

Assignment8

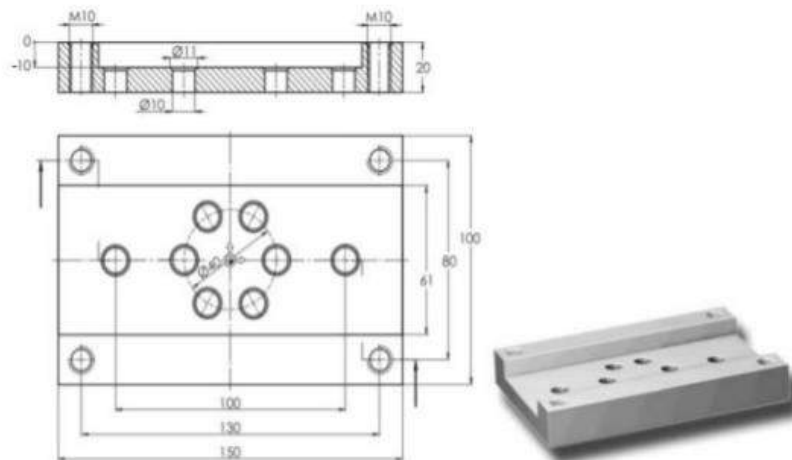
Name: CHIRAG GUPTA

Registration Number: 20BME0300

Question:

Problem -8

Create a 3D model of the given part, simulate the milling tool path and calculate the machining time for the given component using a CAM Software.

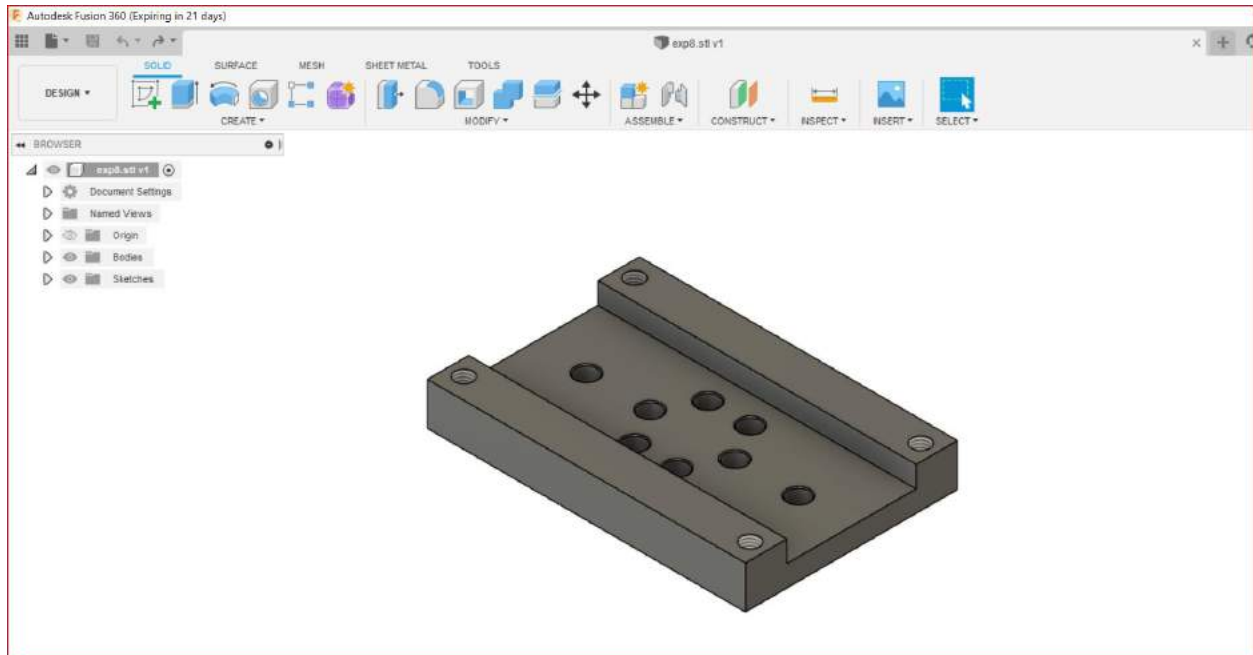


Selection of tools, process parameters and calculation of machining time

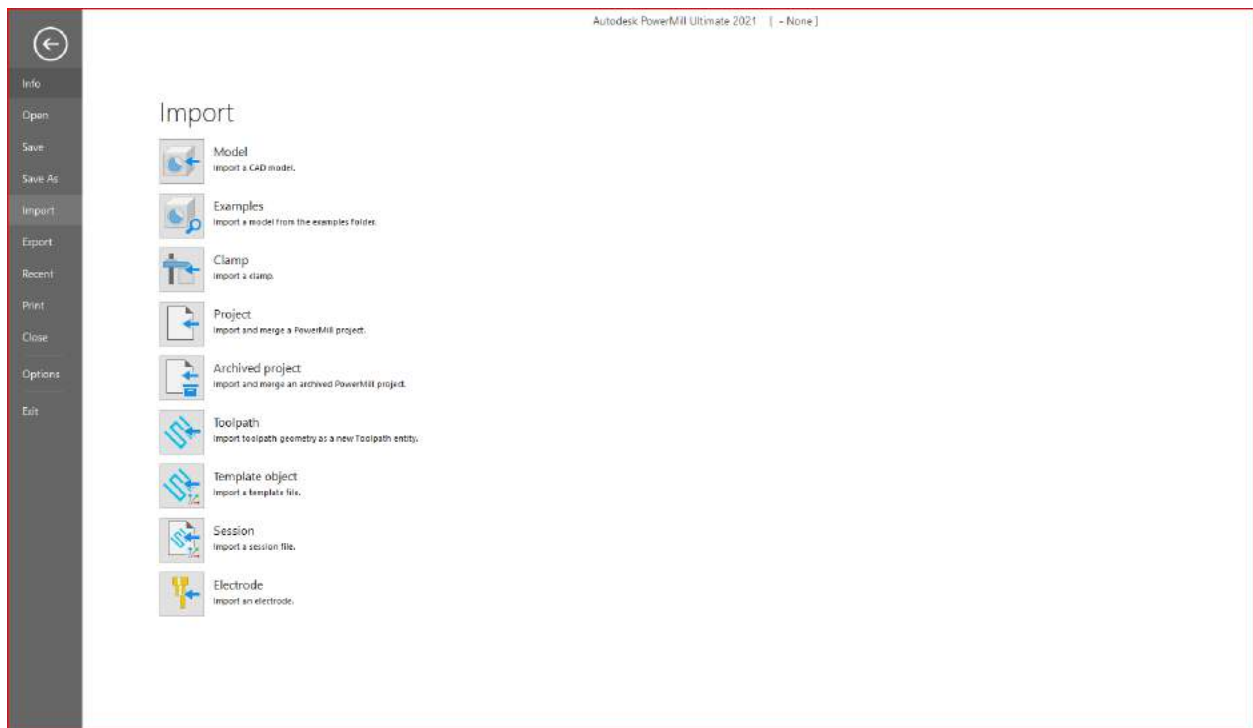
S.No	Machining operation	Selection of tool and dimensions			Process Parameters			Cycle Time (Sec)
		Tool Type	Diameter (mm)	Length (mm)	Speed (rpm)	Feed (mm/ min)	Down Step (mm)	
1								
2								
3								

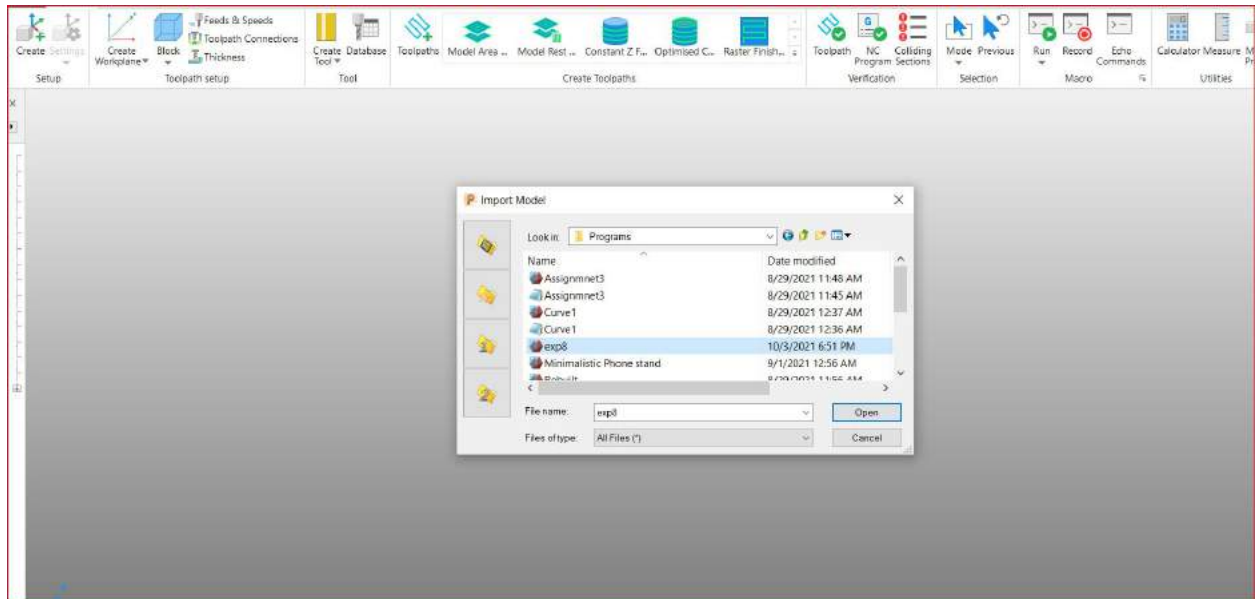
Total Cycle Time:

Step1: Create Model as per given in the question:

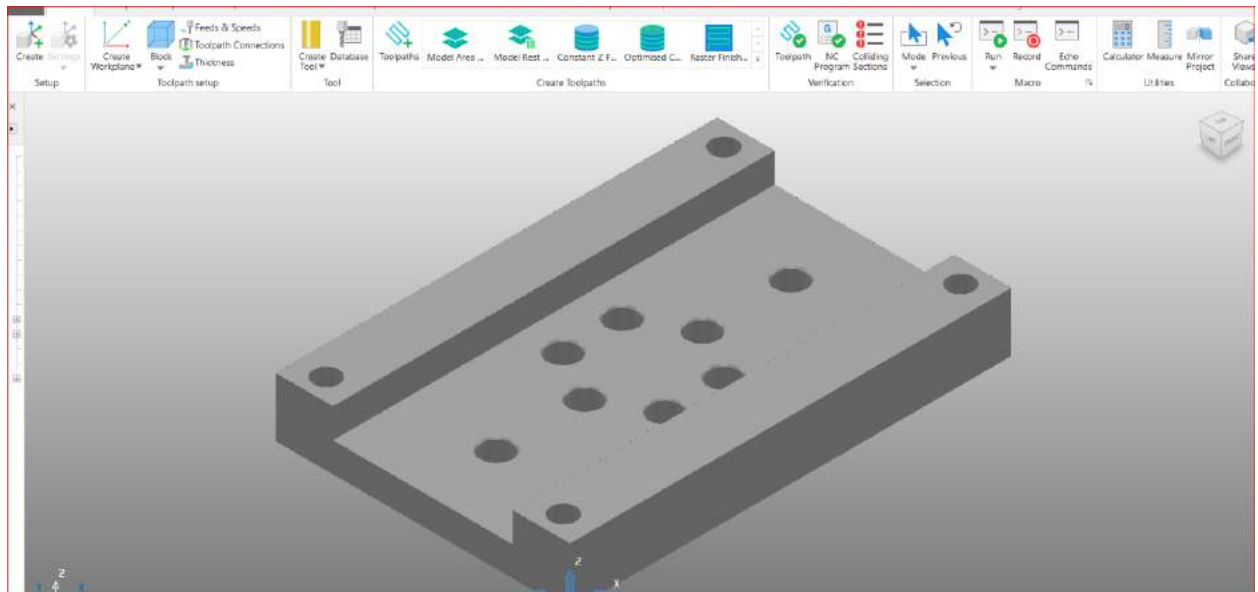


Step2: Open PowerMill and import the model from the folder where the file is saved.

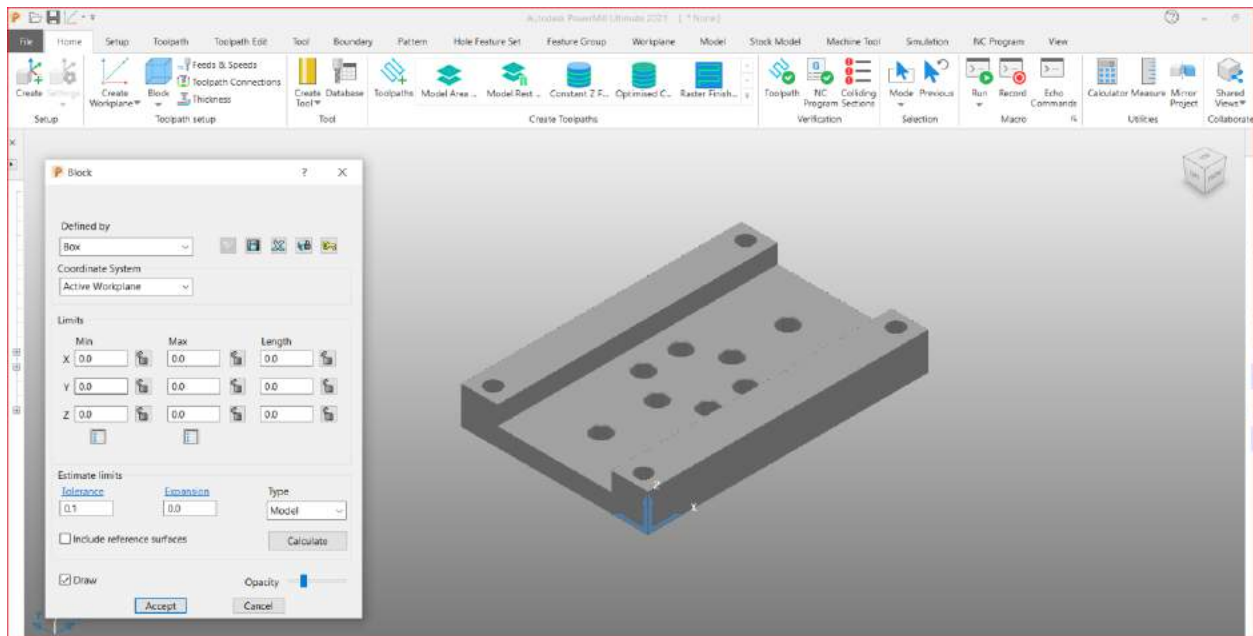




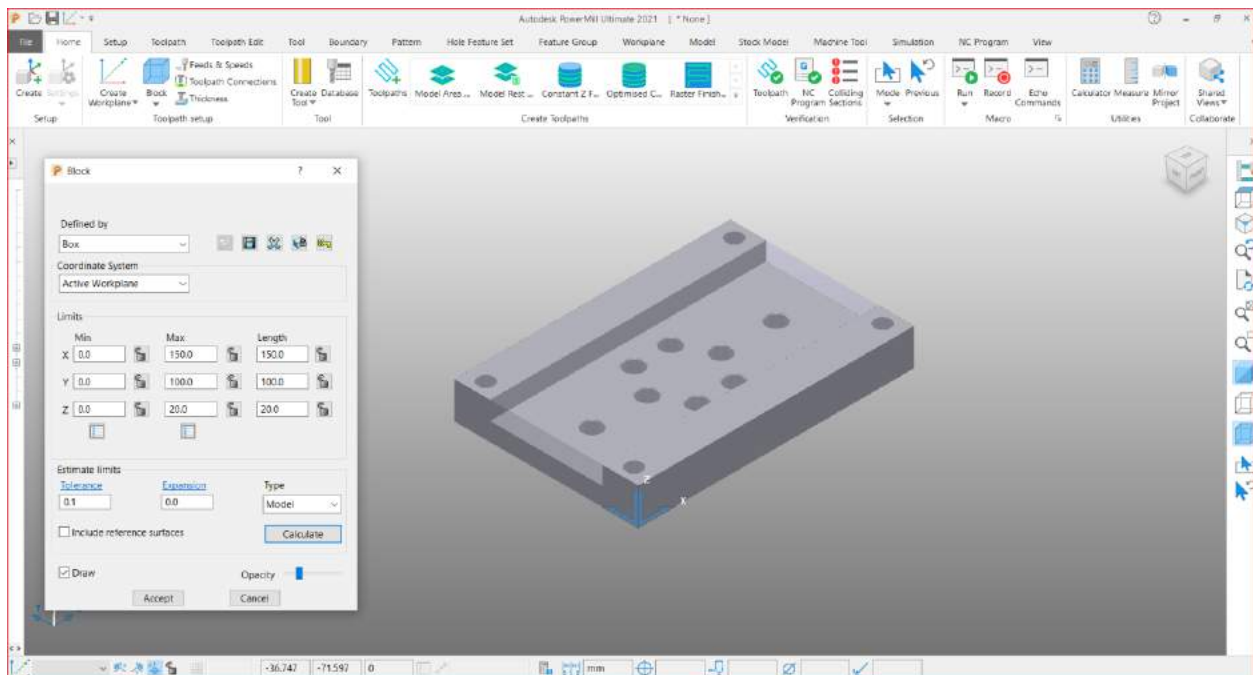
Select suitable isotropic position to get a better view.



Step3: Select the block icon present on the toolbar on top so that easily workplace can be created and oriented.

