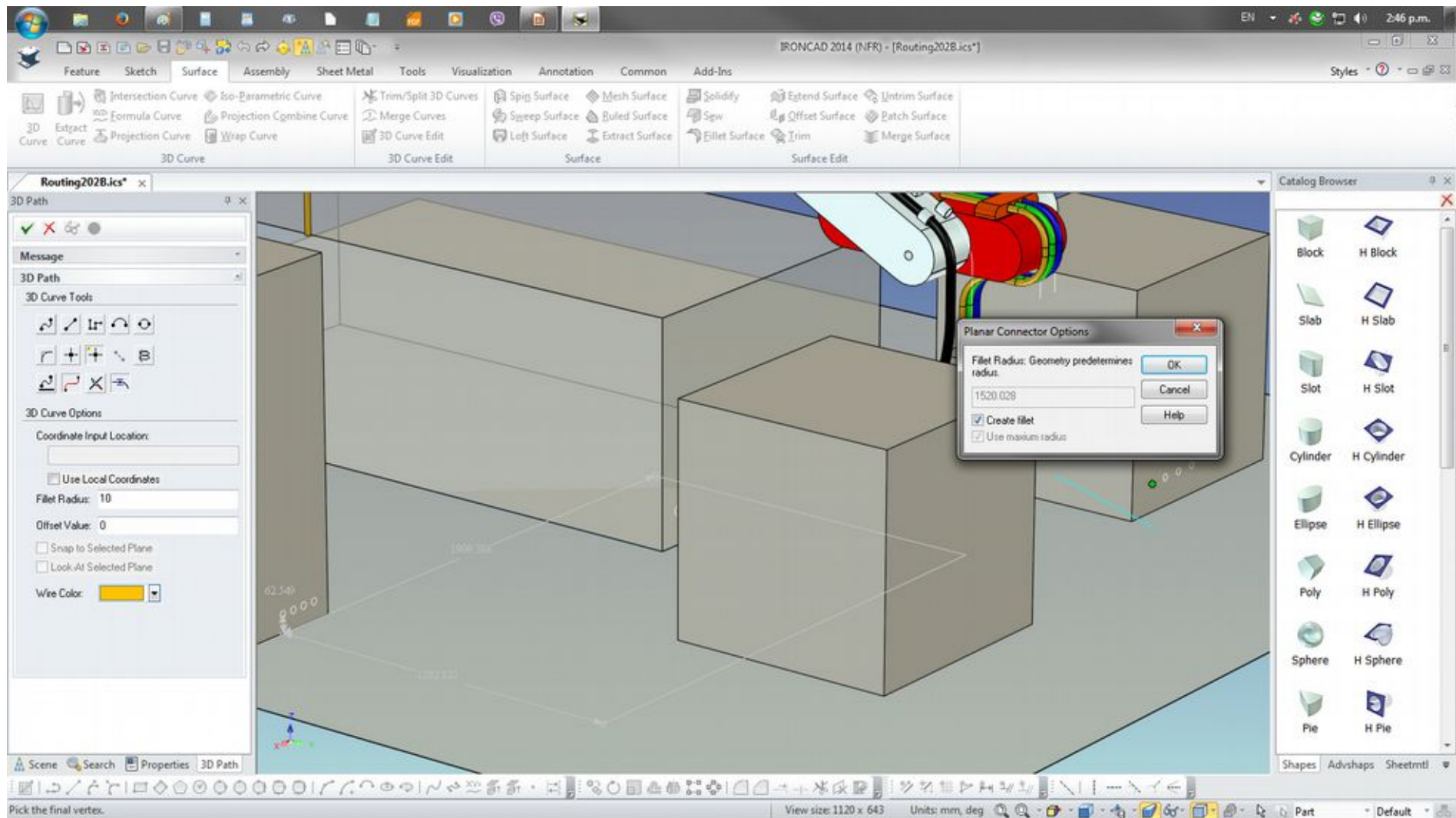


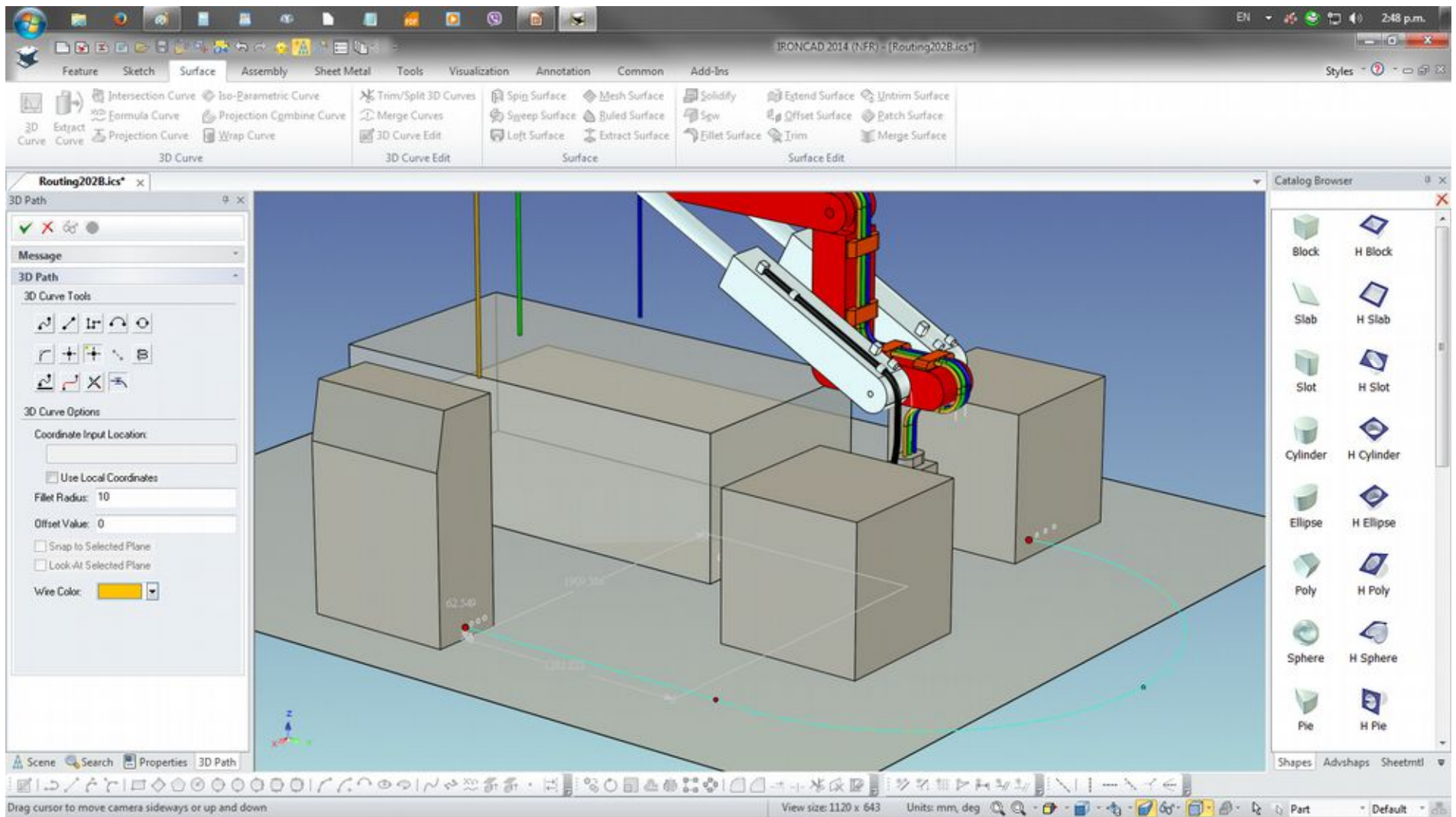
Create 3D Curve wiring using the Insert Connector tool. Note that using the Insert Connector Tool can produce different paths depending on the features used. First screen shows the Planar Connector Options set by the program.