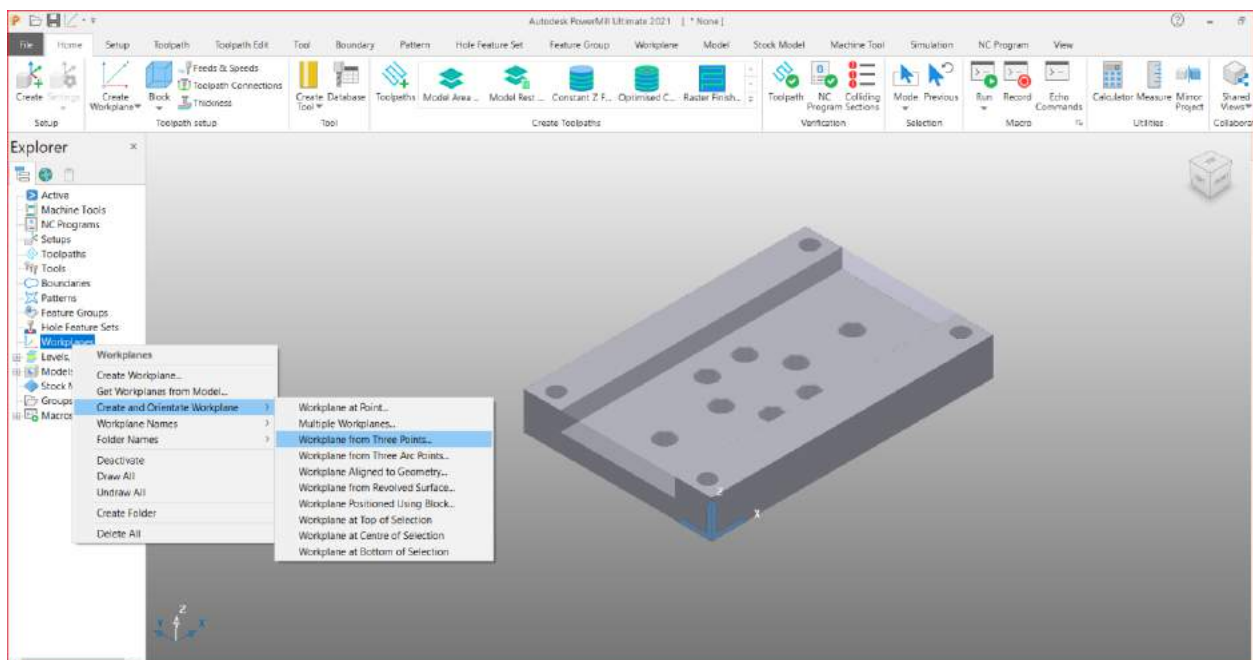


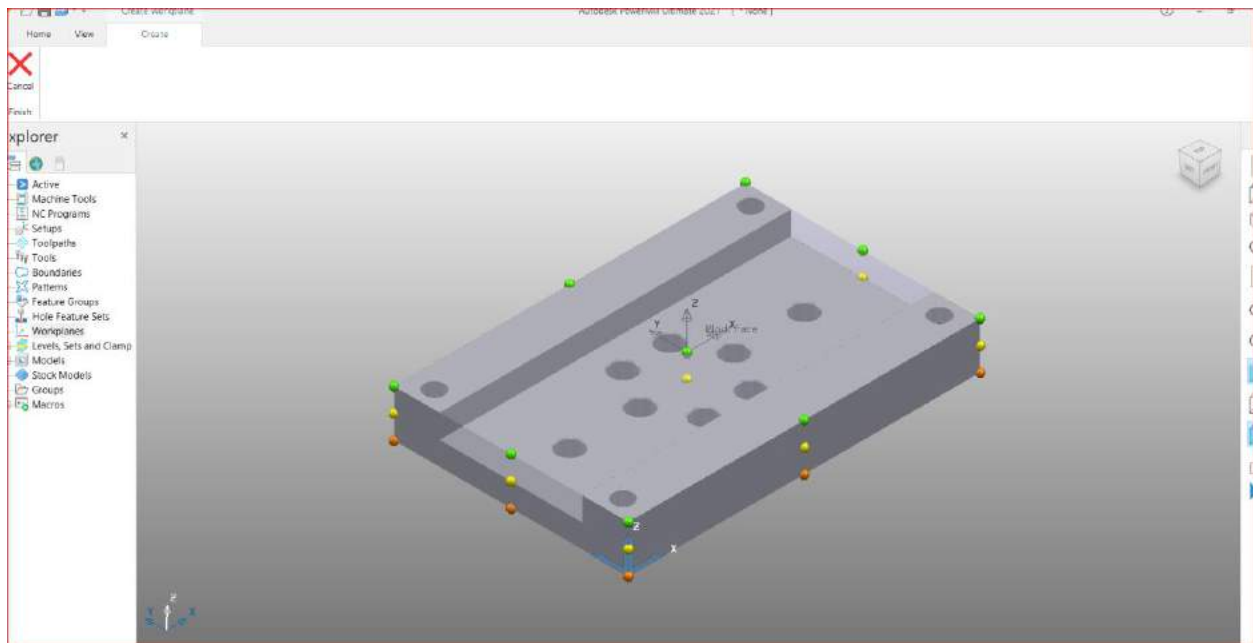
Select Calculate option. This will create a box with the longest dimensions of the model in x, y and z direction. Extra dimension of the box can also be given in all directions by entering value in Expansion box.



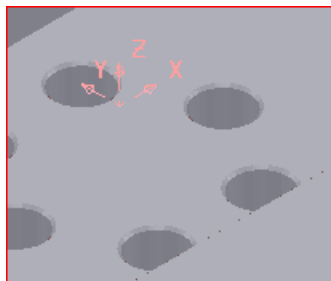
Step4: For machining workplane need to be created for this, Select Workplace – Create and Orientate Workplane – Workplace Positioned using Block.

A set of points will appear on the box. Each point can be used to create workplace. Select the appropriate point according to the properties of the model in such a way that the complete model should come in one direction of z axis.



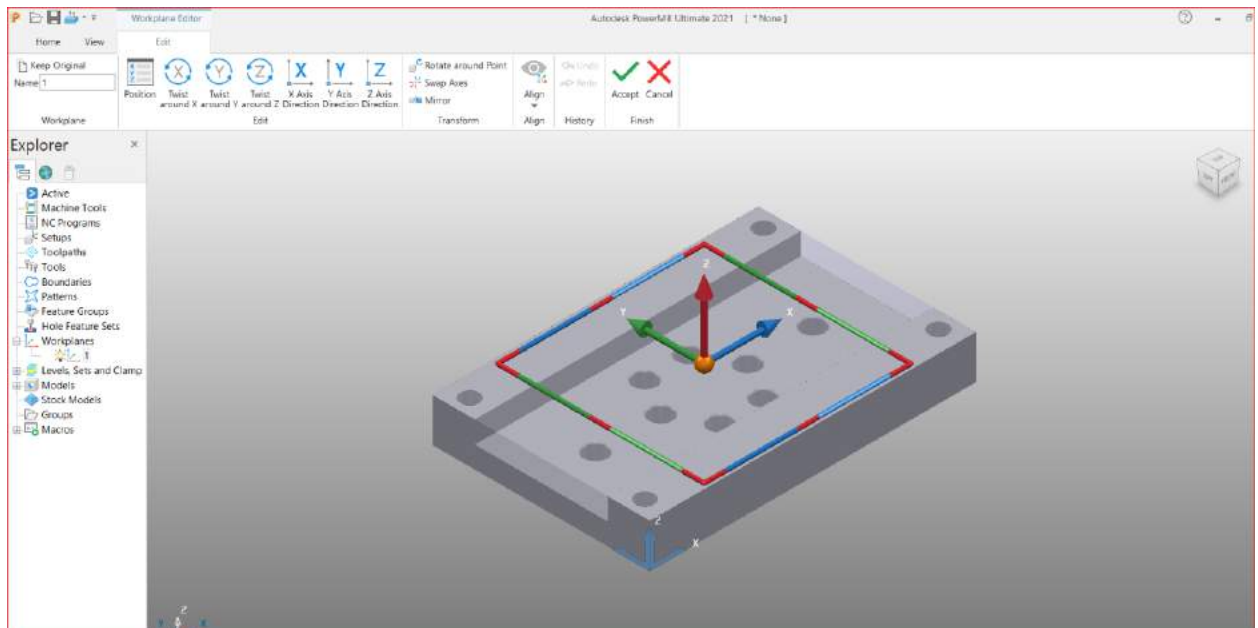
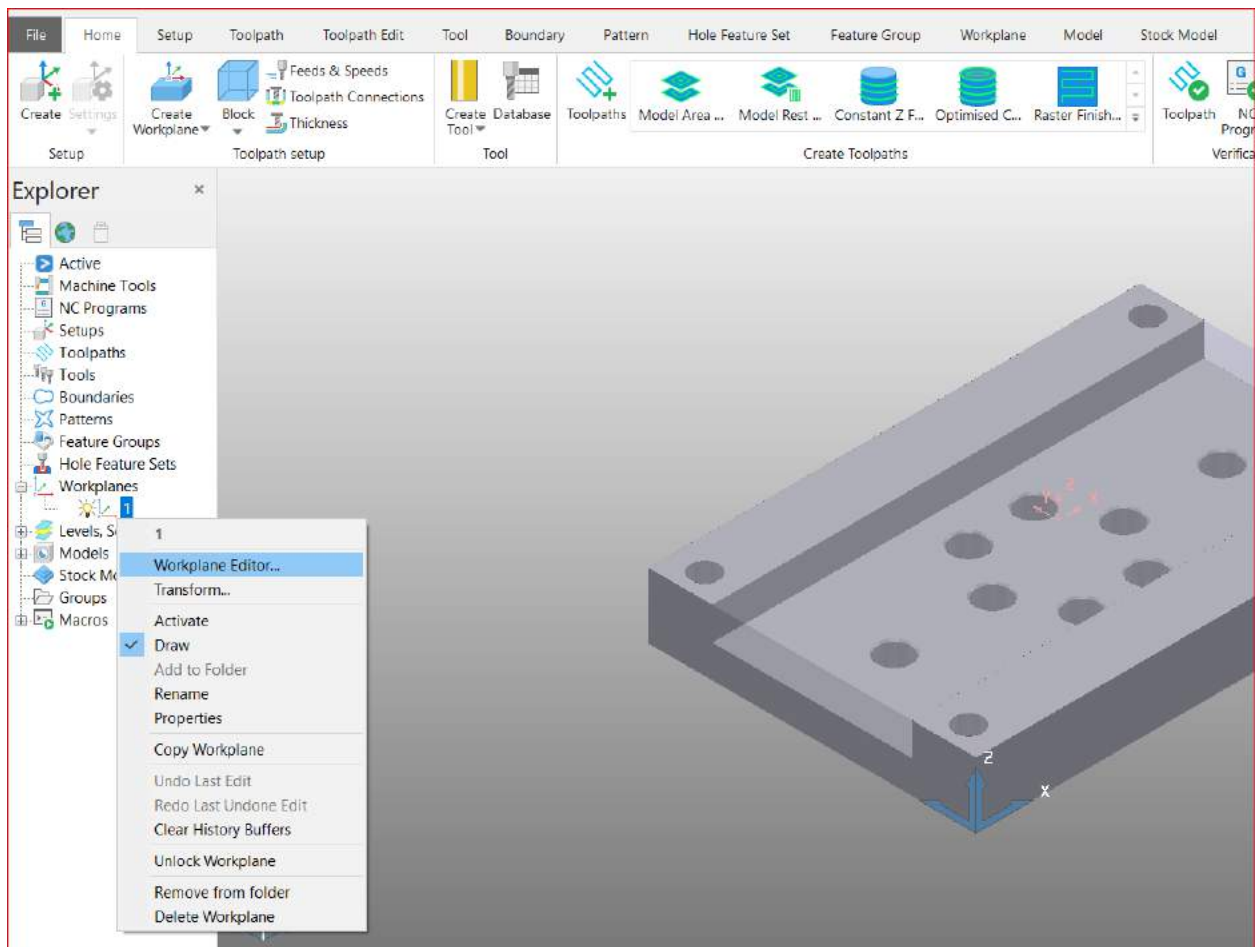


Workplace will be created on that point with the direction of the three coordinates x, y and z.

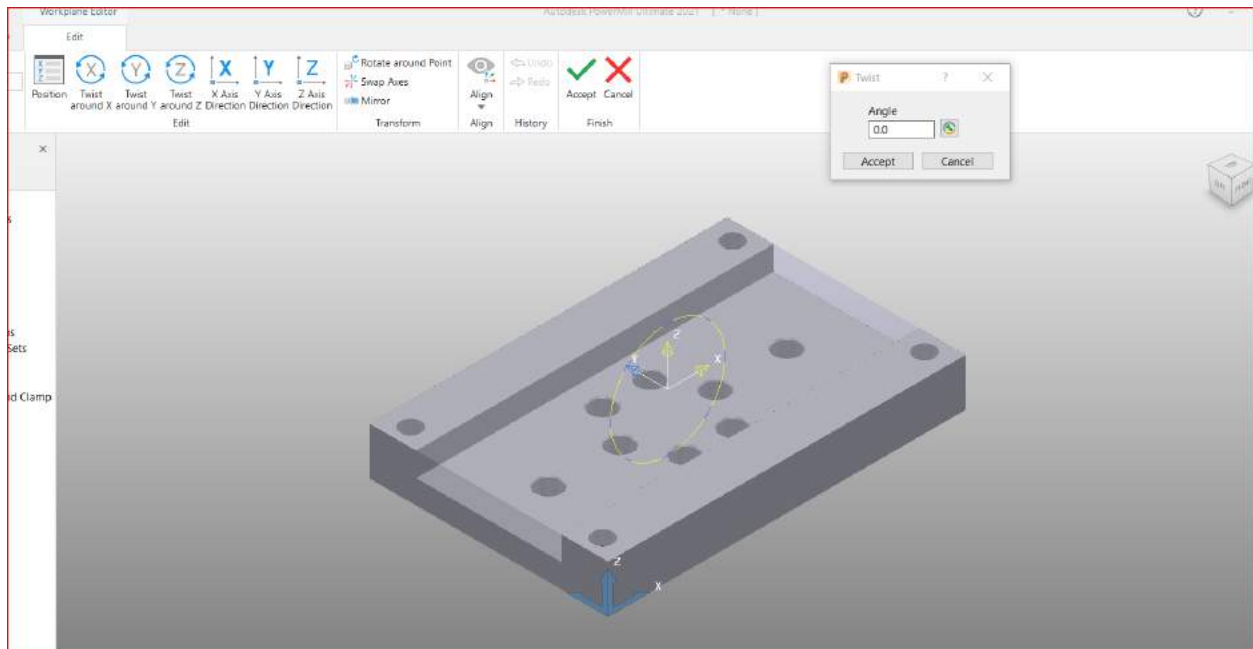


Step4: The orientation can be changed by clicking left mouse key on Workplace and then select Workplace Editor.

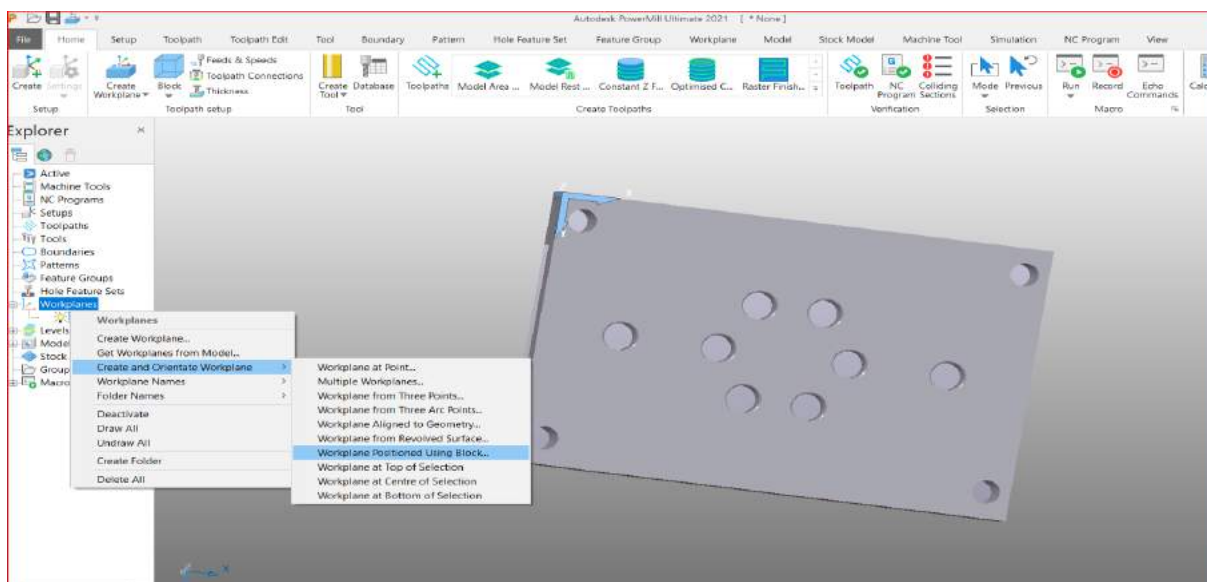
By selecting Twist around any direction, the orientation should be done such that the complete model should be in negative z axis. In this workplace no need of twisting is required as already complete model is in negative z- direction

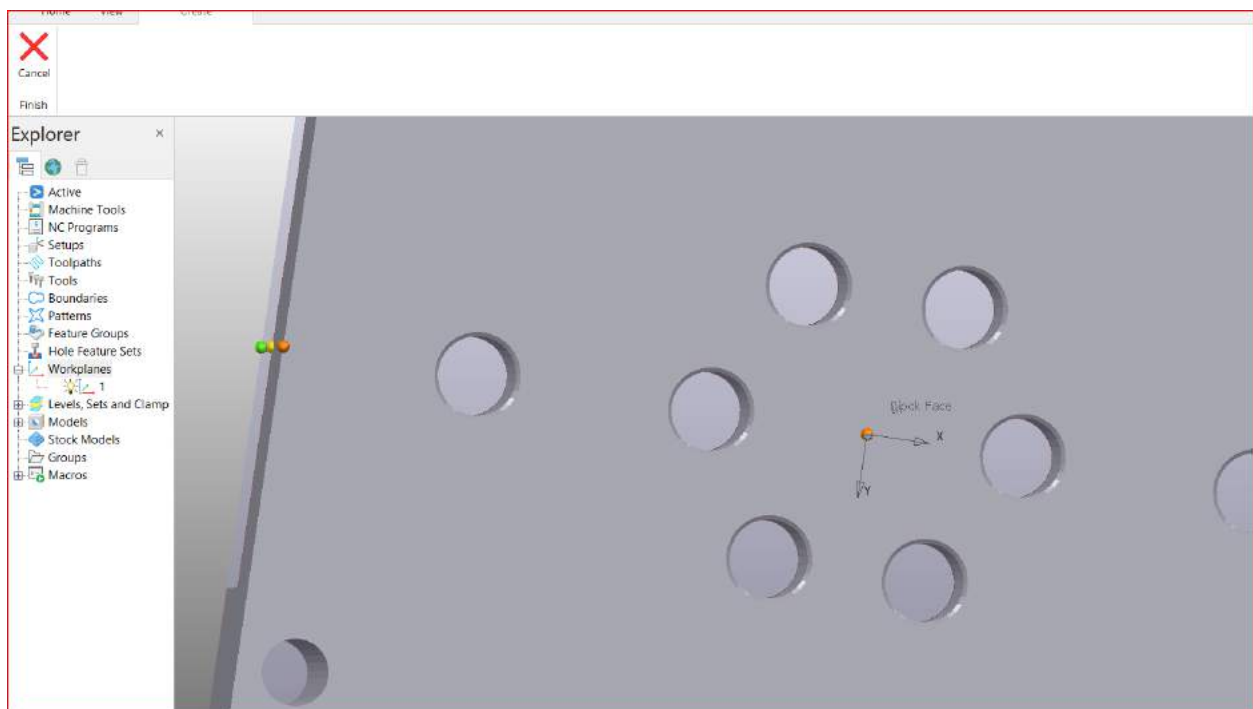
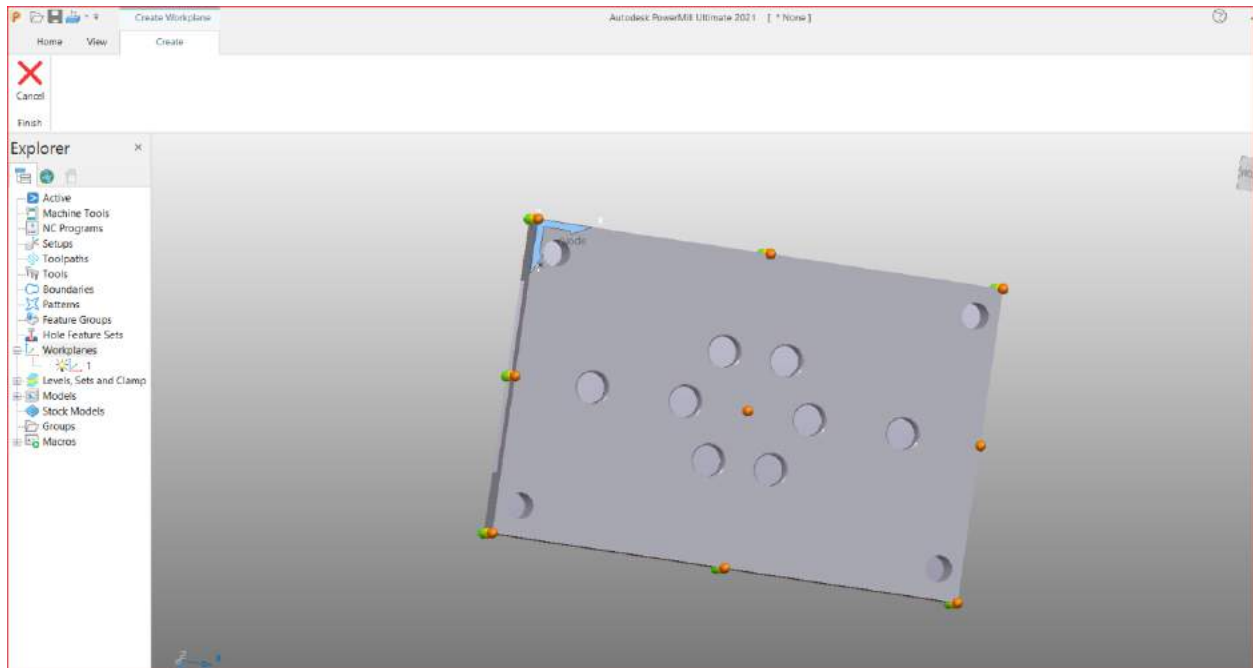