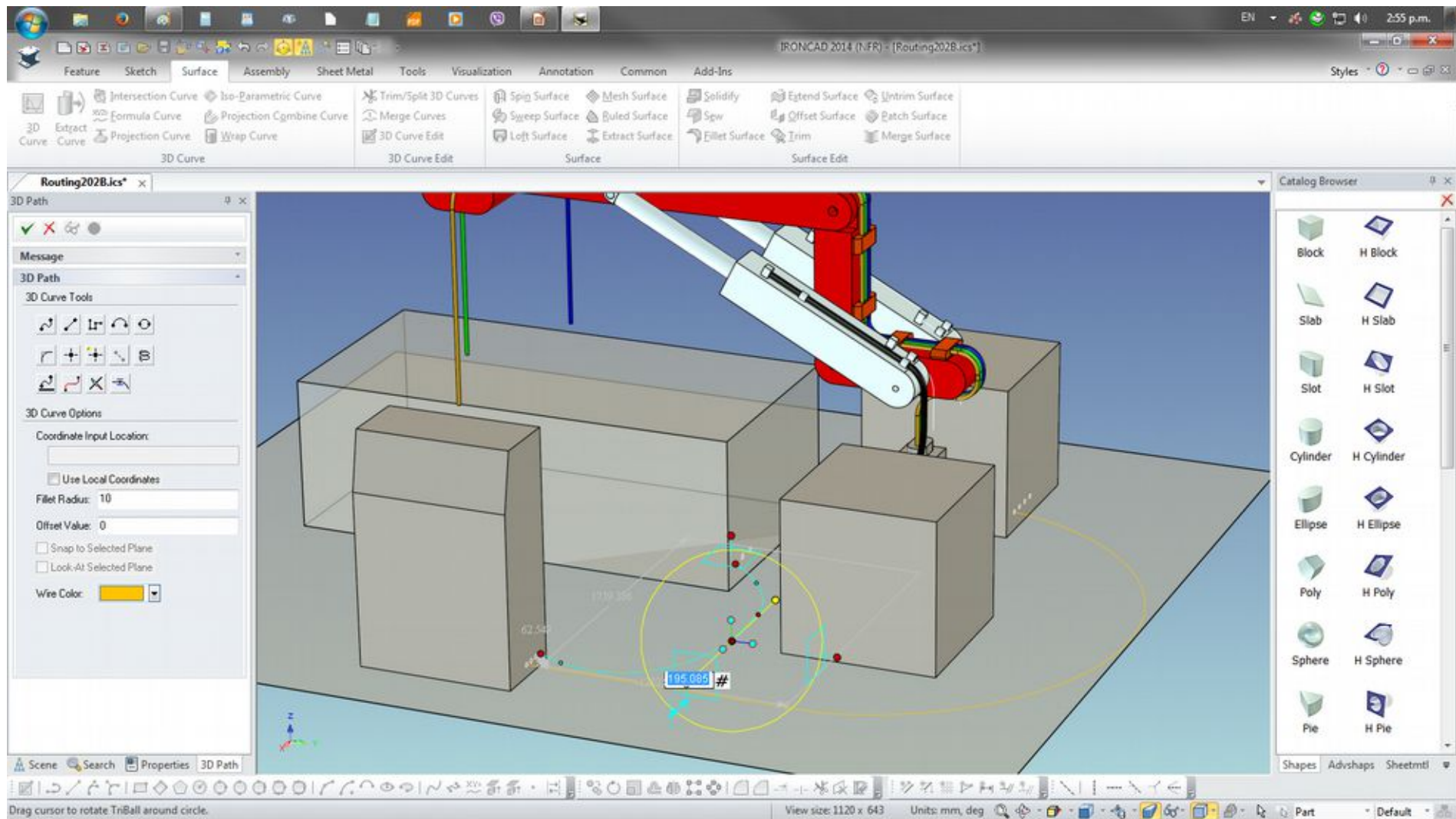


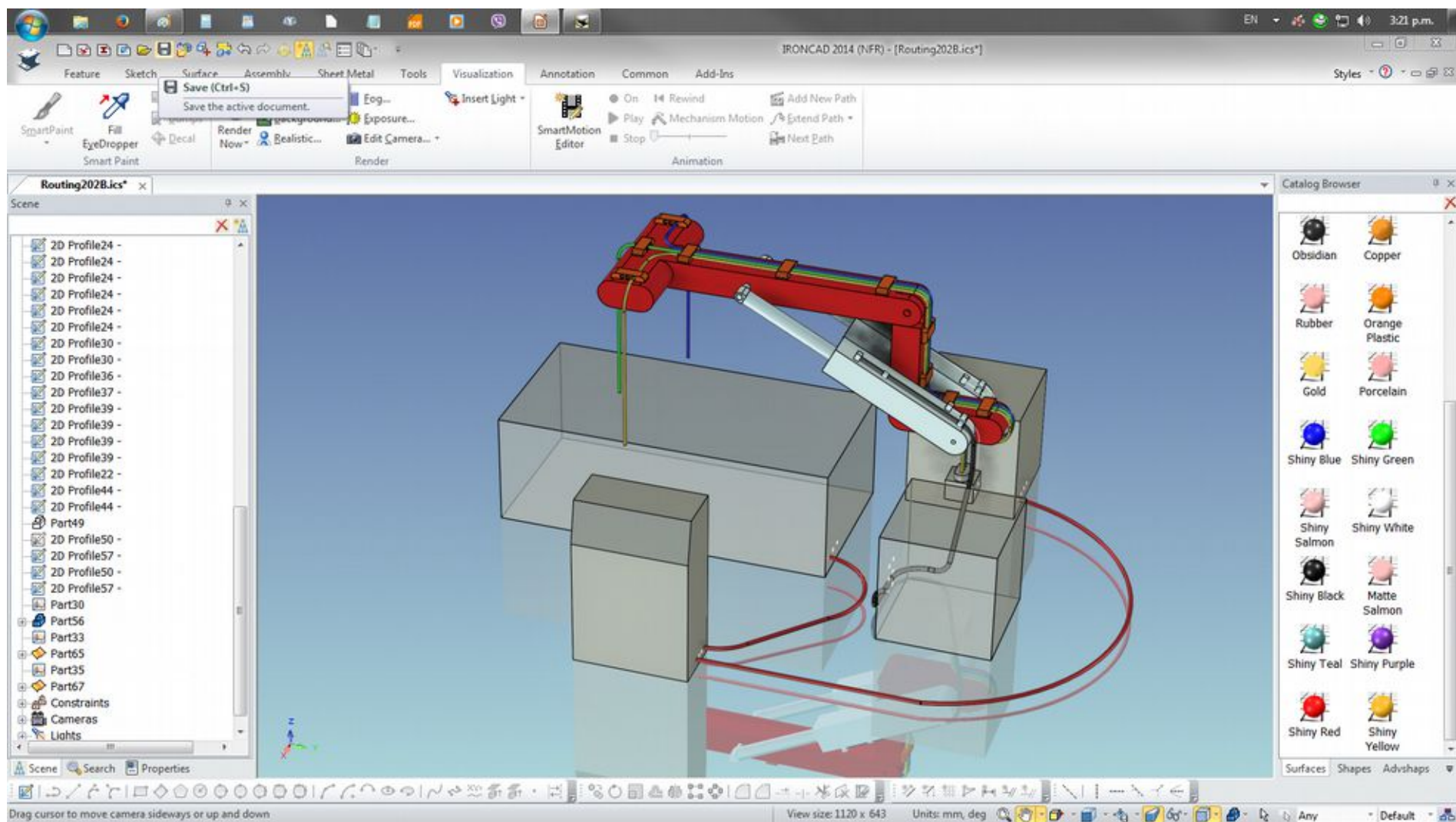
Create 3D Curve wiring using the Insert Connector and Create Smoothly Connected Curve tool. The Planar Connector Options set with Create fillet option.



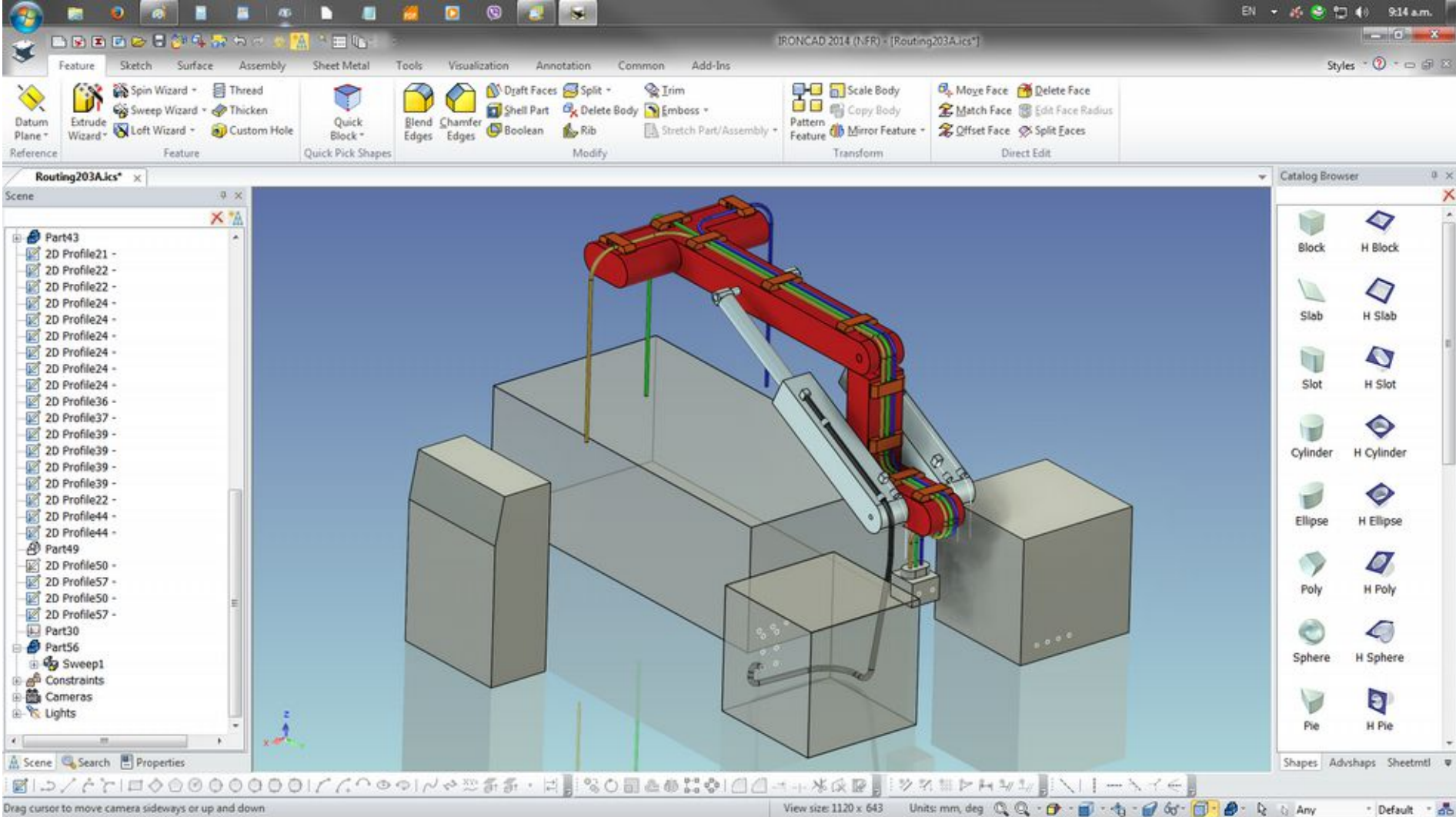


3D Curve path created with Planar Connection Option at default. Point drag with TriBall, if points moved by mouse pointer, orientation cannot be controlled properly