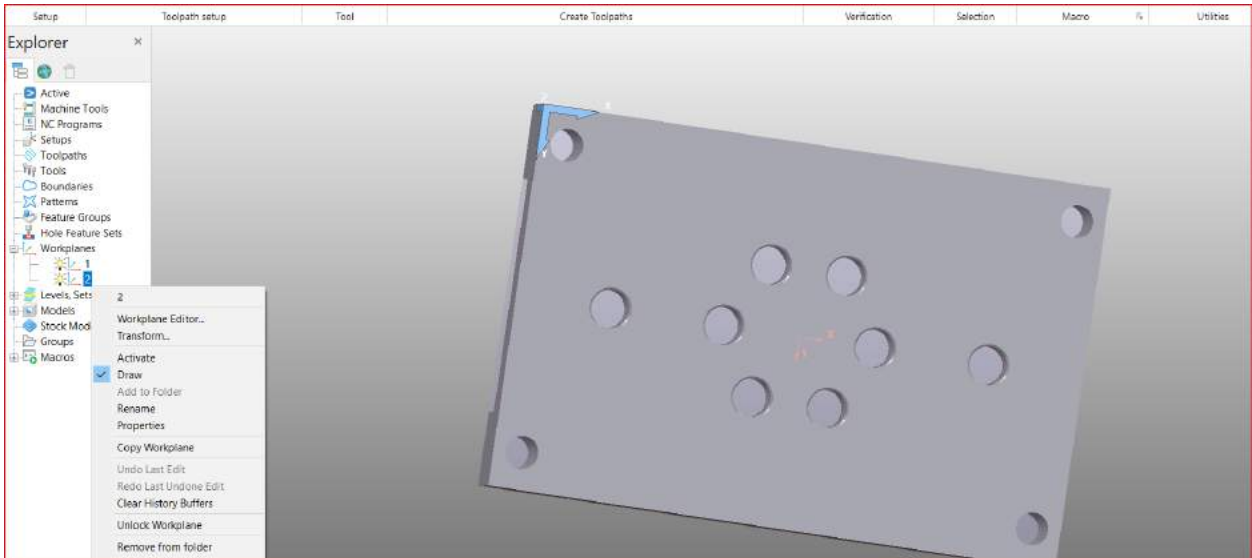
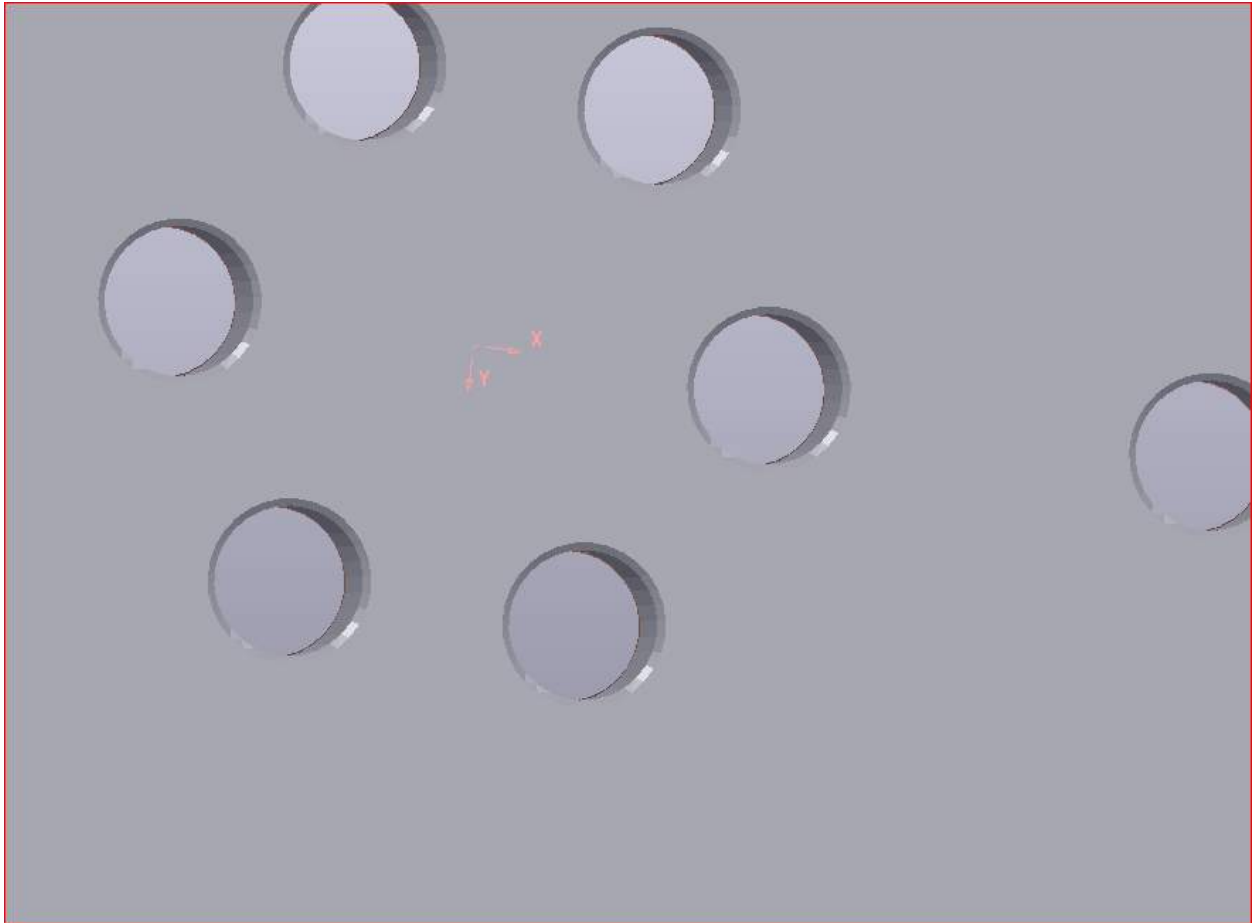
Now select Accept button.

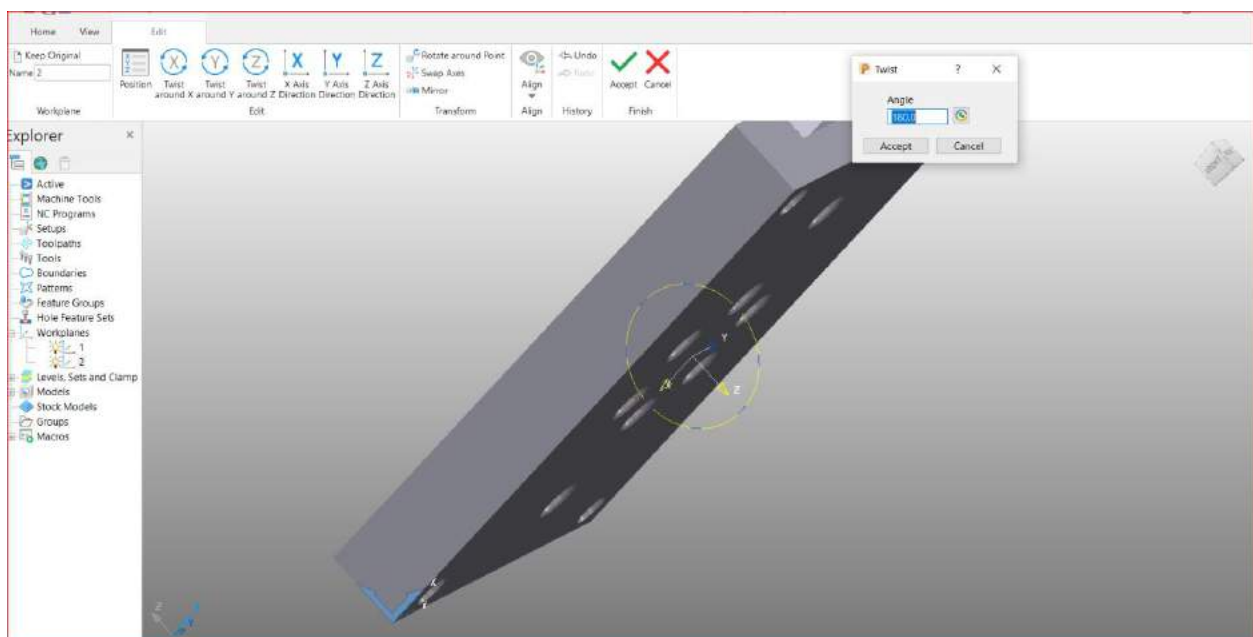
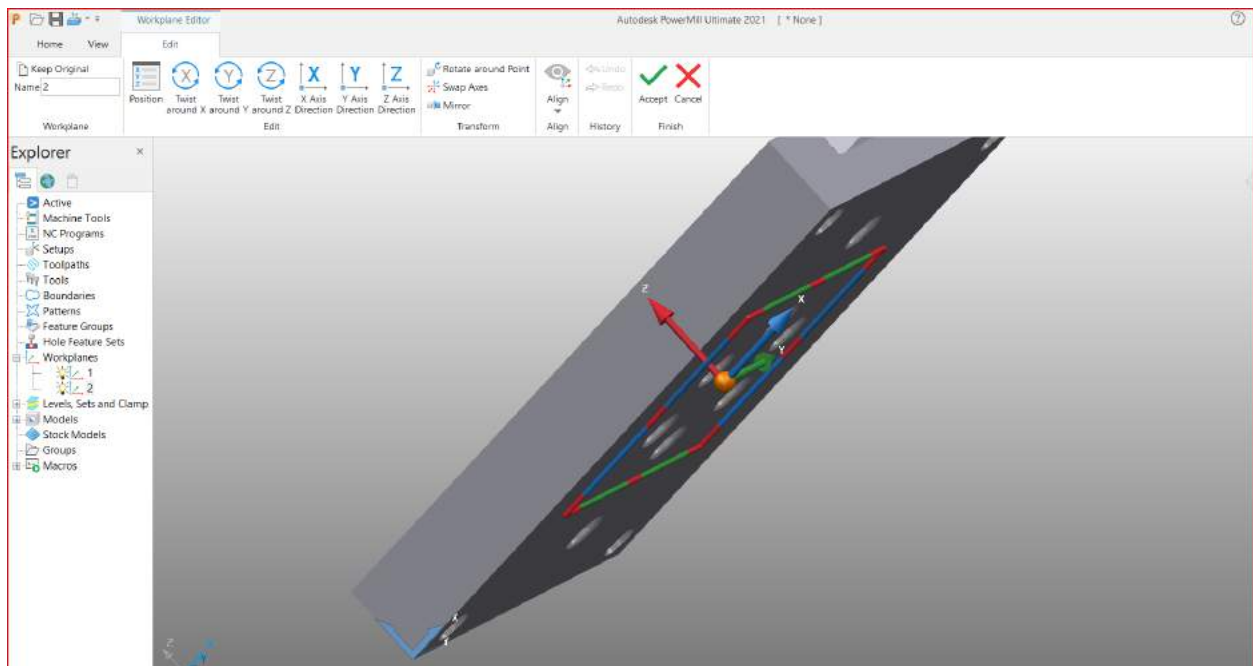


Step5: Rotate the complete model 180 degree as for machining, two workspaces should be created opposite to each other. Repeat Step3 to create workplace but this time after selecting an appropriate dot in this model the y-direction must be twisted at an angle of 180 degrees by following same procedure as done in Step4 so that model could be completely in negative z direction.

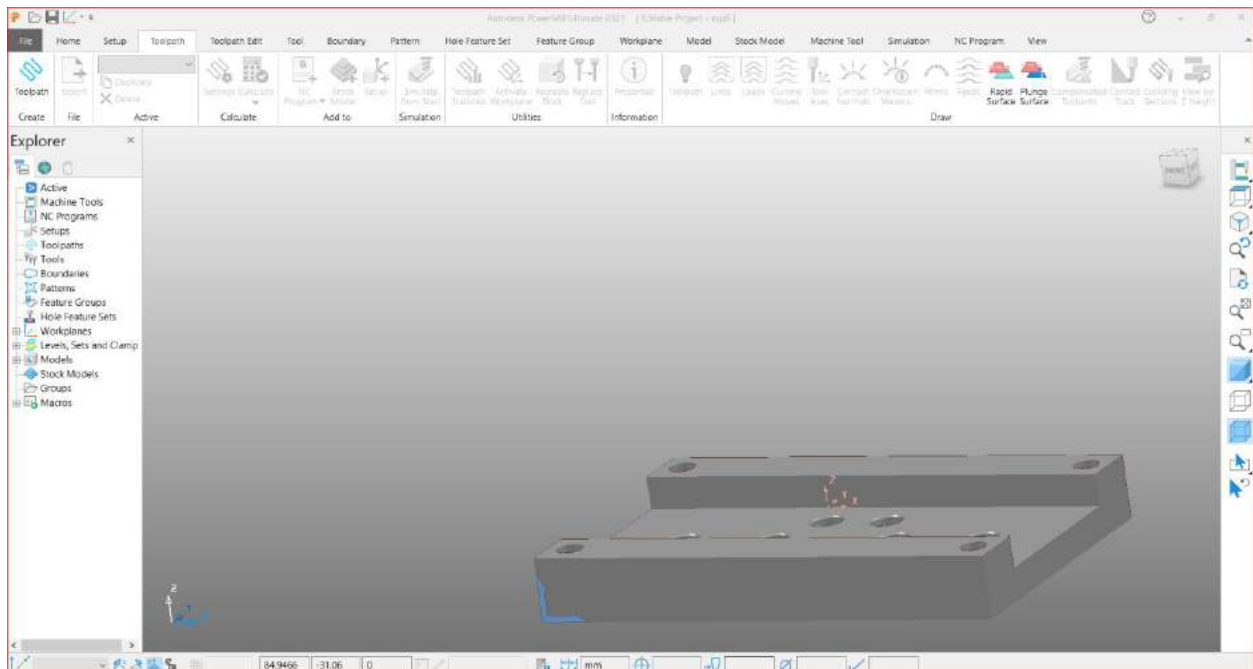
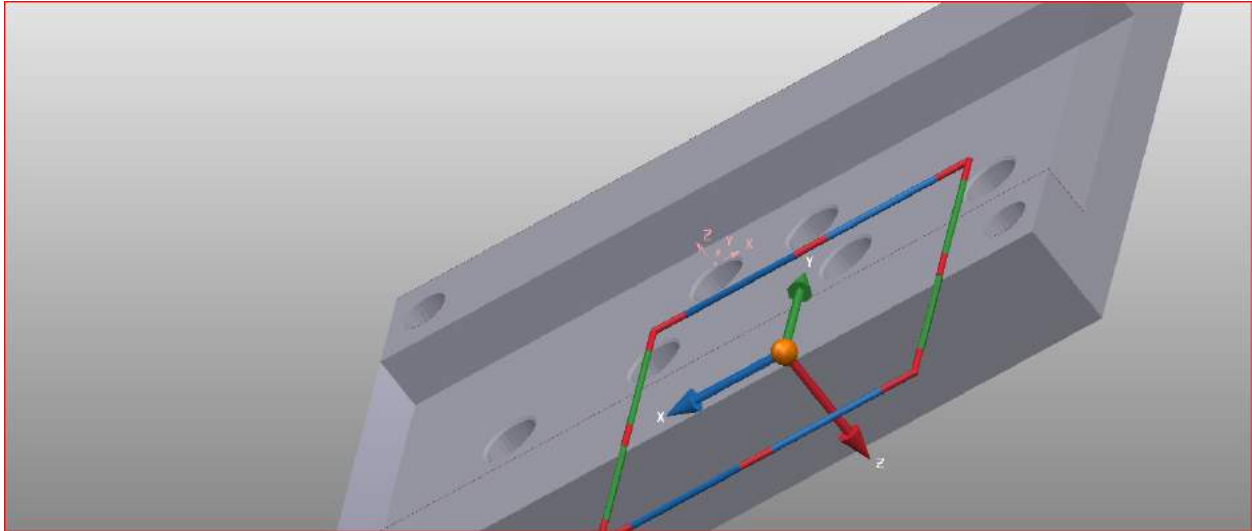




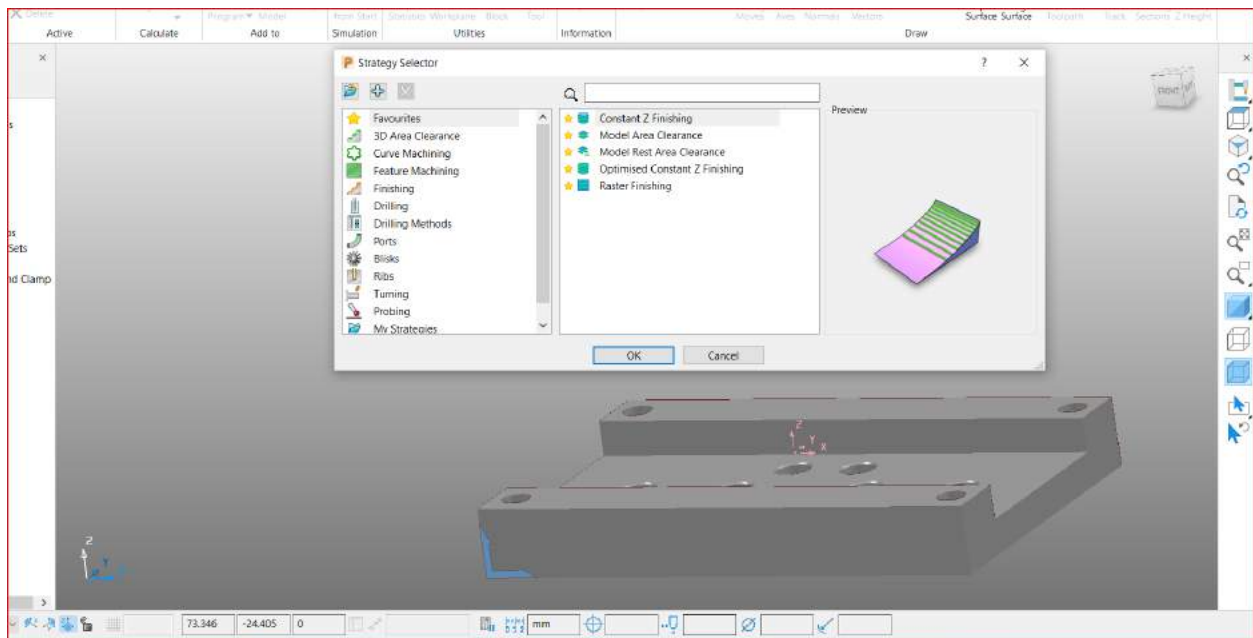




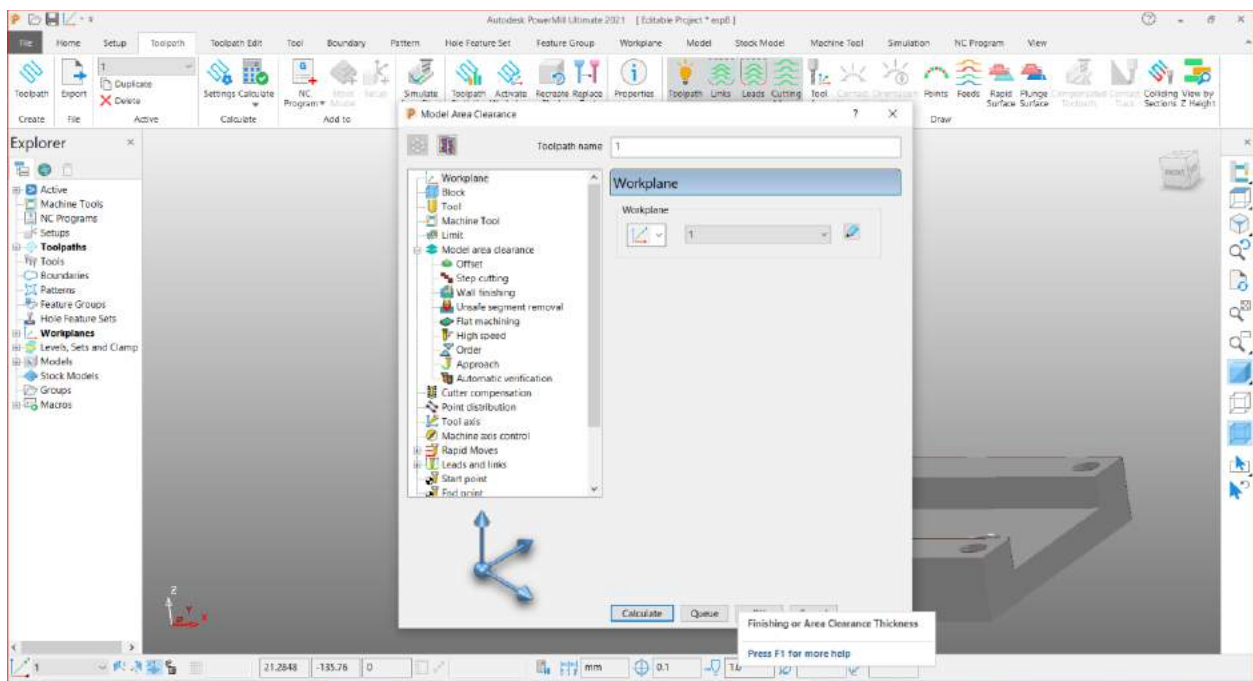
After twisting 180 degrees the complete model remains in negative z direction which was required for machining

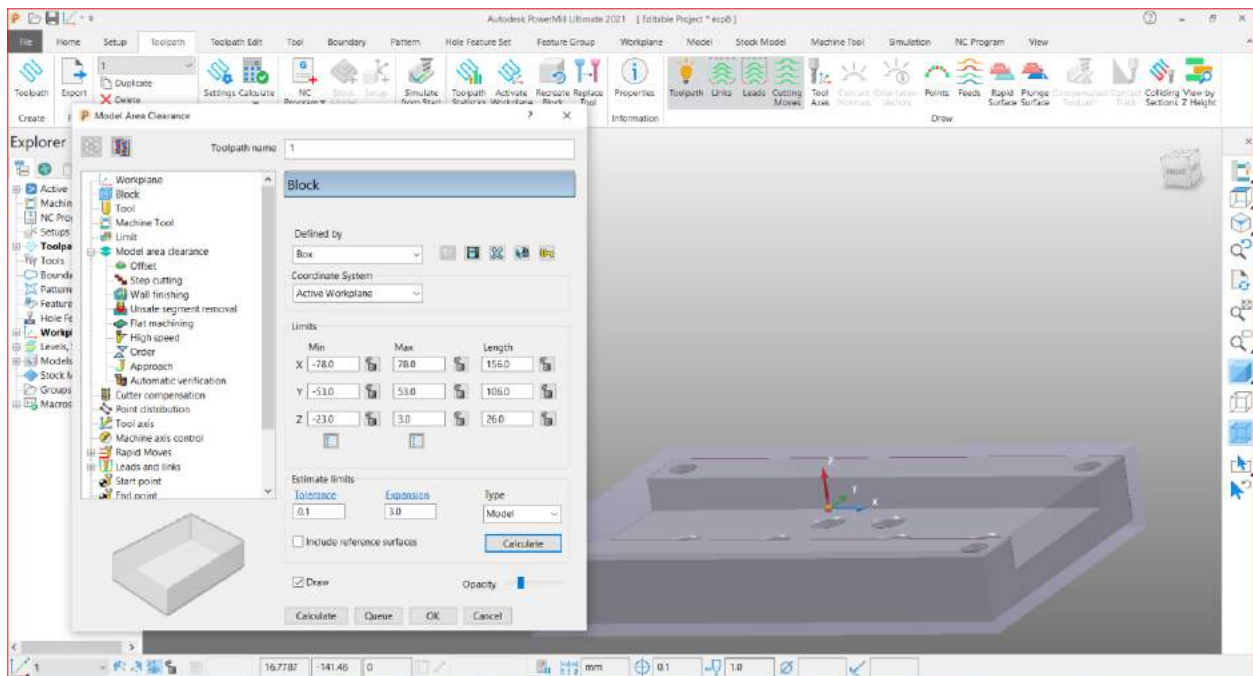


Step6: Select Toolpath option and then select Model Area Clearance under 3D Area Clearance.

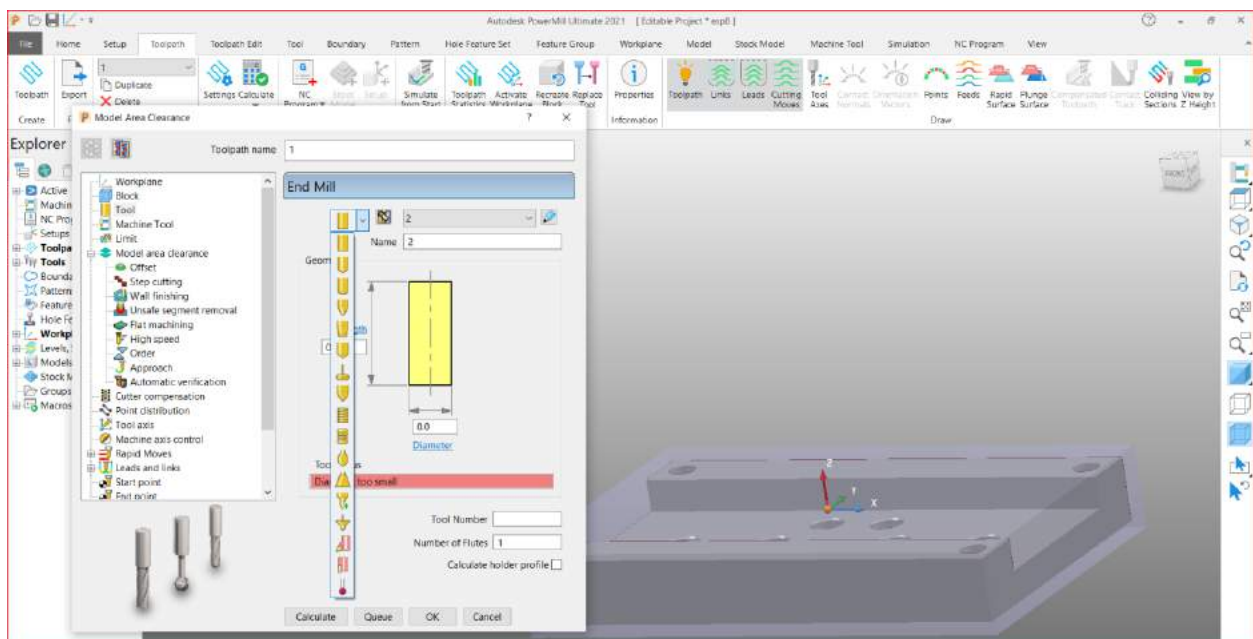


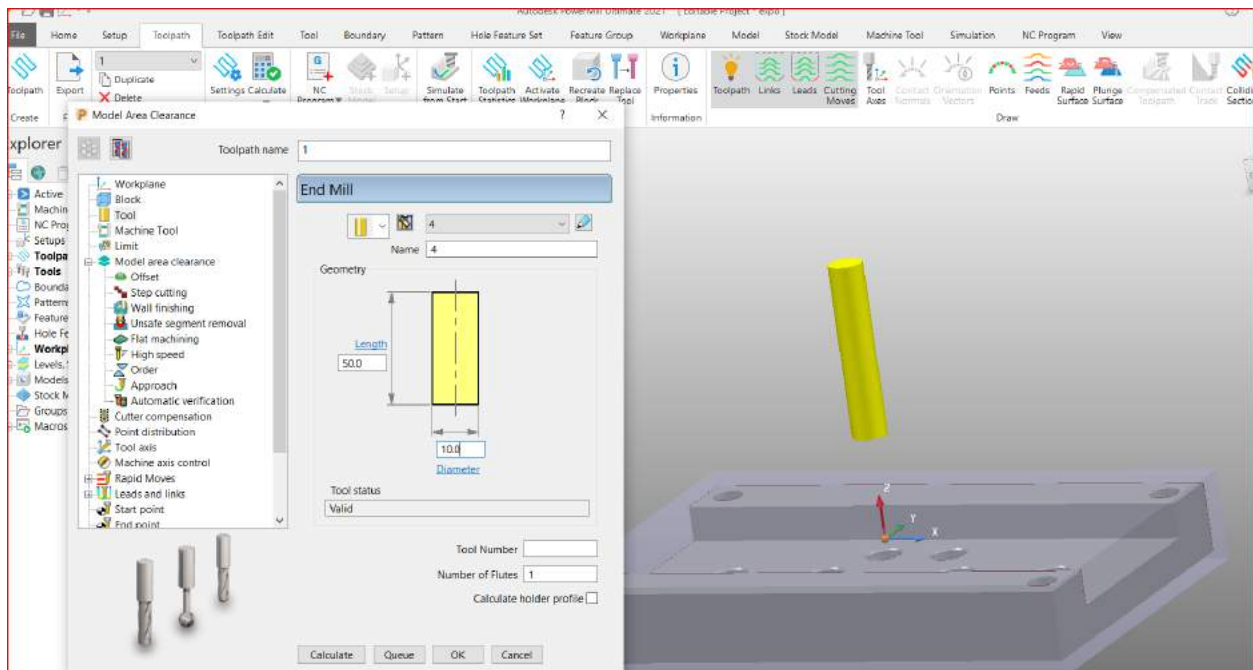
Select Workplace option and select workplane 1.



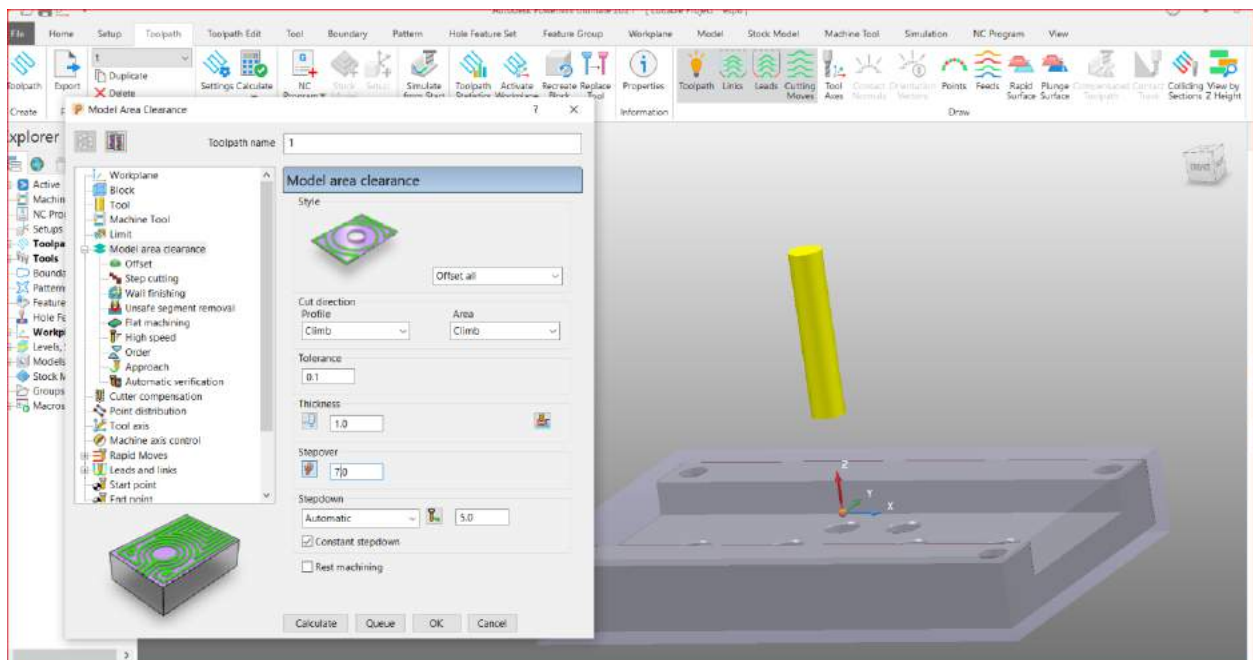


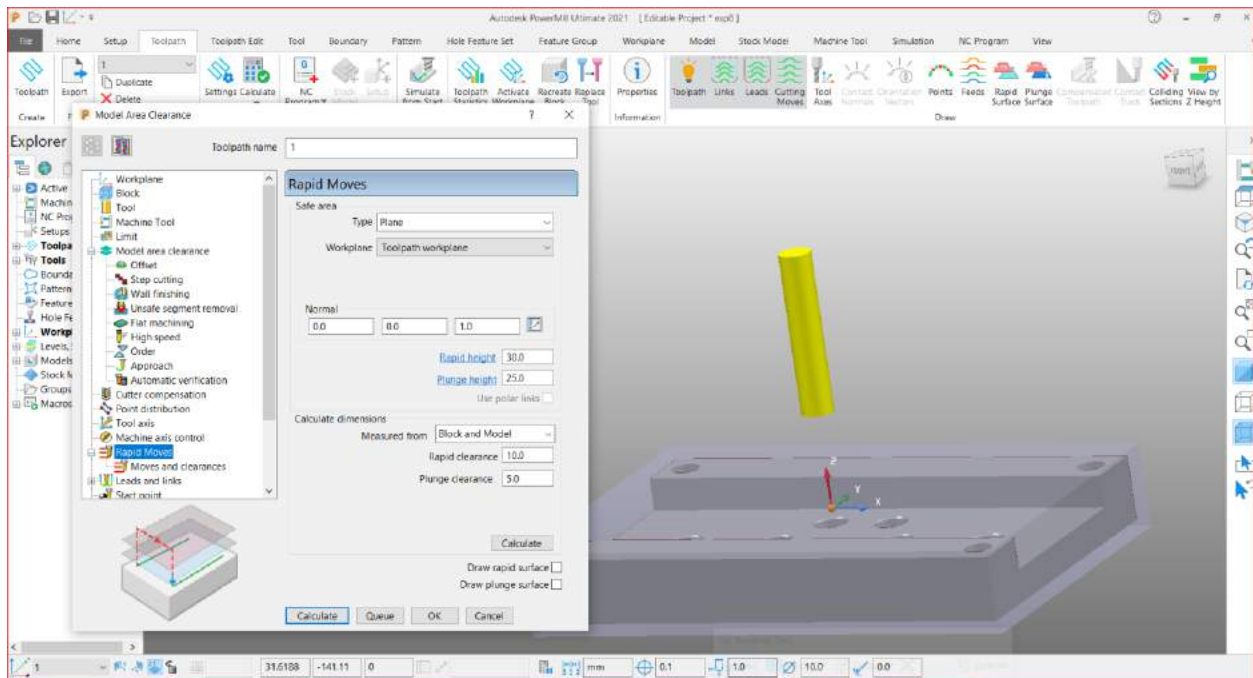
Select Tool option and select Create End Mill under it and enter 10 mm diameter the length will automatically be entered which is 50mm