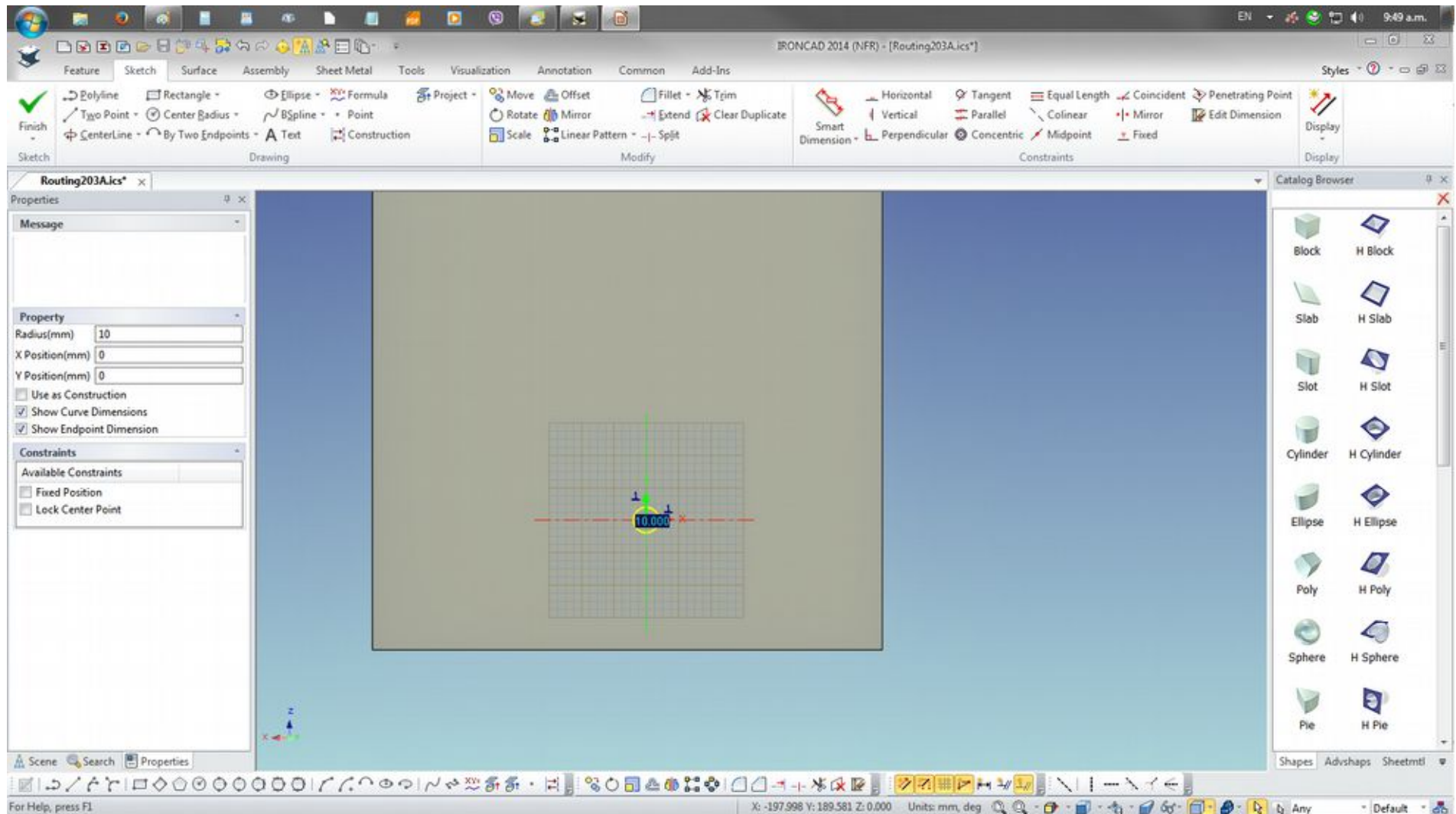
On this scene, create 2D sketch of 5 20 mm reference power points



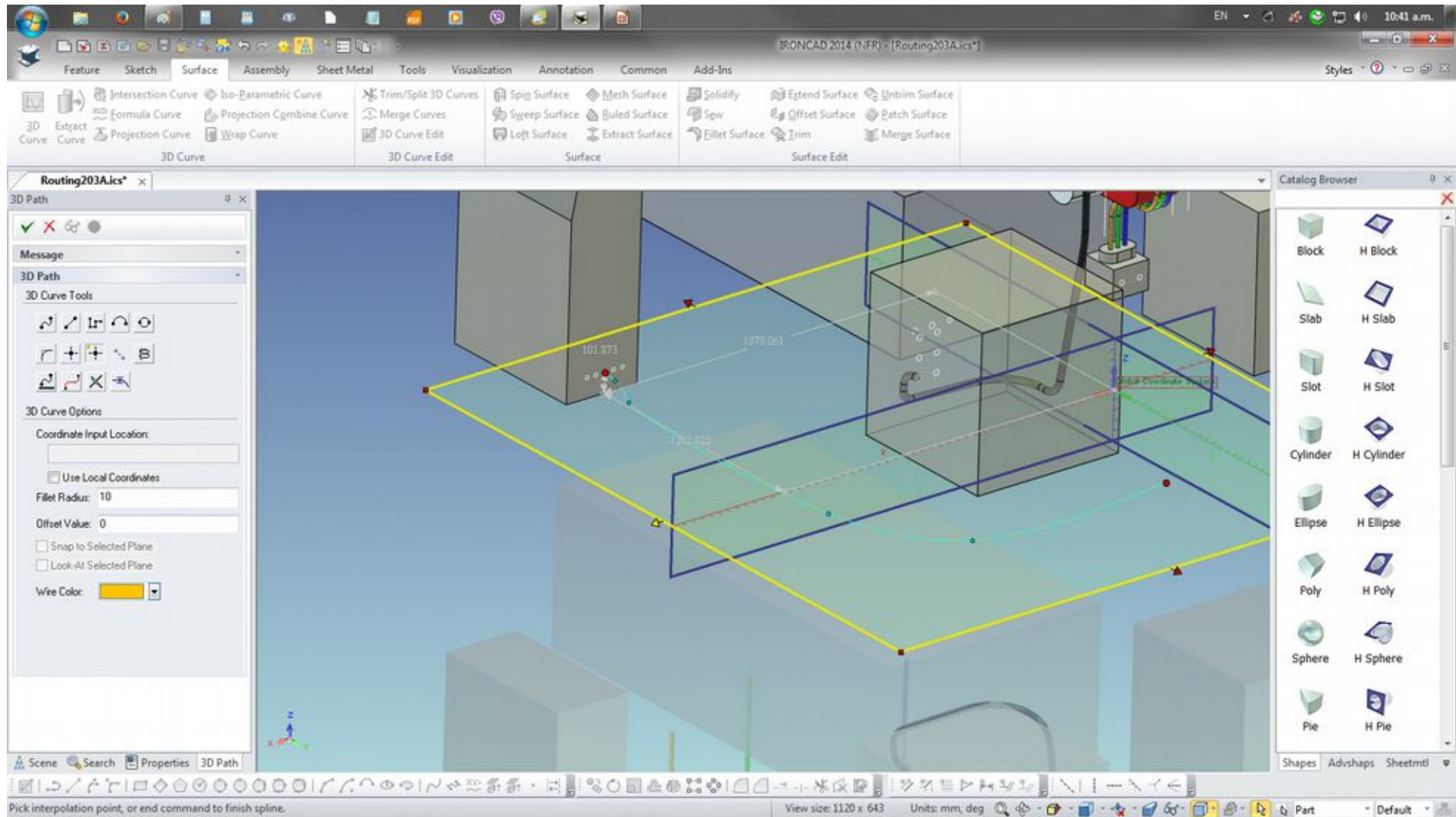
After drawing a 2D sketch reference 20 mm \varnothing of a power point, select Move from the Actions dialogue panel.

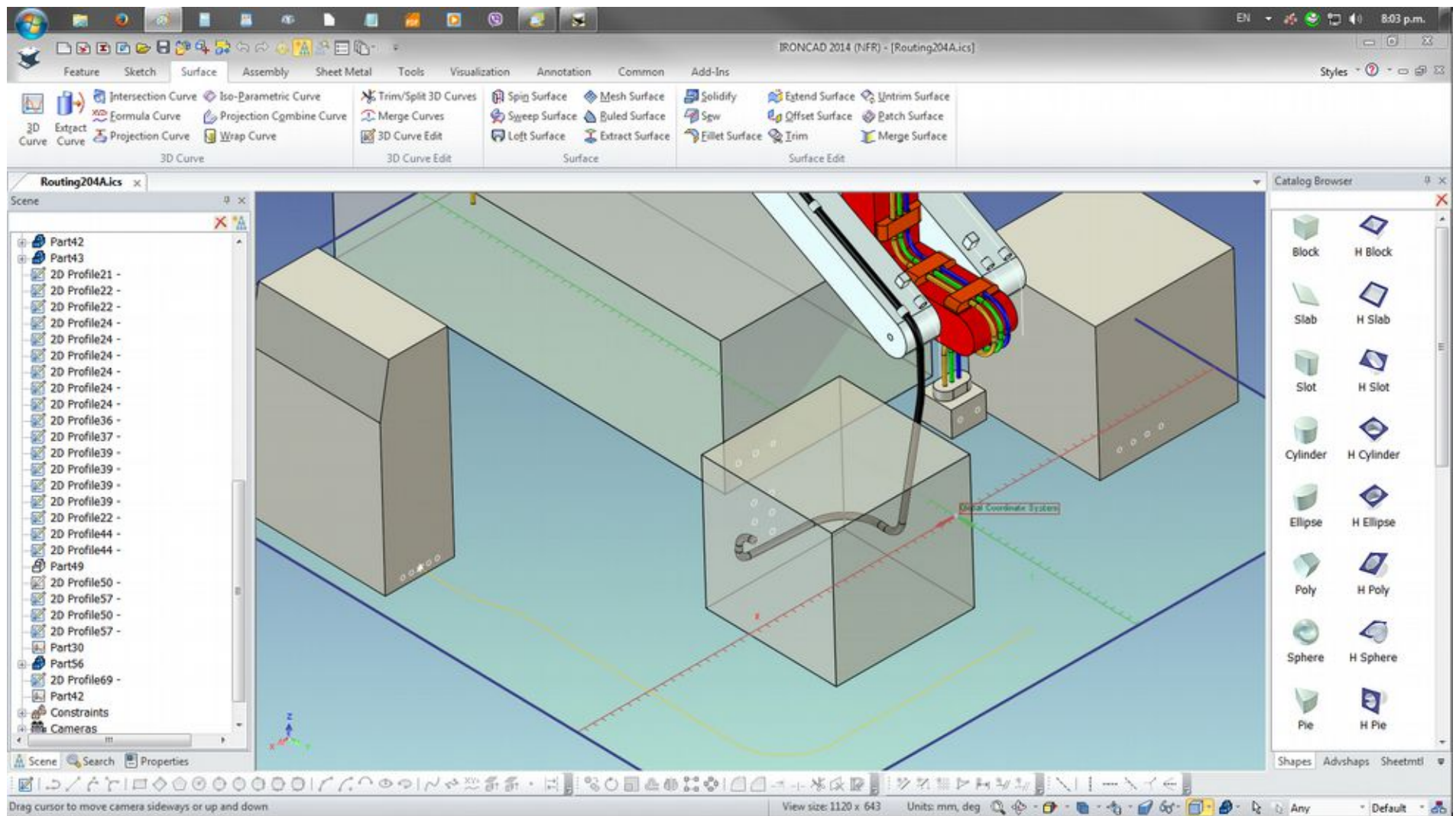


On the Parameters, enter 50 for X > tick Copy with the Copy Number 2 > tick OK check symbol. Repeat the process but enter -50 for X. It was done this way because the 25 mm \varnothing was drawn on the center of the 2D Sketch drawing grid.

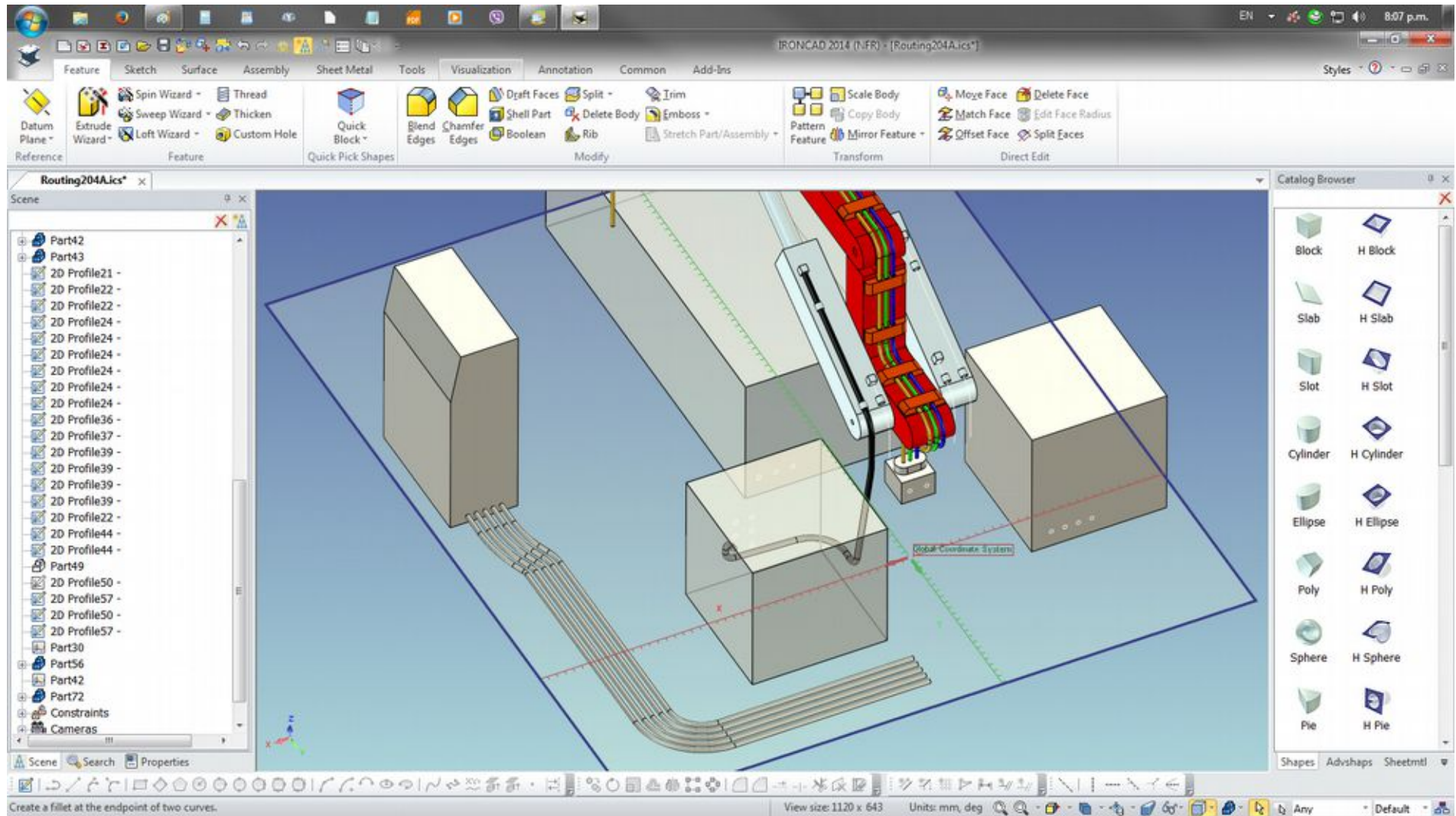


Once the 3D Curve polyline has been created, press the A key to show all planes and adjust the size of the XY plane to guide the TriBall on that plane. Alternatively, the Z key will display the XY plane only.