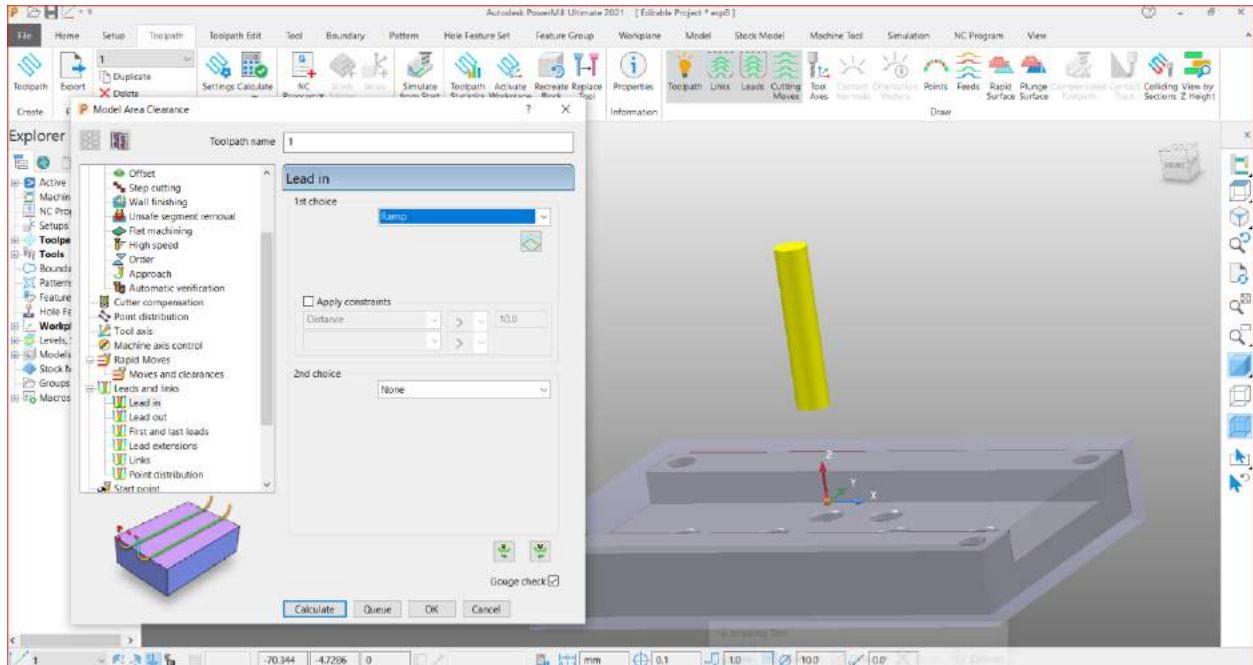


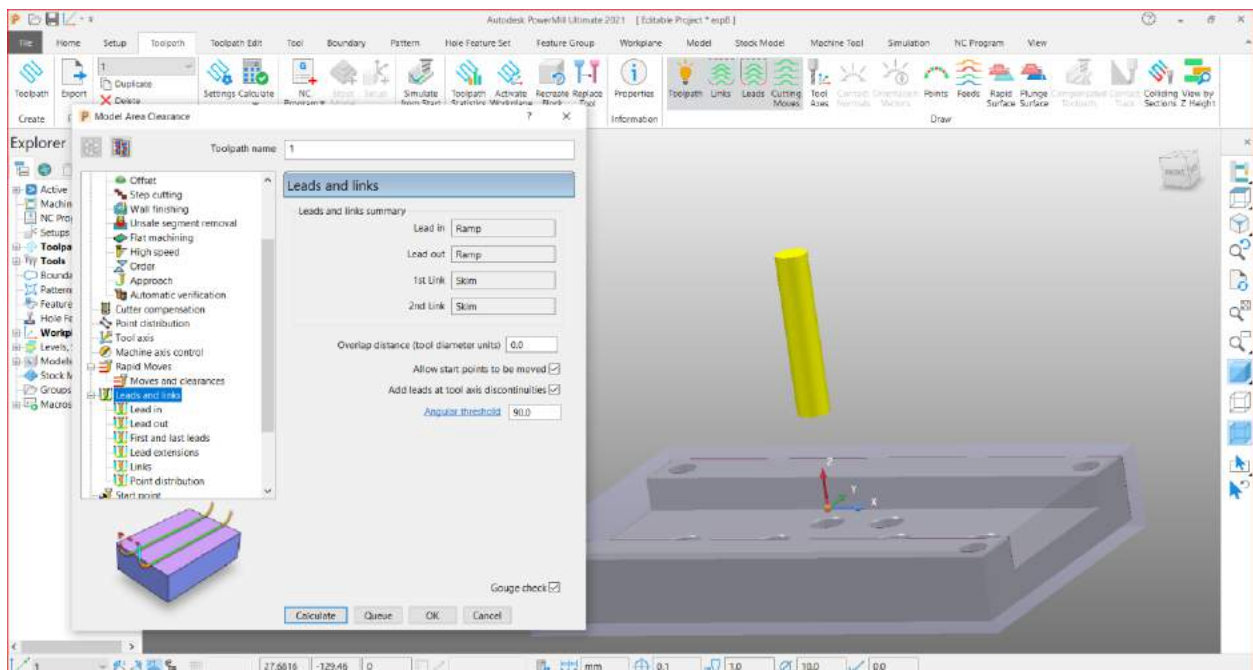
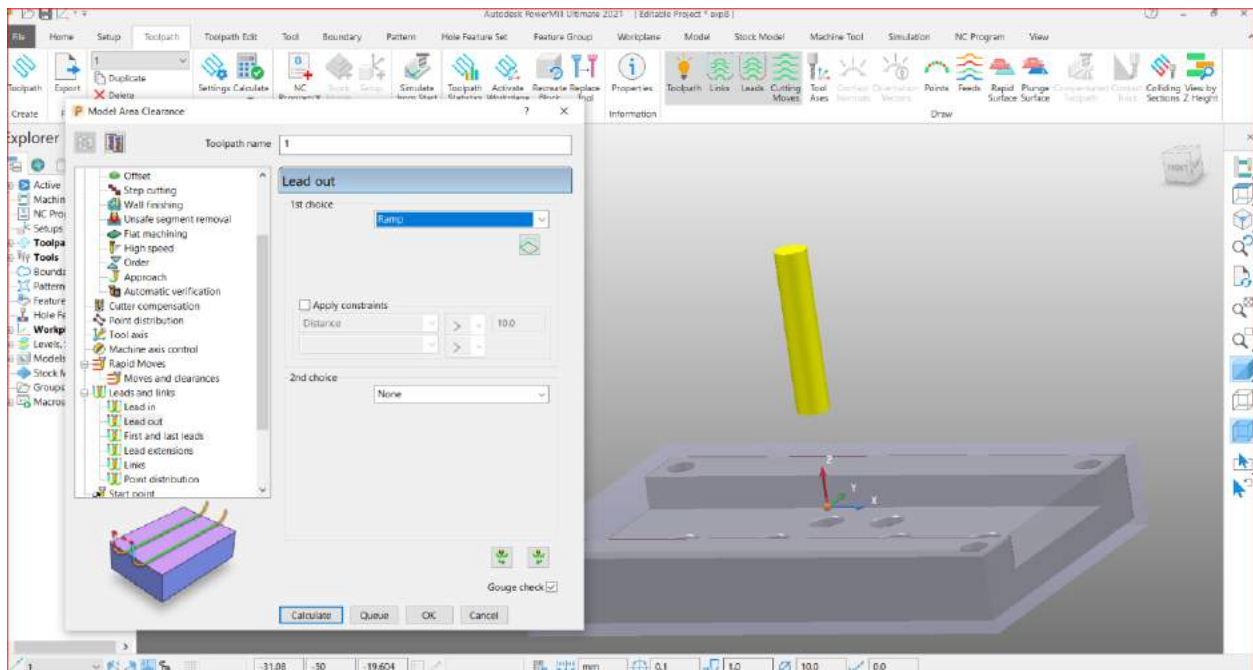
In stepover 70% of the diameter should be entered.



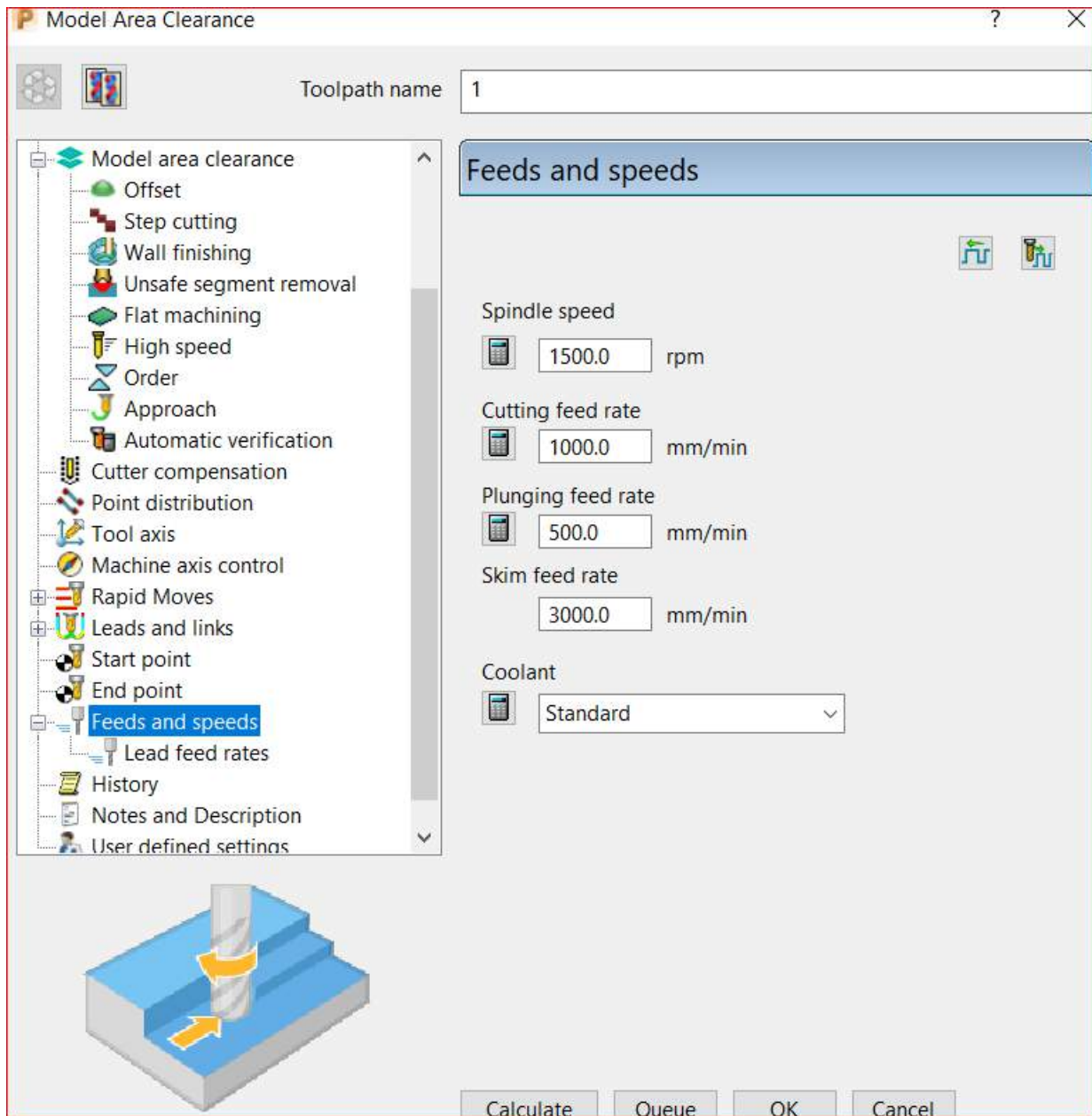


Select Ramp option under Lead in and Lead out under Leads and Links option





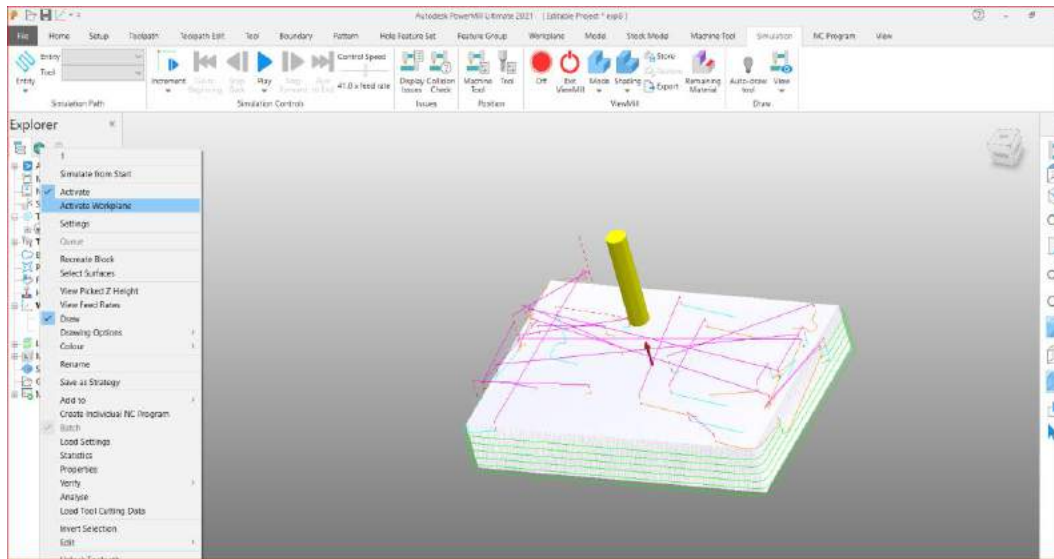
Under Feeds and speech the spindling speed can be changed depending upon the quality of the splinder.



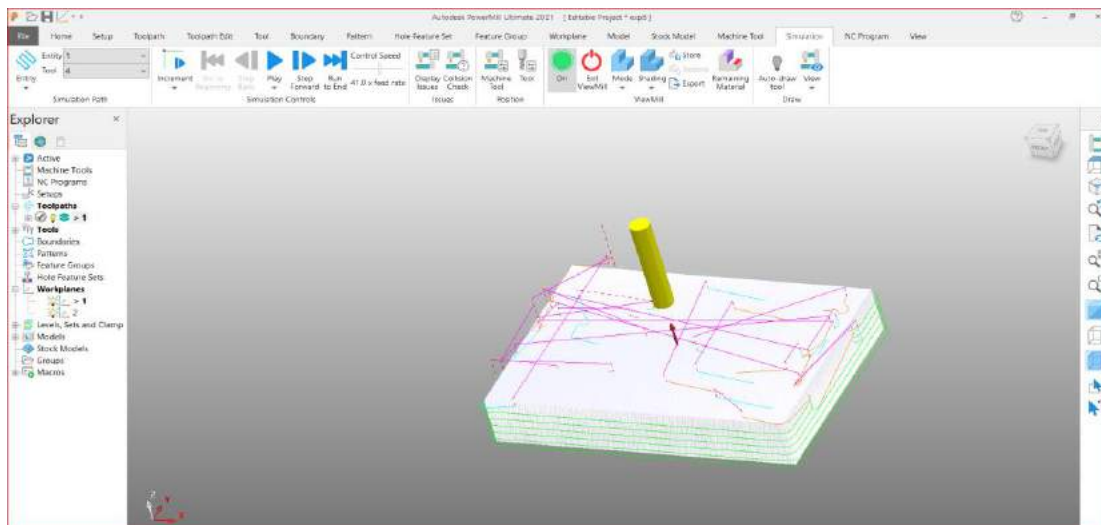
Press Calculate option followed by Close button.

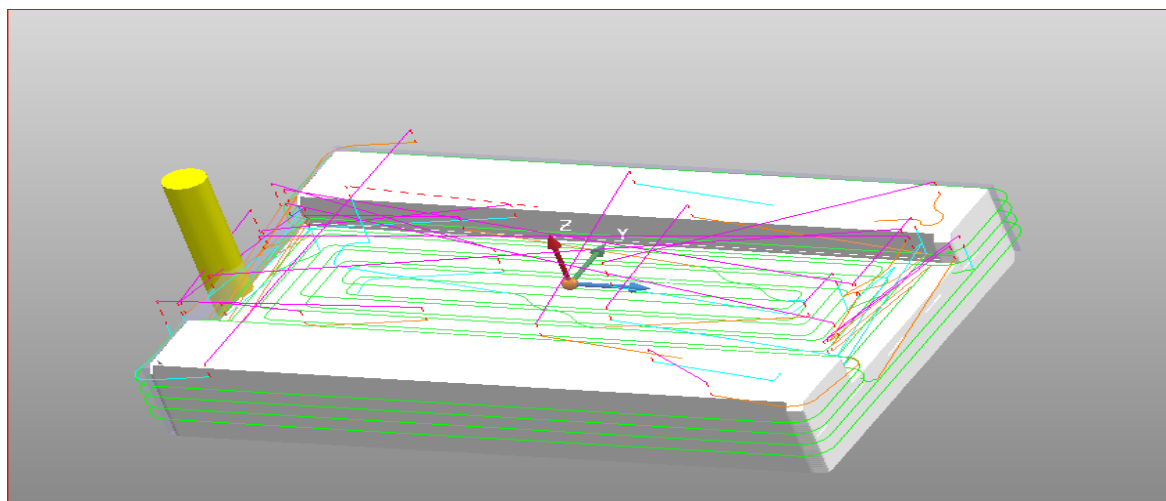
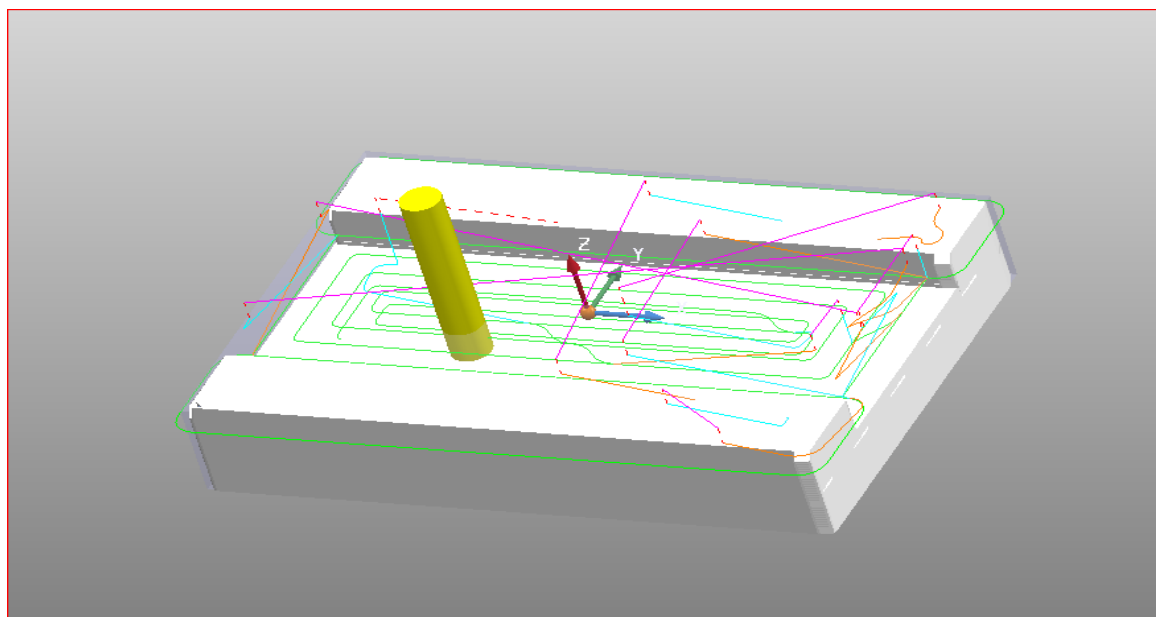
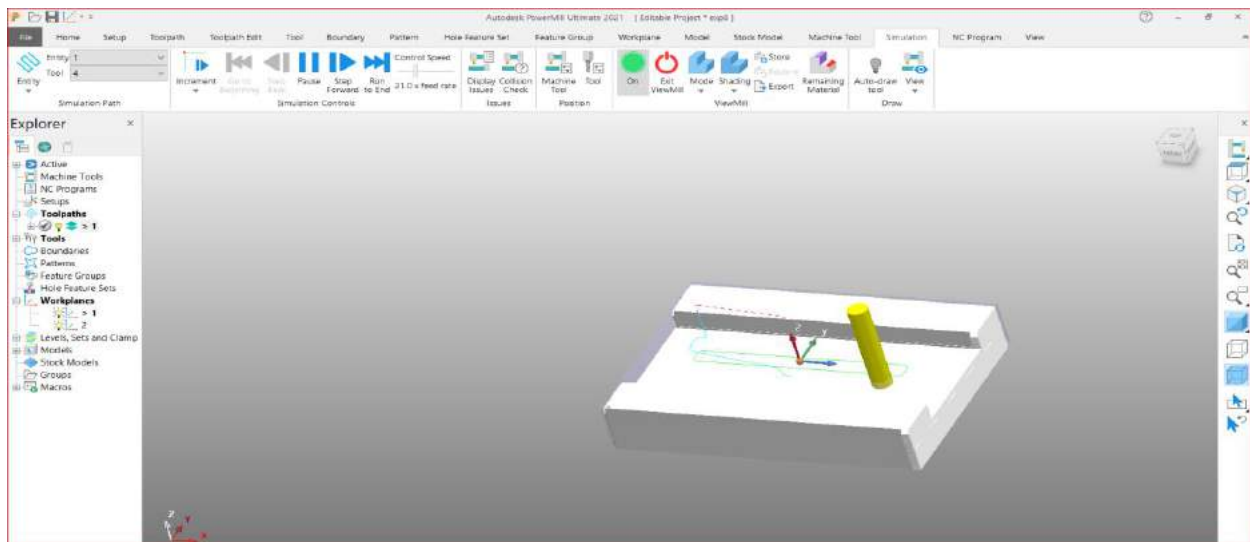
Select Simulation option and switch OFF button to ON button.

Right click the Toolpath and select Stimulate from Start option.