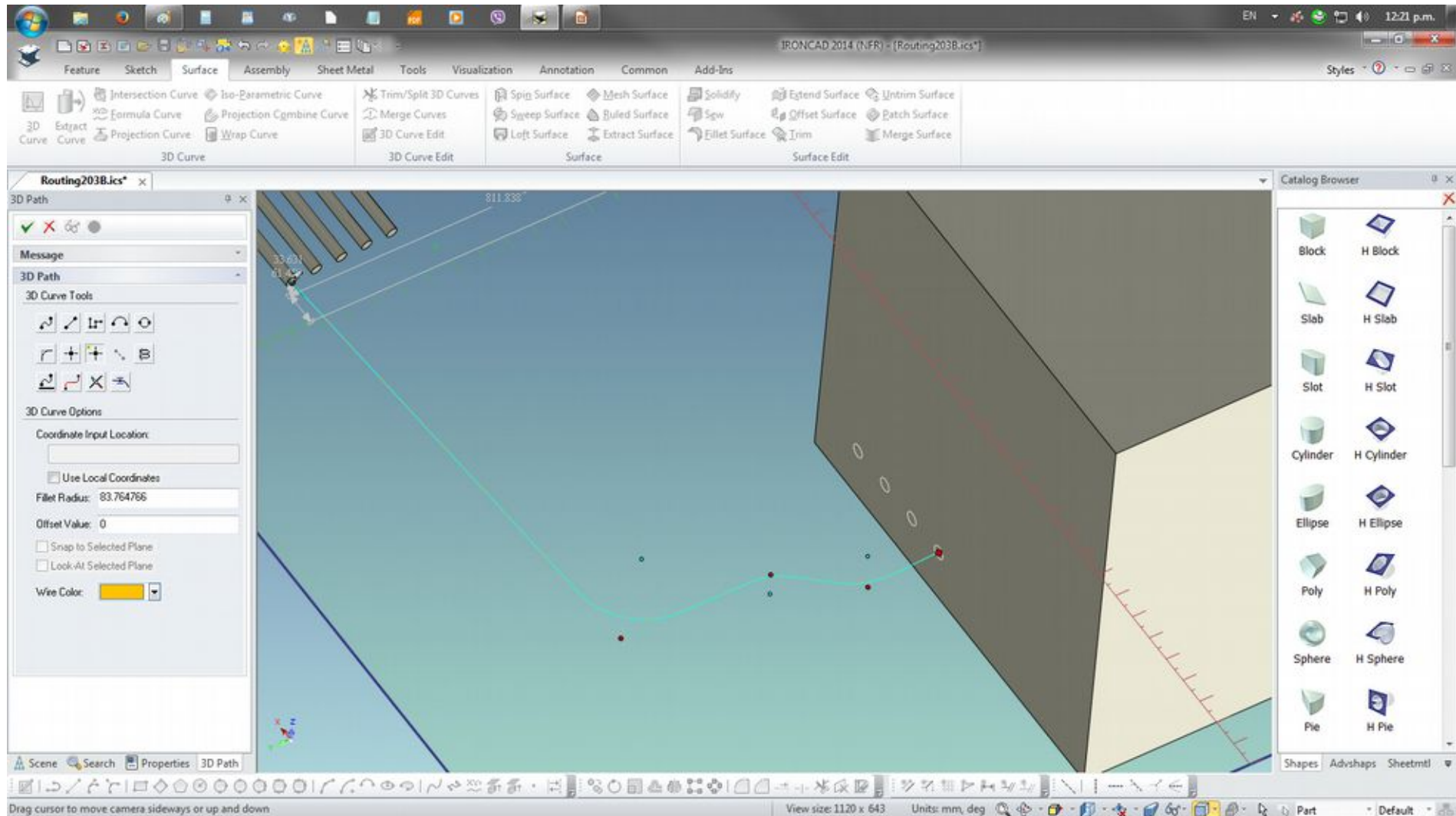




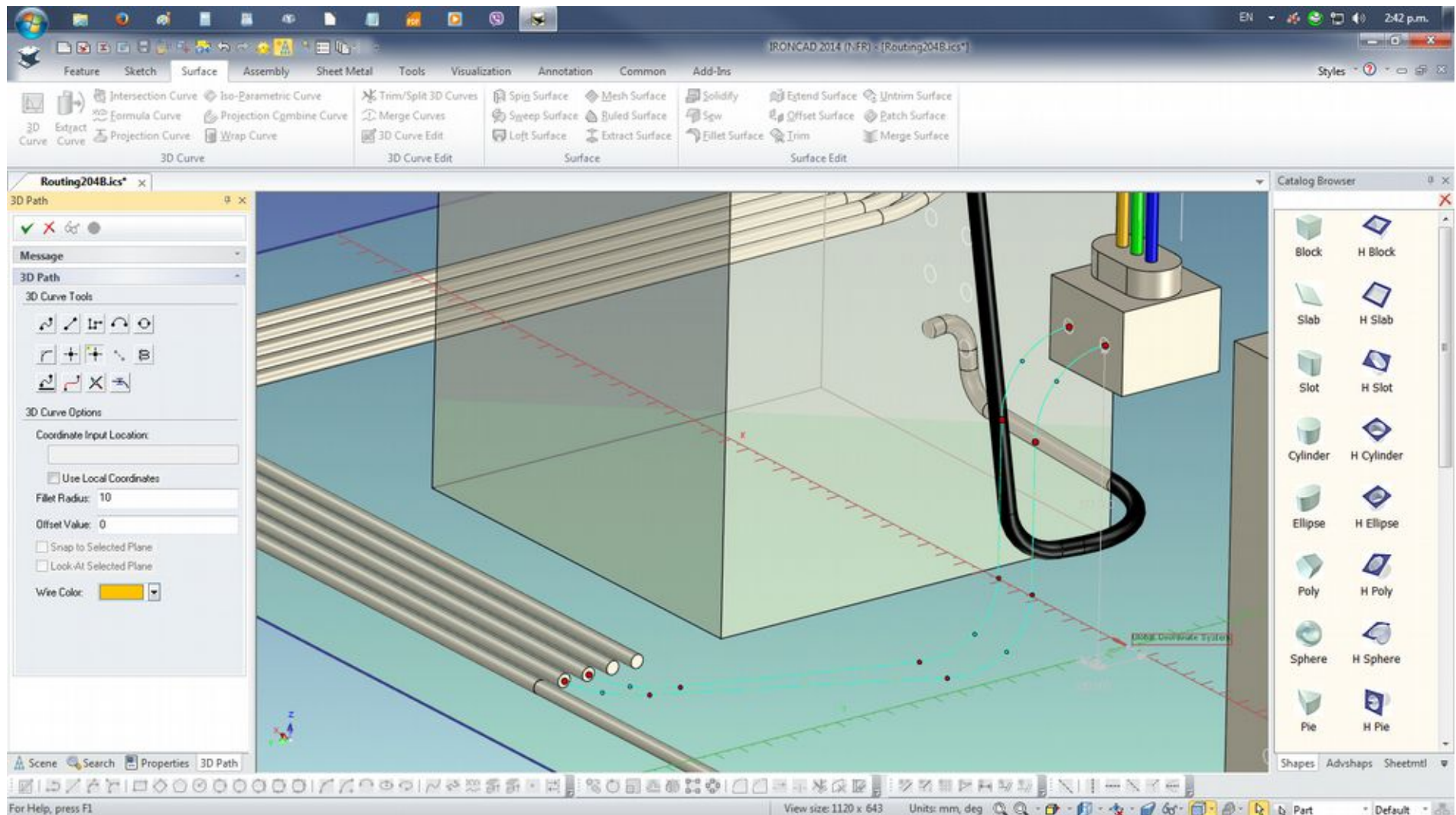
With the wiring cables Part72 created from the Part10 C Panel, the 3D Curve Tool Insert Polyline and Insert Connector will be used to connect with the other components of the machinery.



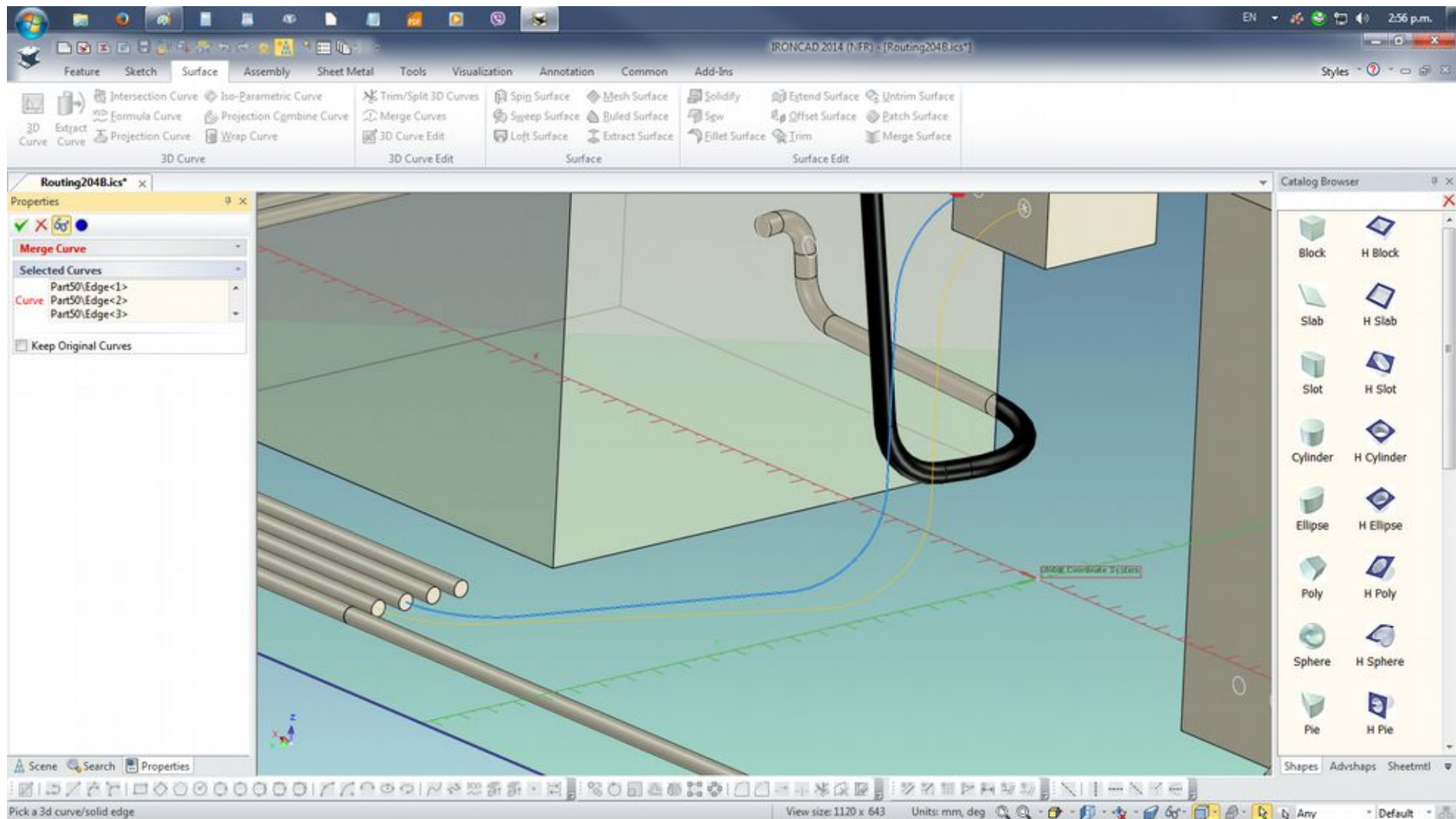
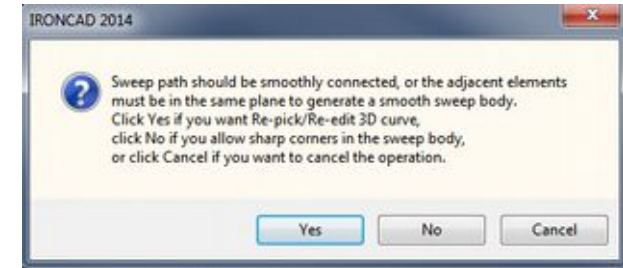
Using Insert Polyline offers more control when a straight forward connector is required. Use the TriBall to position the points of the created polyline. Use the F3 Orbit Camera or Camera Picker to position the point with the TriBall. It will also help switching off the Perspective Camera F9 so the points moved by the Triball tool will be in plane working plane. Use Insert Fillet to smooth the connection. Orbit the scene so it give you a good view when using Insert Fillet so you will not get a series warning prompts the Fillet Radius is to big. If faced with that situation, key Esc.