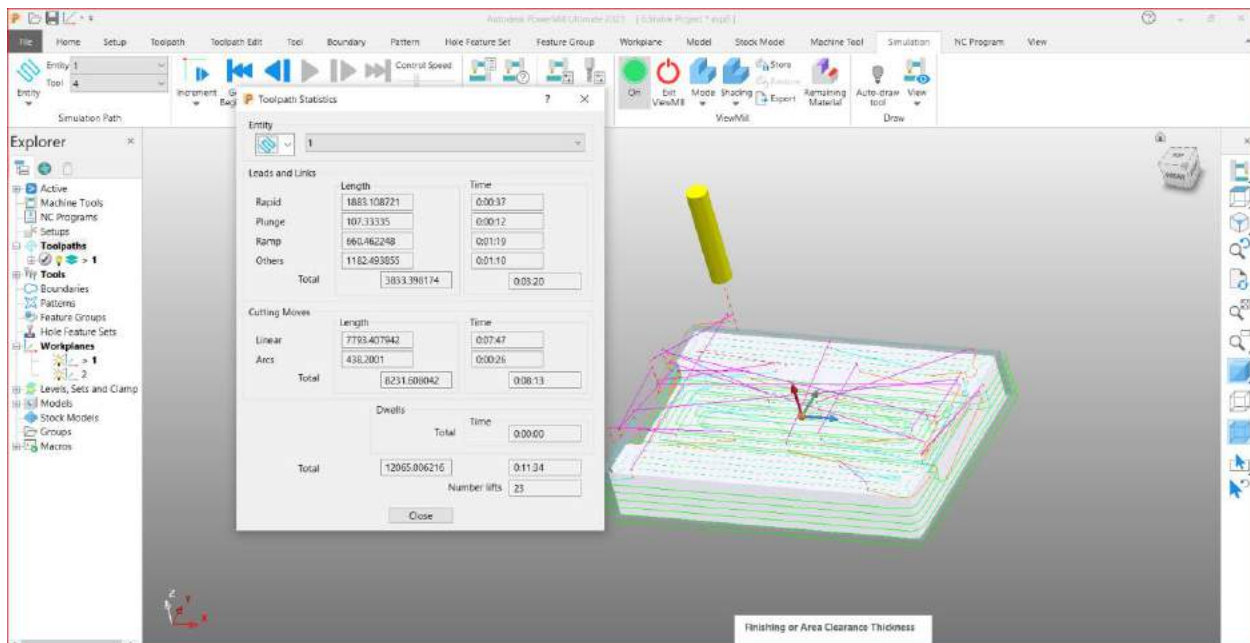
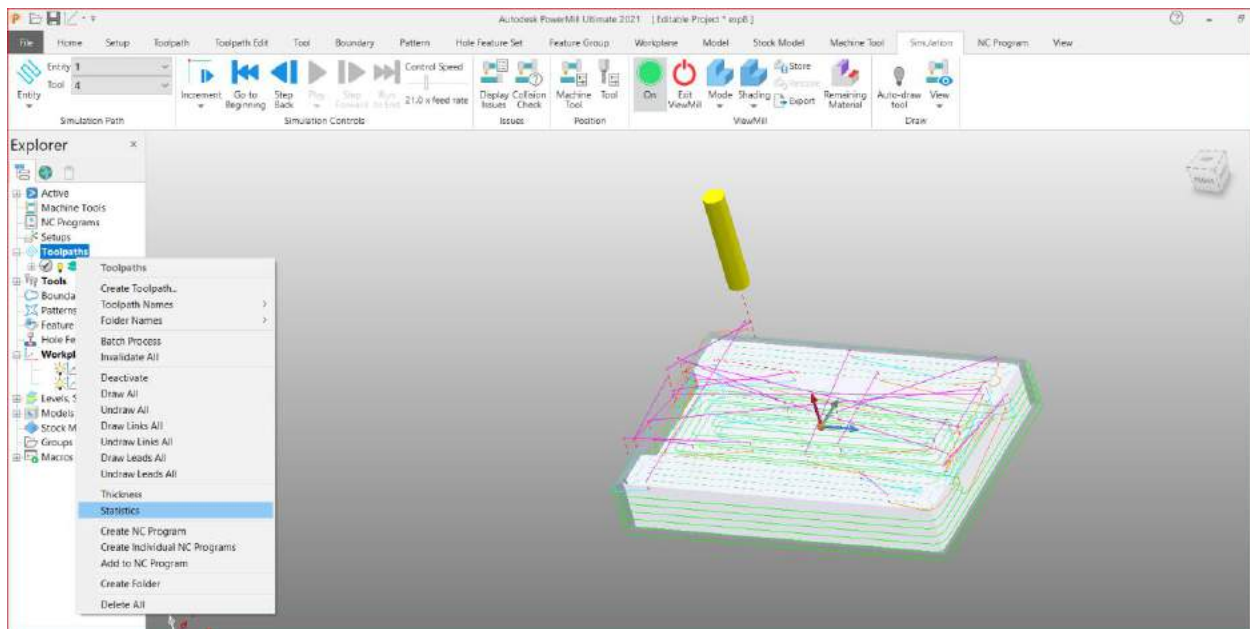


Simulation will start. Here are some snaps in between the simulation.






Step7: Click left mouse button on Toolpath option and then select Statistics. A pop-up box will appear showing all the statistics of the Toolpath.



Toolpath Statistics

Entity:  1

Leads and Links	
	Length
Rapid	1883.108721
Plunge	107.33335
Ramp	660.462248
Others	1182.493855
Total	3833.398174

Time	
	0:00:37
	0:00:12
	0:01:19
	0:01:10
Total	0:03:20

Cutting Moves	
	Length
Linear	7793.407942
Arcs	438.2001
Total	8231.608042

Time	
	0:07:47
	0:00:26
Total	0:08:13

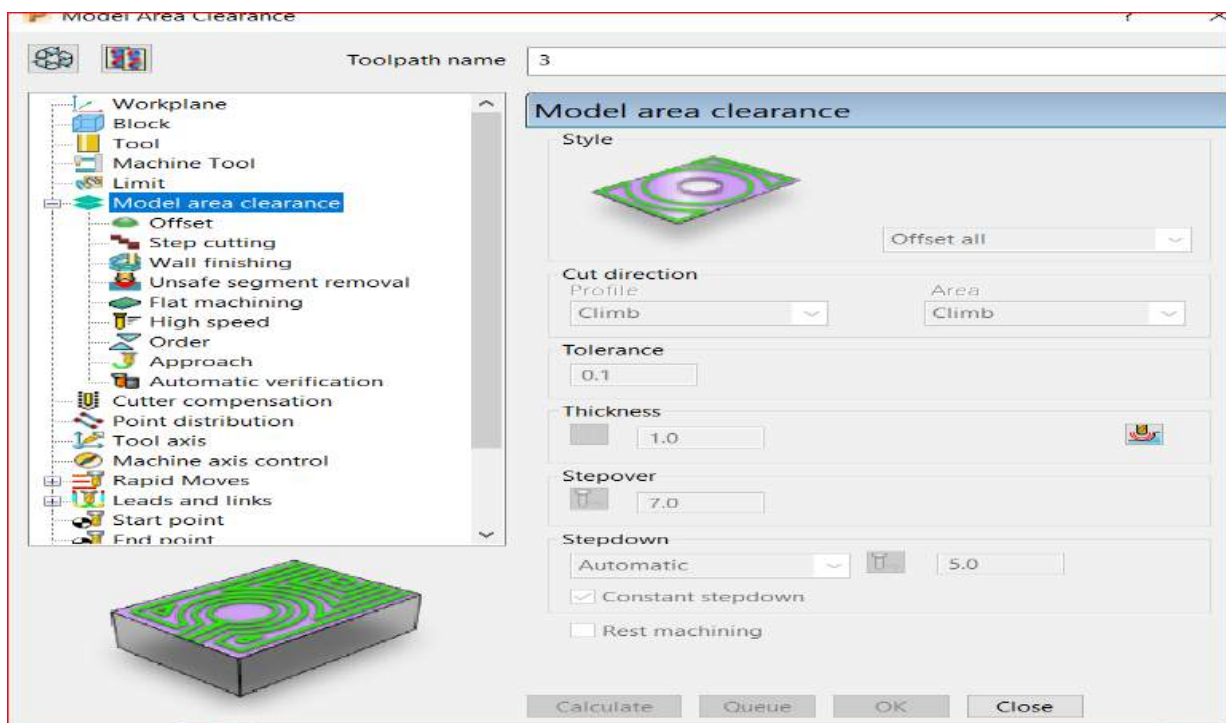
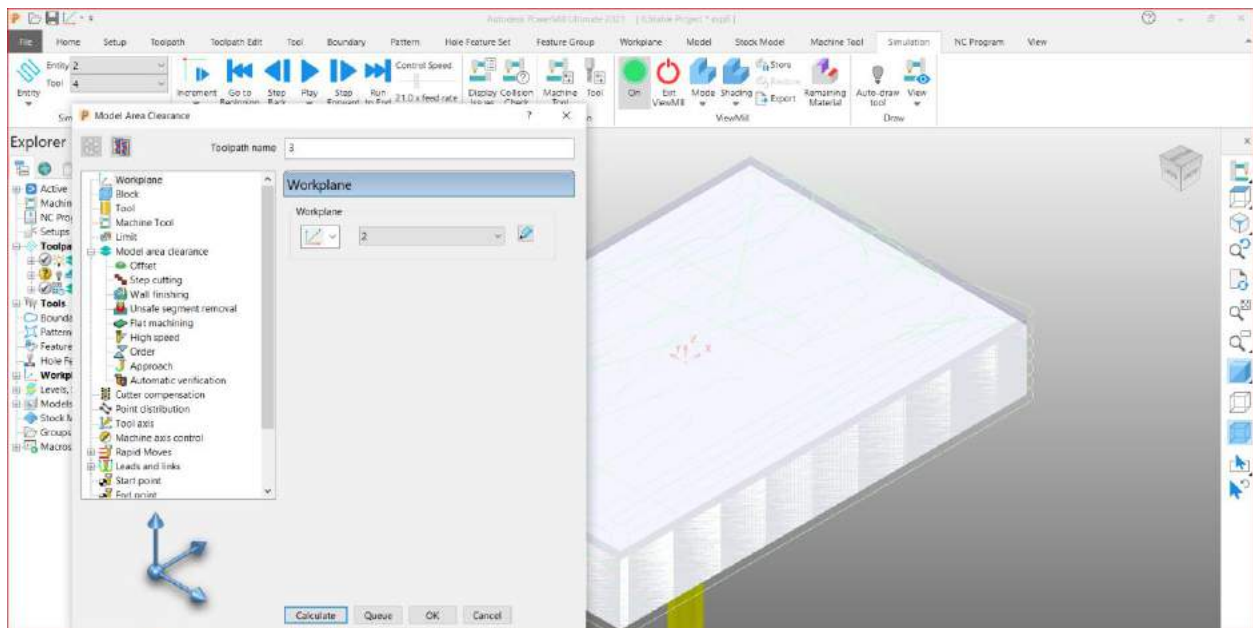
Dwells	
	Time
Total	0:00:00

Total	12065.006216	0:11:34
	Number lifts	23

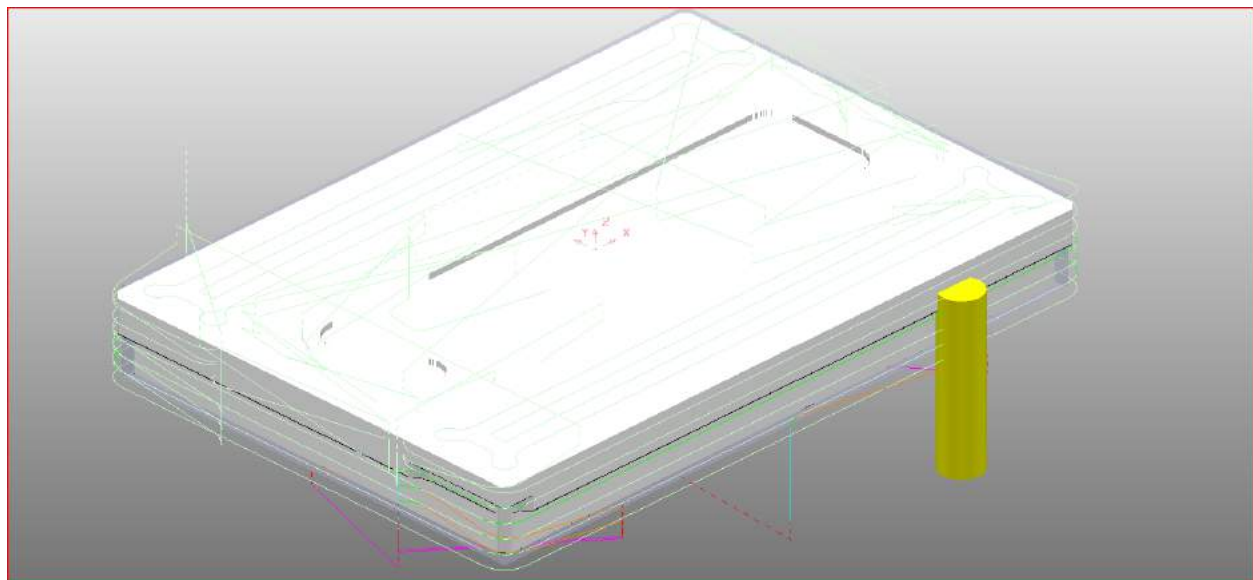
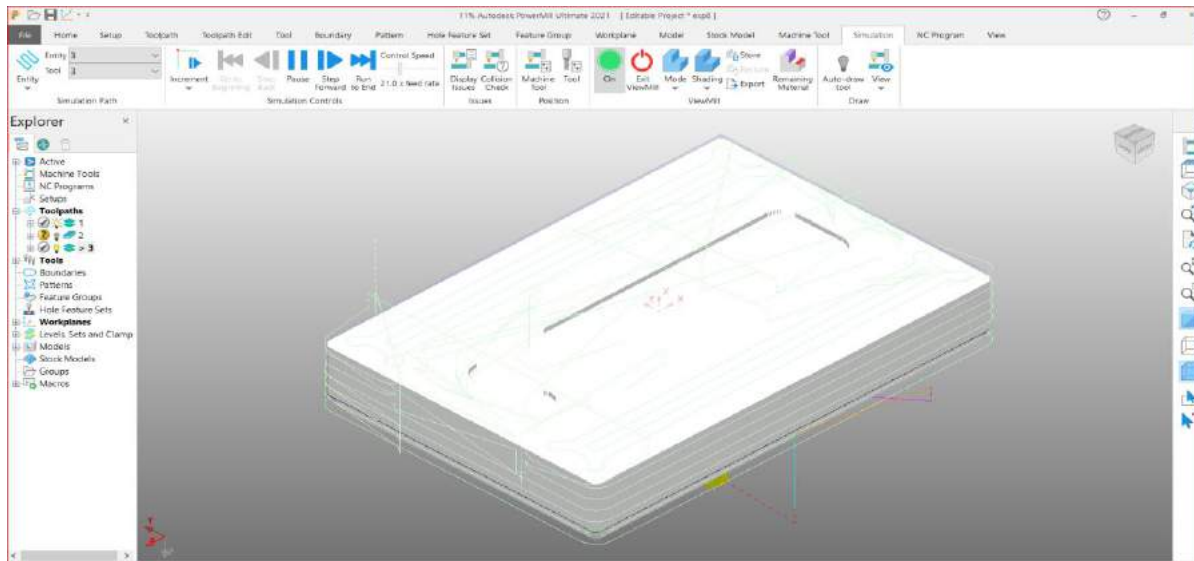
Close

So total time taken for machining by Model Area Clearance in workspace1 is 11 minutes 34 seconds

Step8: Create a new Toolpath with Model Area Clearance only and follow the same procedure but this time with workplane2.




Step9: Select calculate followed by the close option and follow Step7. Simulation will start. Here is a snap in between the simulation.



Click left mouse button on Toolpath option and then select Statistics. A pop-up box will appear showing all the statistics of the Toolpath.

Toolpath Statistics

Entity:  3

Leads and Links		Length	Time
Rapid		525.163091	0:00:10
Plunge		73.0	0:00:08
Ramp		40.318922	0:00:04
Others		365.308426	0:00:21
Total		1003.790439	0:00:46

Cutting Moves		Length	Time
Linear		5417.071704	0:05:25
Arcs		262.446481	0:00:15
Total		5679.518186	0:05:40

Dwells		Time
Total		0:00:00

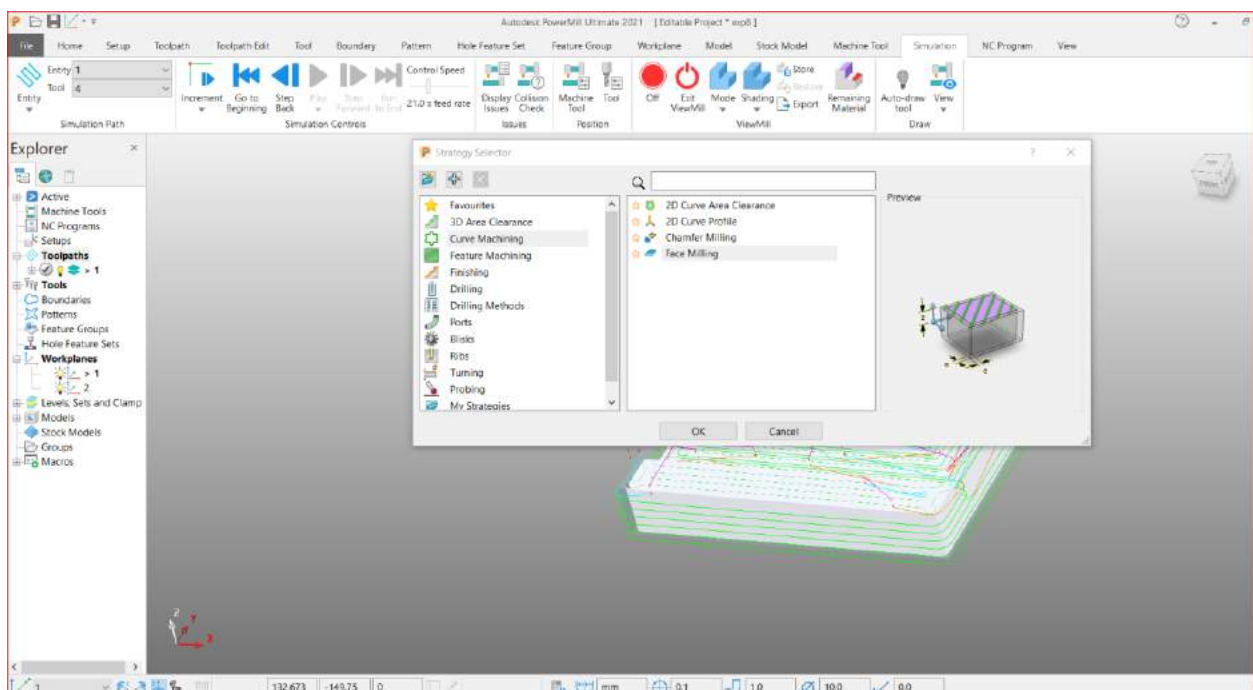
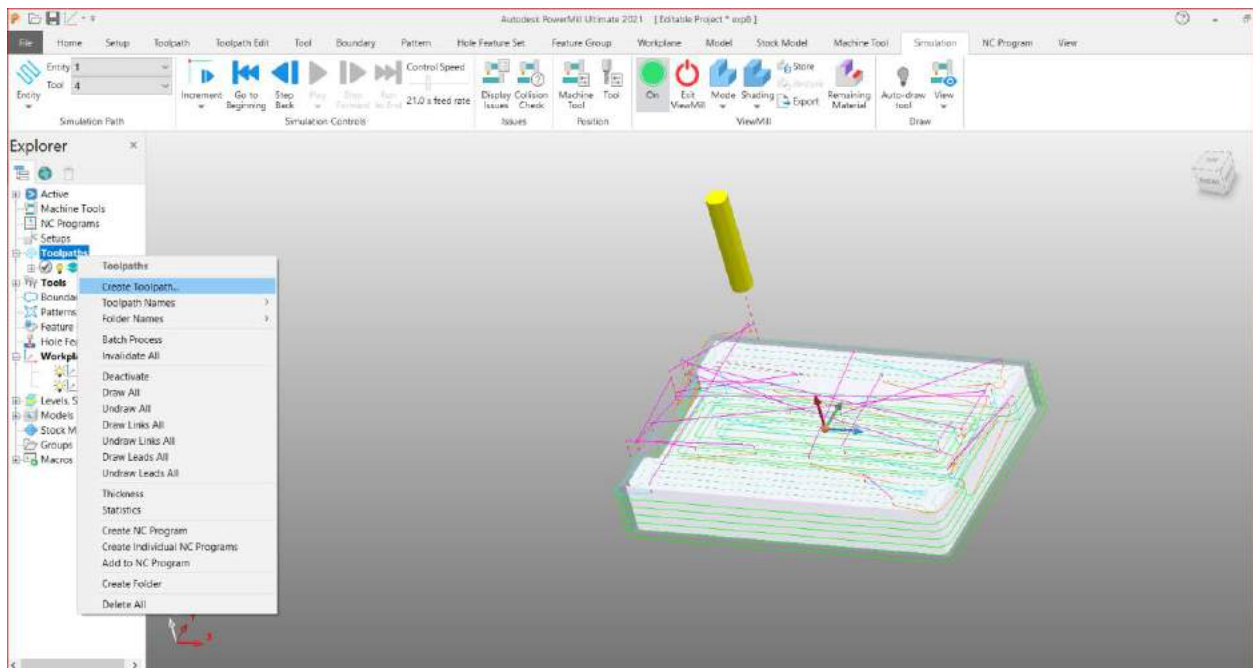
Total	6683.308625	0:06:26
	Number lifts	7