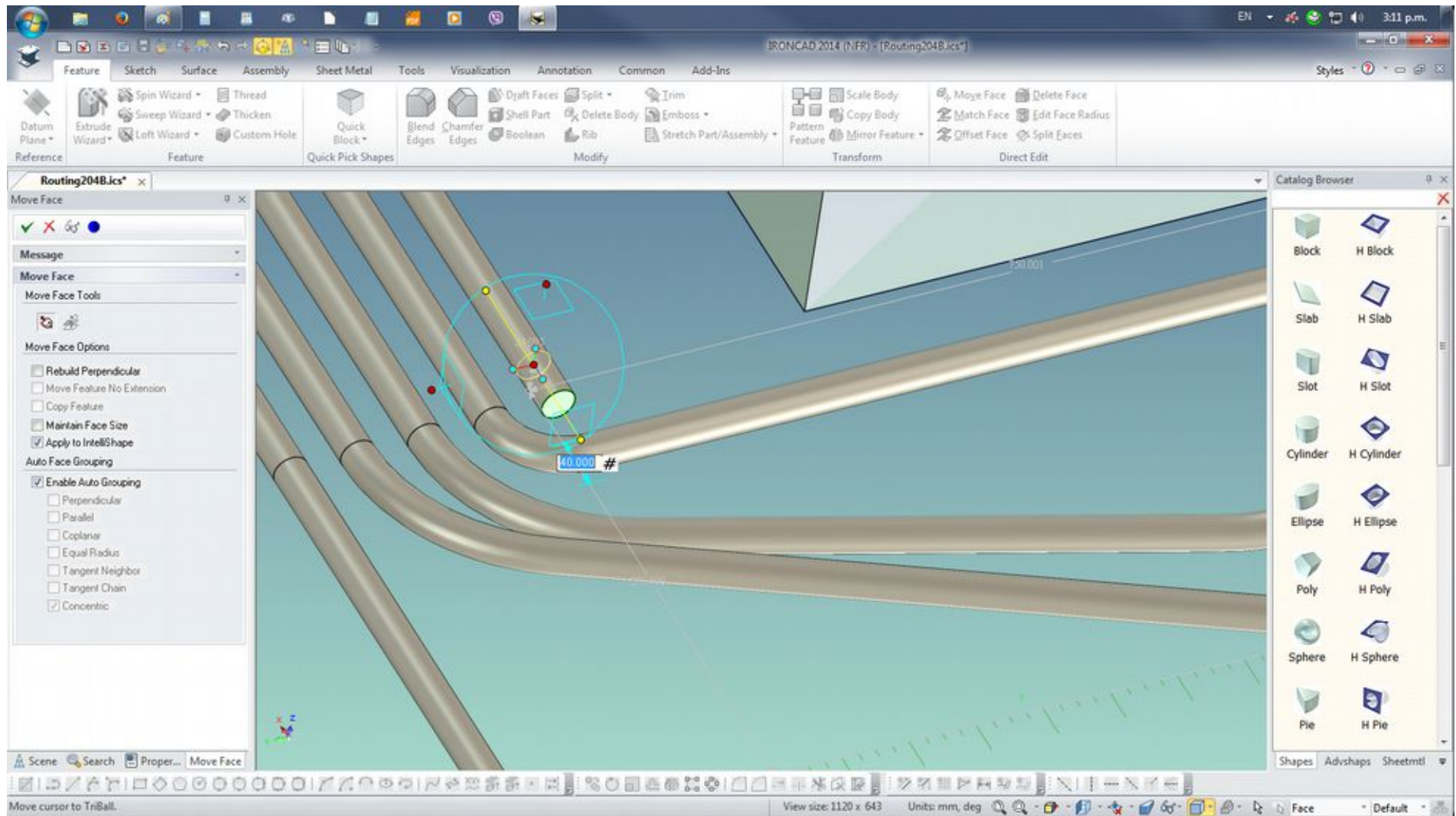
Using Insert Connector is best used for short connections. Also picking the right starting point from either object can produce better or unyielding result. This was connection was done top > down and the flow was smooth. Earlier it was drawn with bottom > up and the created corners that seem unaware of the plane it was going to. This created 3D Curve Part46



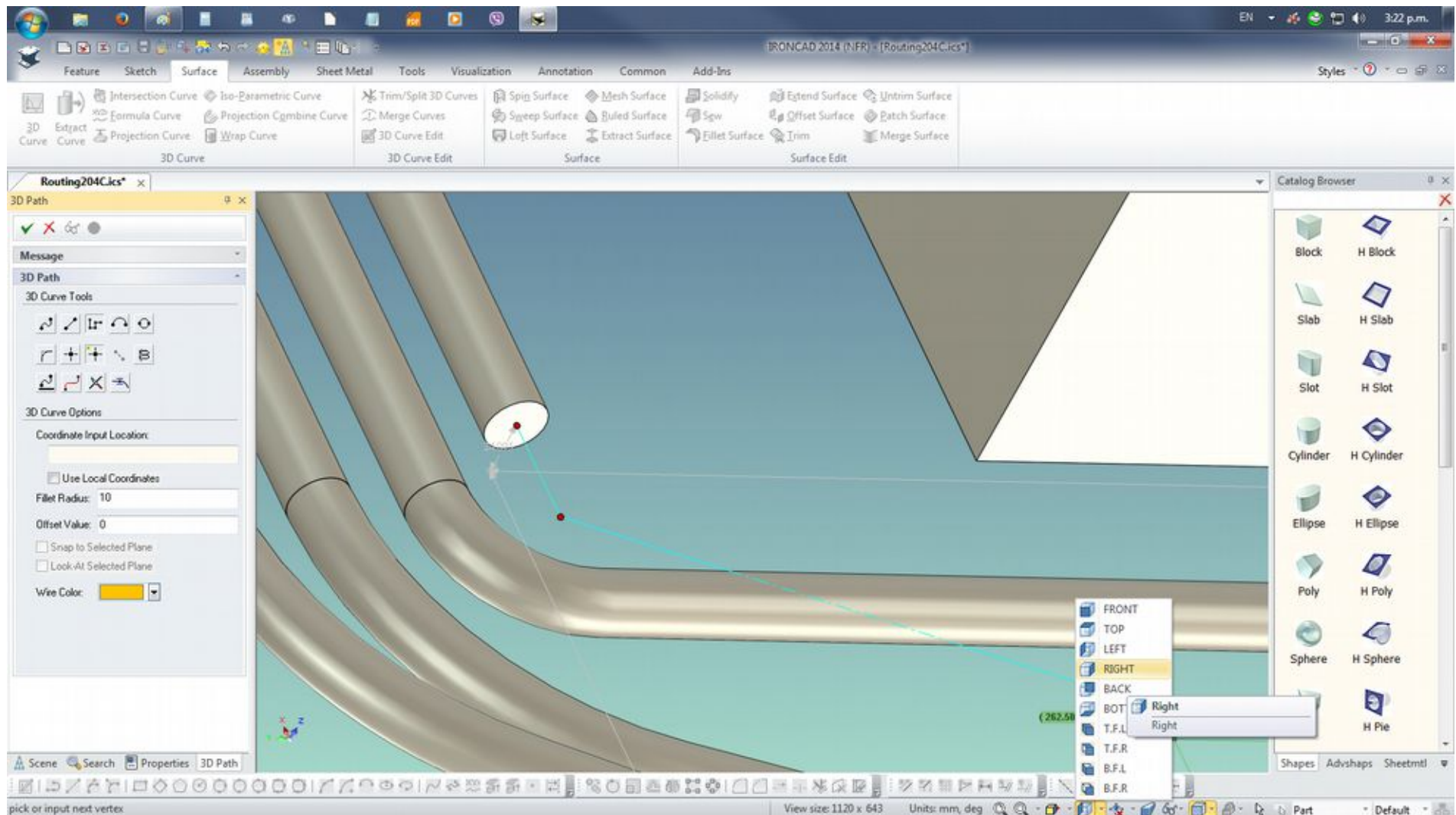
With a 3D Path created with Insert Line, Polyline or Connector and get this screen prompt when creating a sweep, go Merge Curves so it will create a single 3D path.



On the 5th cable, Move Face command is necessary to allow a cable routing space to connect to the pump module.



After the face has been moved, create the 3D Curve and On the 3D Curve Tools, select Insert Line. Depress SHIFT key before picking the center of the profile to create a perpendicular line. Insert Polyline to create the path for the connection to the pump module. Adjust the points with the TriBall to create the desired routing path. Apply the necessary fillets on the corners of the created path.



Power line cable routing from the Part10 C Panel to the modules.