Close

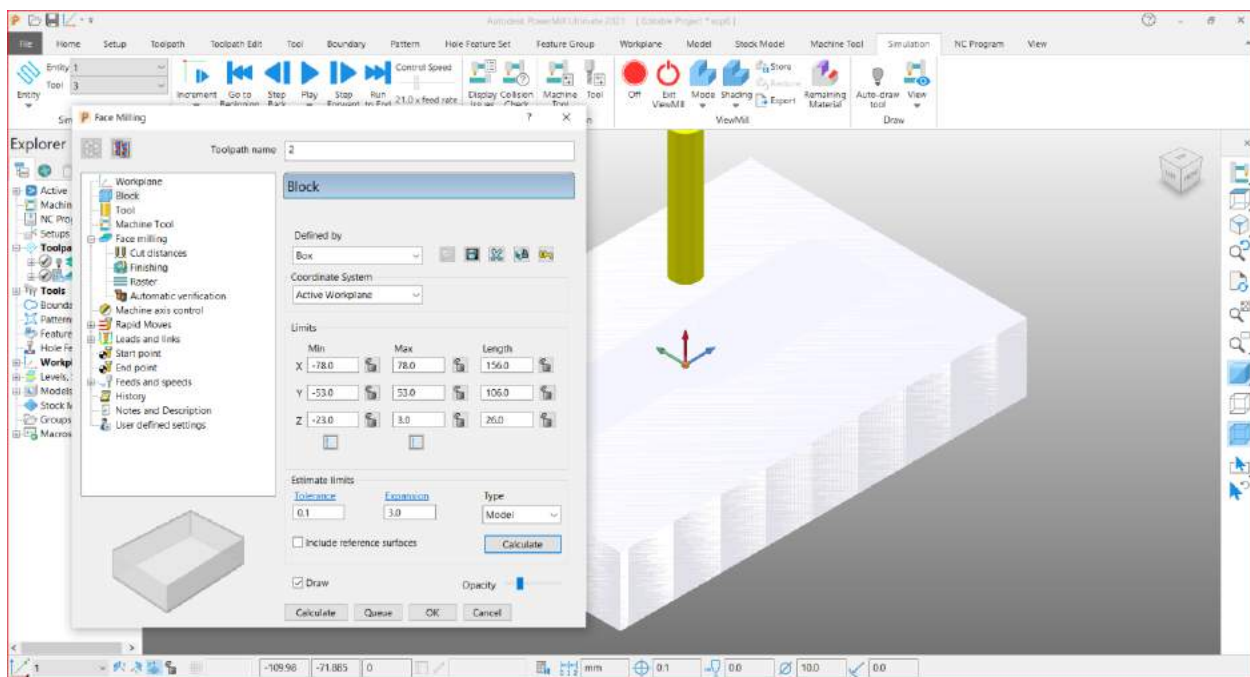
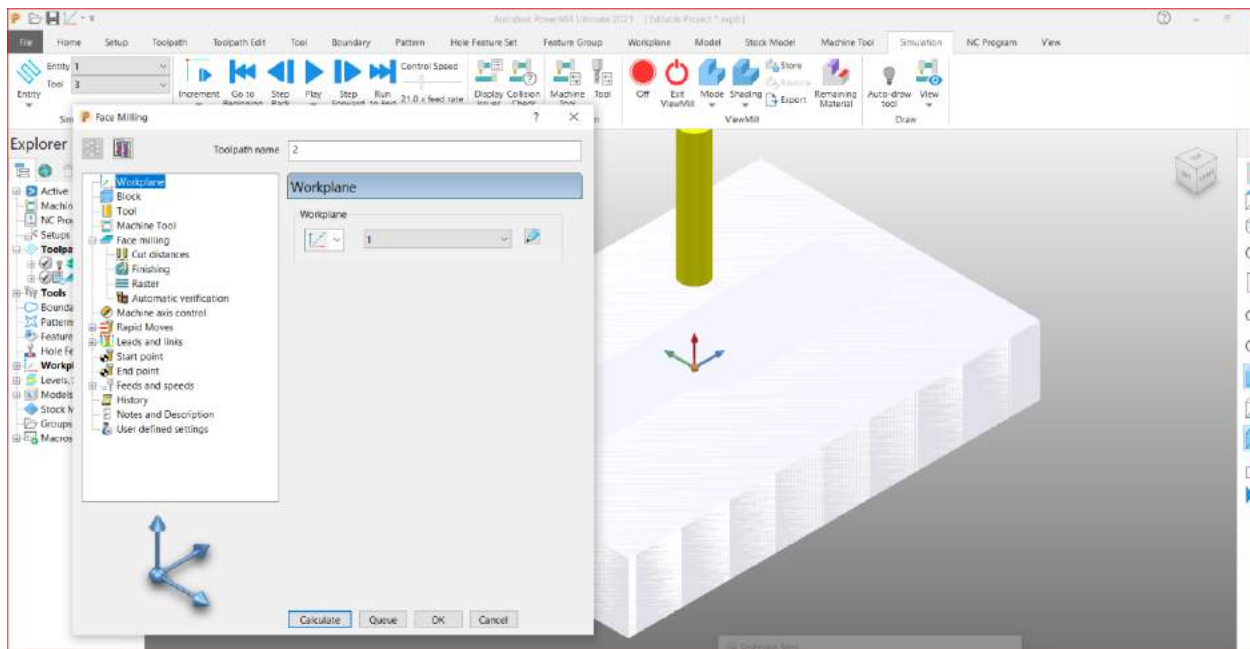
So the total time taken for machining by Model Area Clearance for workplace2 is 6minutes 26 seconds.

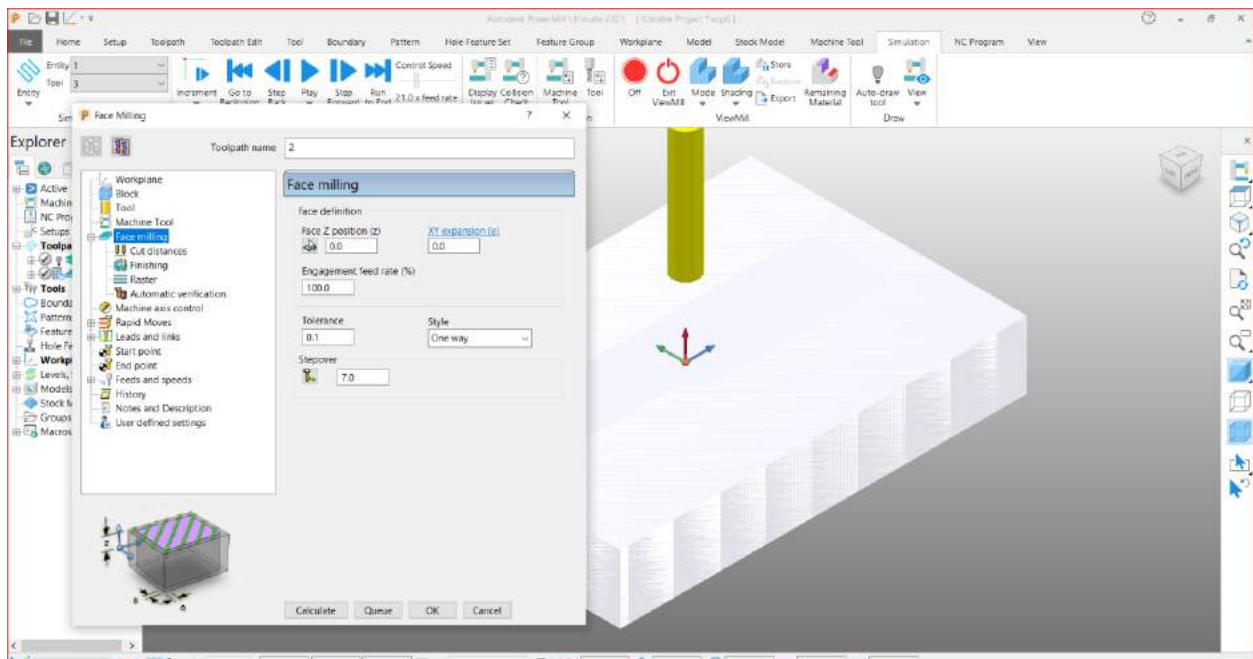
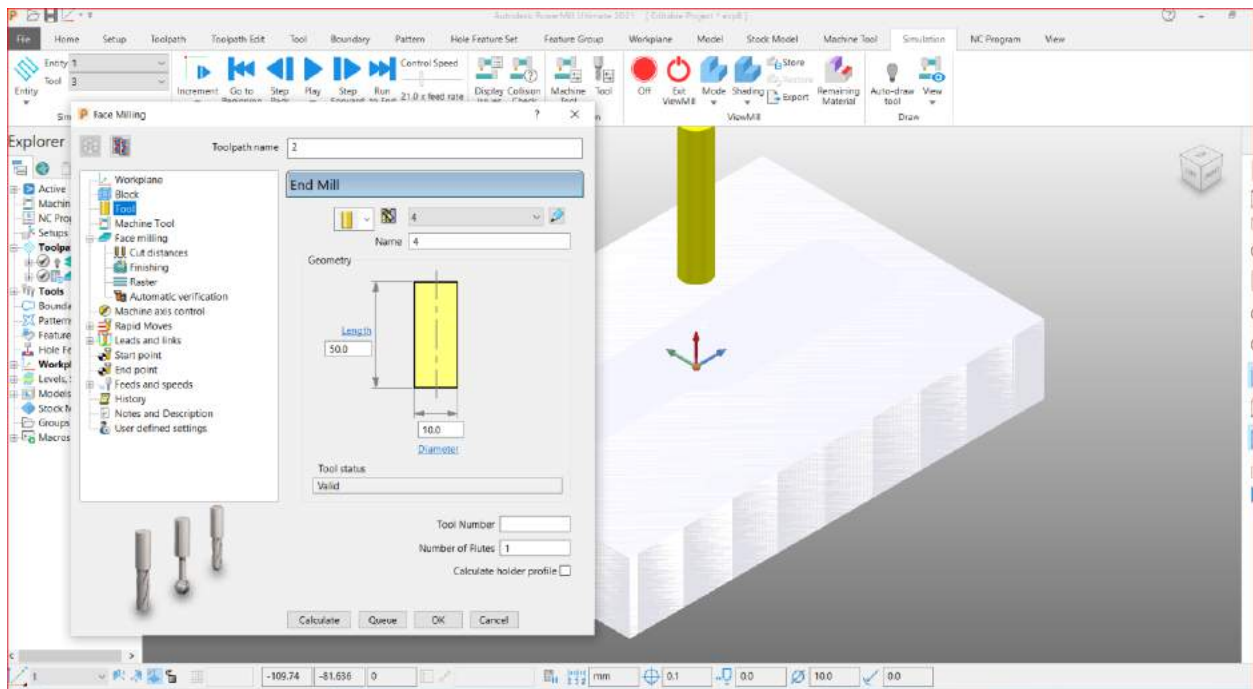
So the total time taken by Model Area Clearance will be 18 minutes.

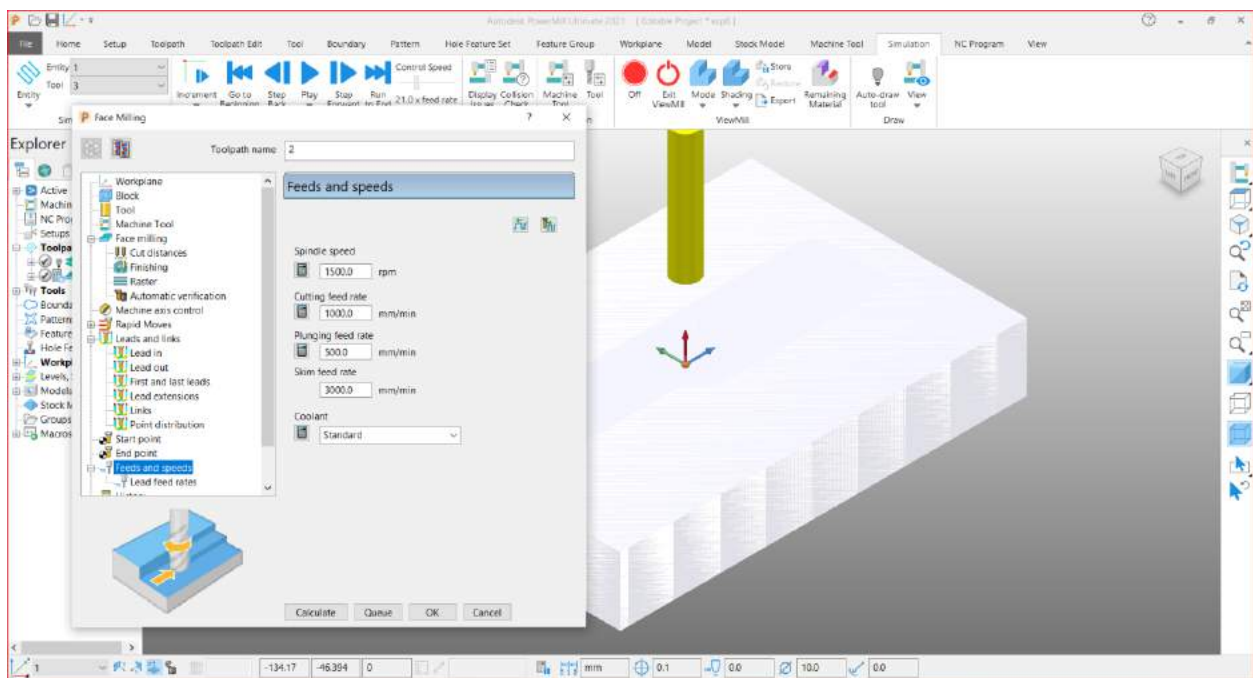
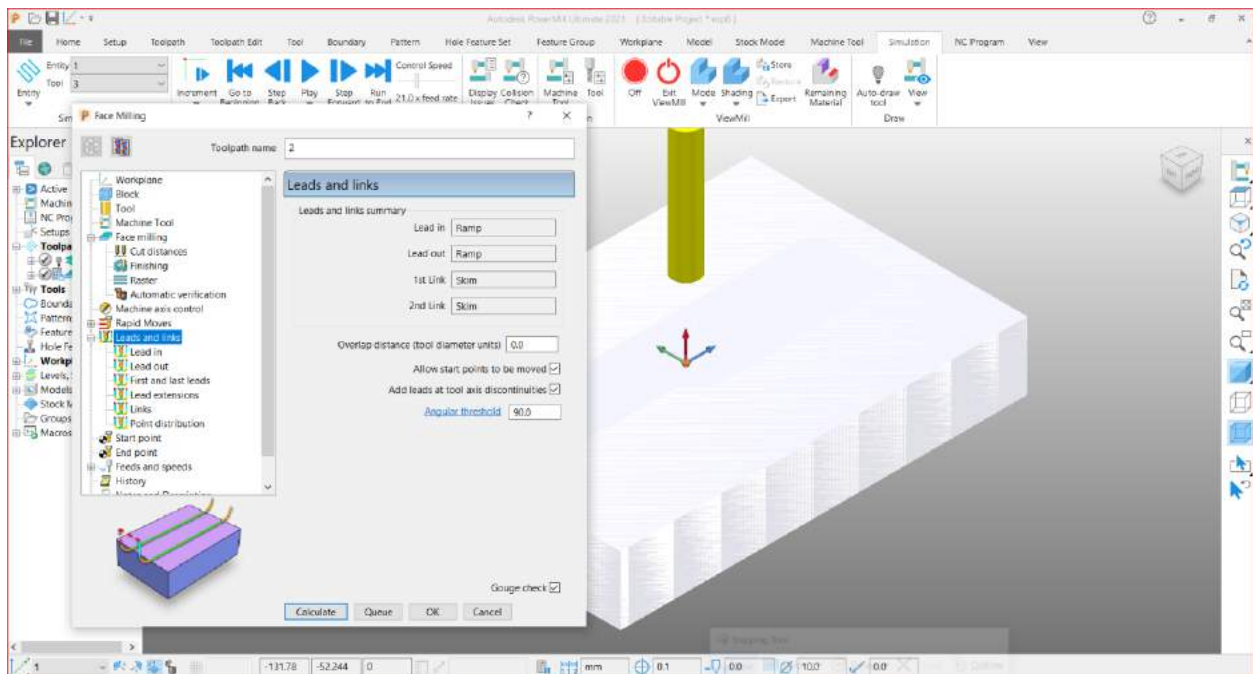
Step10: Follow same procedure by selecting **Face Milling** option under Curve Machining.

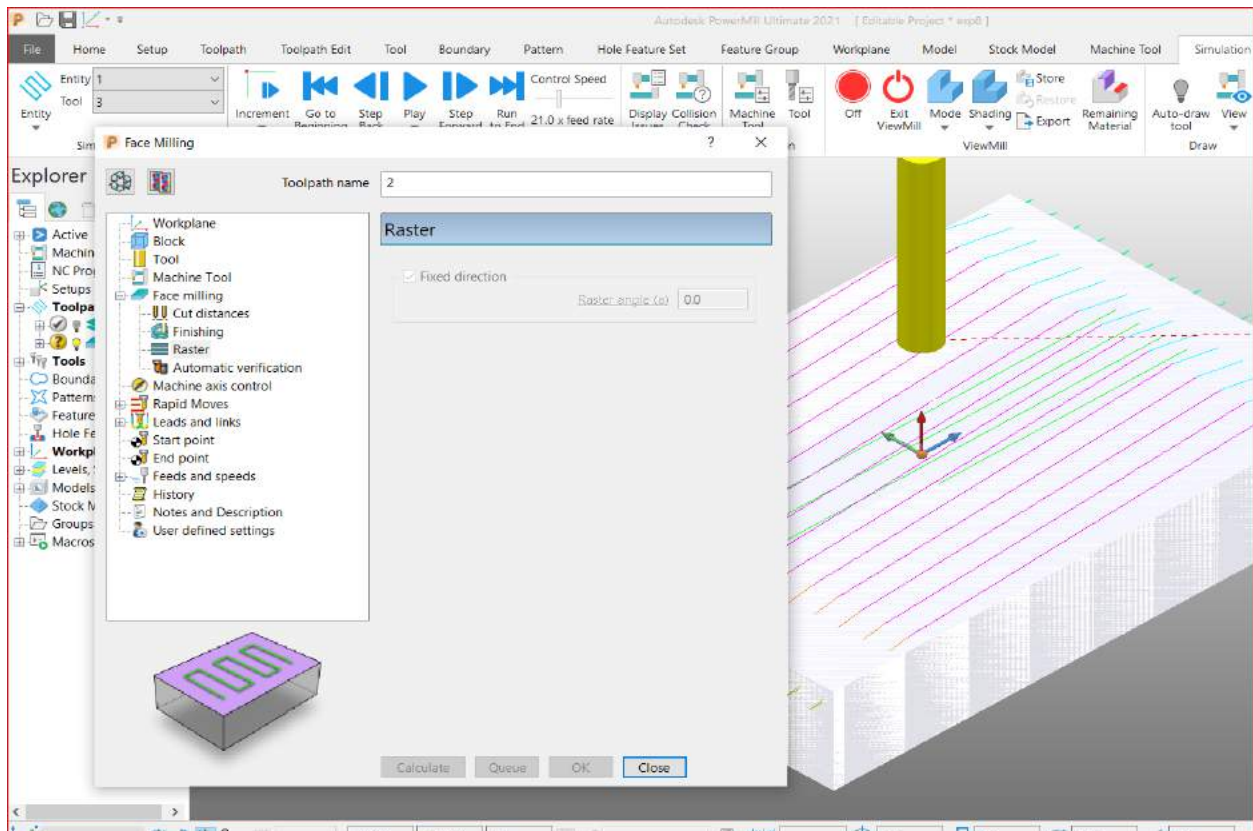


The Simulation time will be calculated for first workplace 1 followed by for the 2nd workplace. Here are the snaps of the steps to be followed.

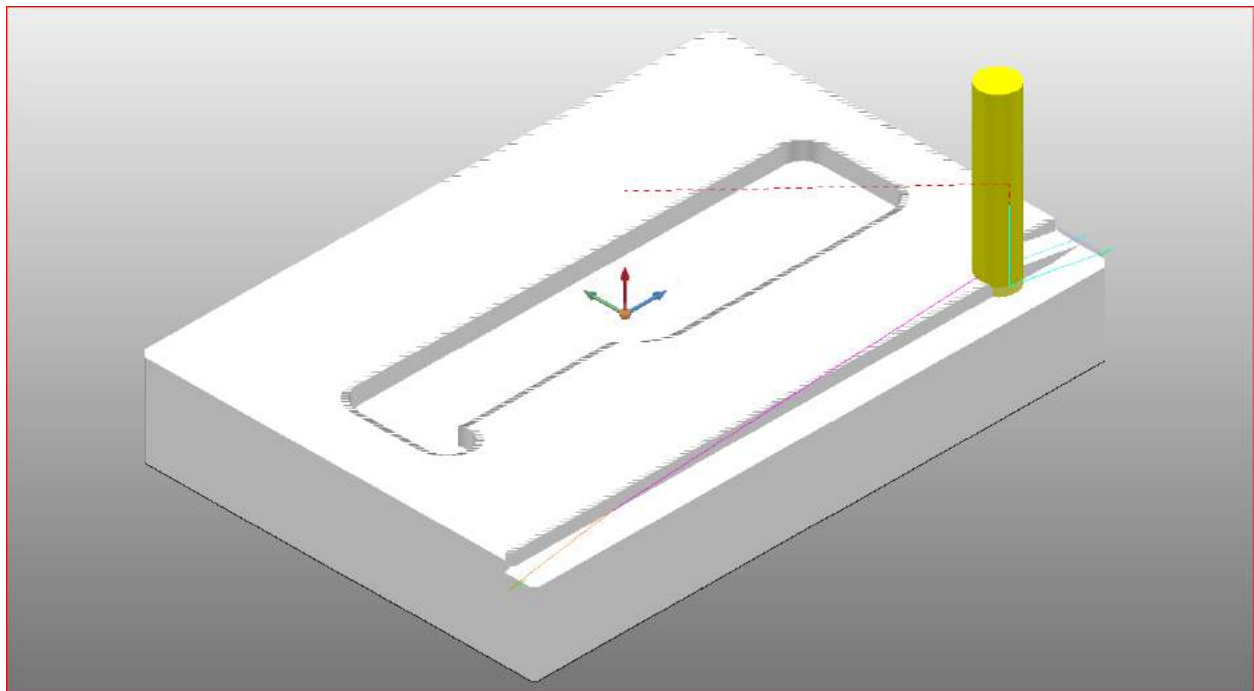









Simulation will start. Here are the snaps during simulation for workplane1



Toolpath Statistics ? X

Entity  2

Leads and Links		
	Length	Time
Rapid	1747.366077	0:00:34
Plunge	20.0	0:00:02
Ramp	460.701668	0:00:55
Others	460.701668	0:00:27
Total	2688.769414	0:02:00

Cutting Moves		
	Length	Time
Linear	2656.0	0:02:39
Arcs	0.0	0:00:00
Total	2656.0	0:02:39

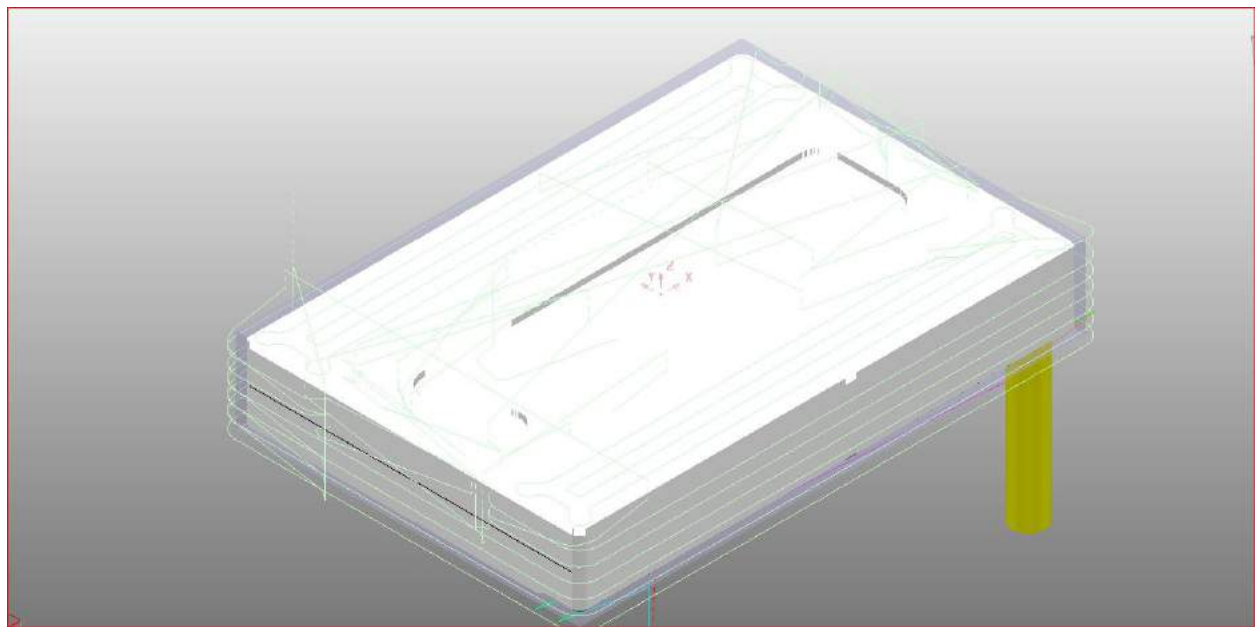
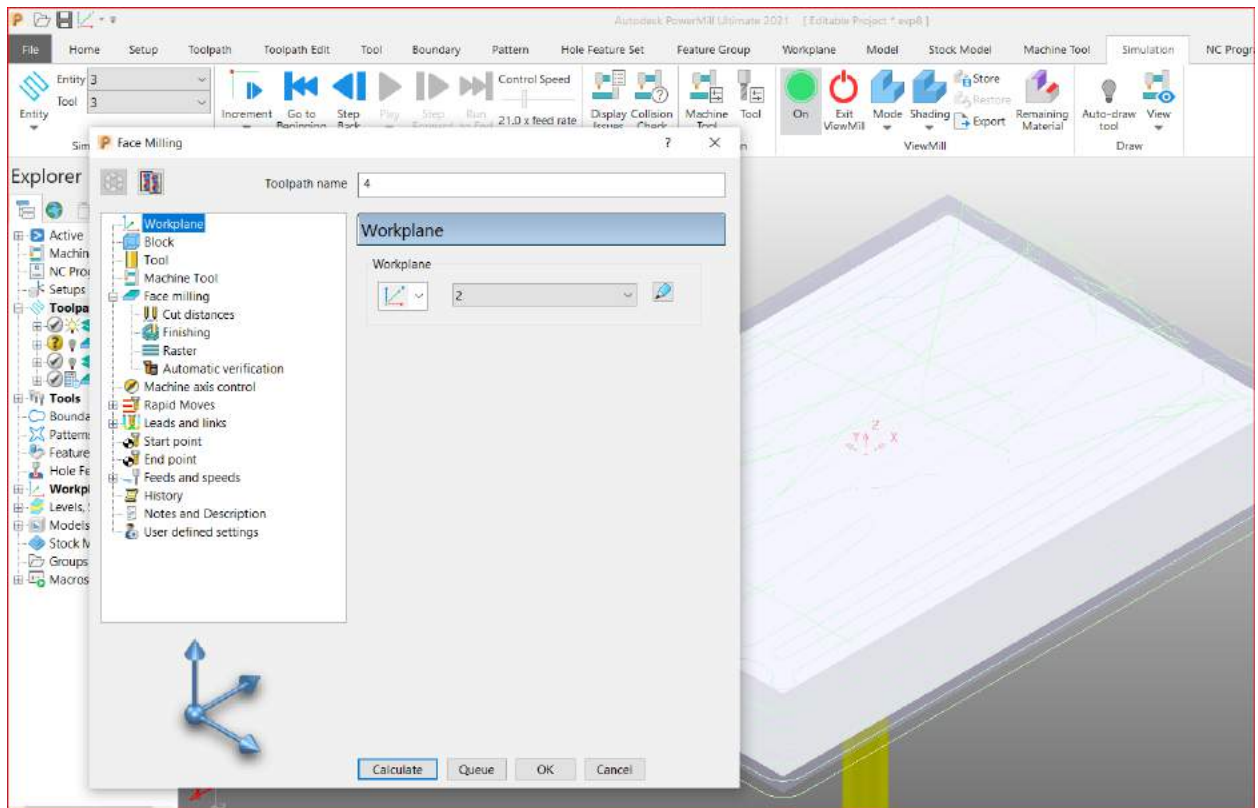
Dwells	
Total	Time
	0:00:00

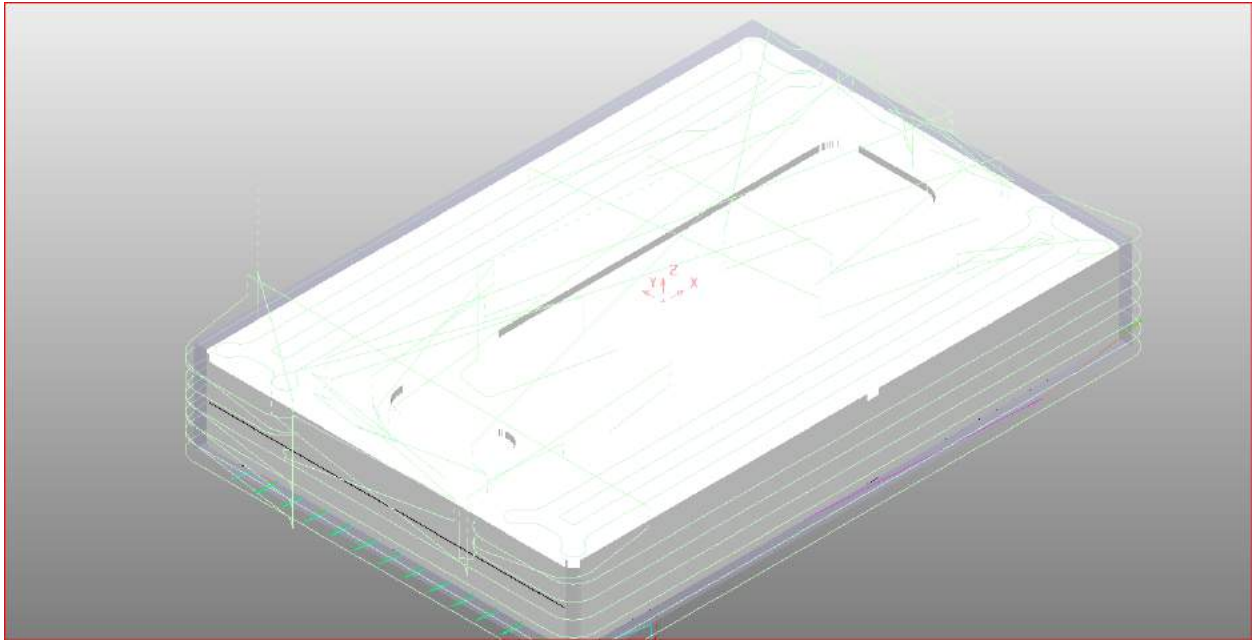
Total	5344.769414	0:04:39
	Number lifts	16

Close


So the total time taken for workplace 1 is 4minutes 39 seconds by Face Milling option.

Same procedure is followed for workplace2.





Toolpath Statistics ? X

Entity:  4

Leads and Links

	Length	Time
Rapid	1747.366077	0:00:34
Plunge	20.0	0:00:02
Ramp	460.701668	0:00:55
Others	460.701668	0:00:27
Total	2688.769414	0:02:00

Cutting Moves

	Length	Time
Linear	2656.0	0:02:39
Arcs	0.0	0:00:00
Total	2656.0	0:02:39

Dwells

	Time
Total	0:00:00

Total

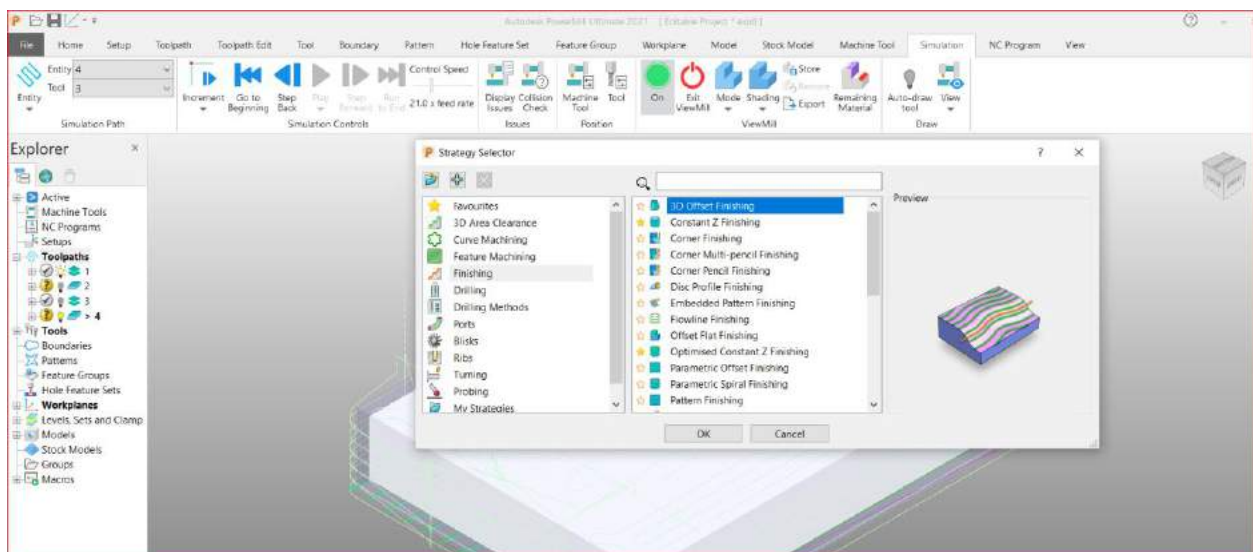
	5344.769414	0:04:39
Number lifts	16	

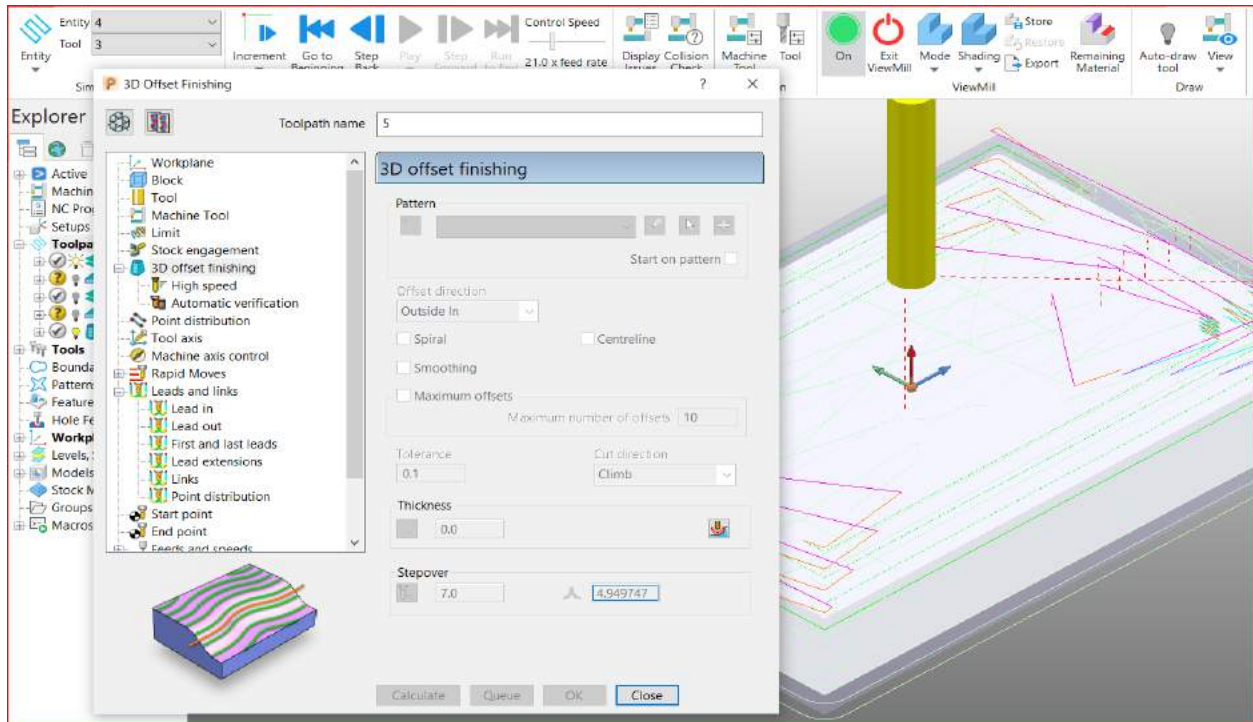
Close

So the total time taken for workplace 2 is also 4minutes 39 seconds by Face Milling option.

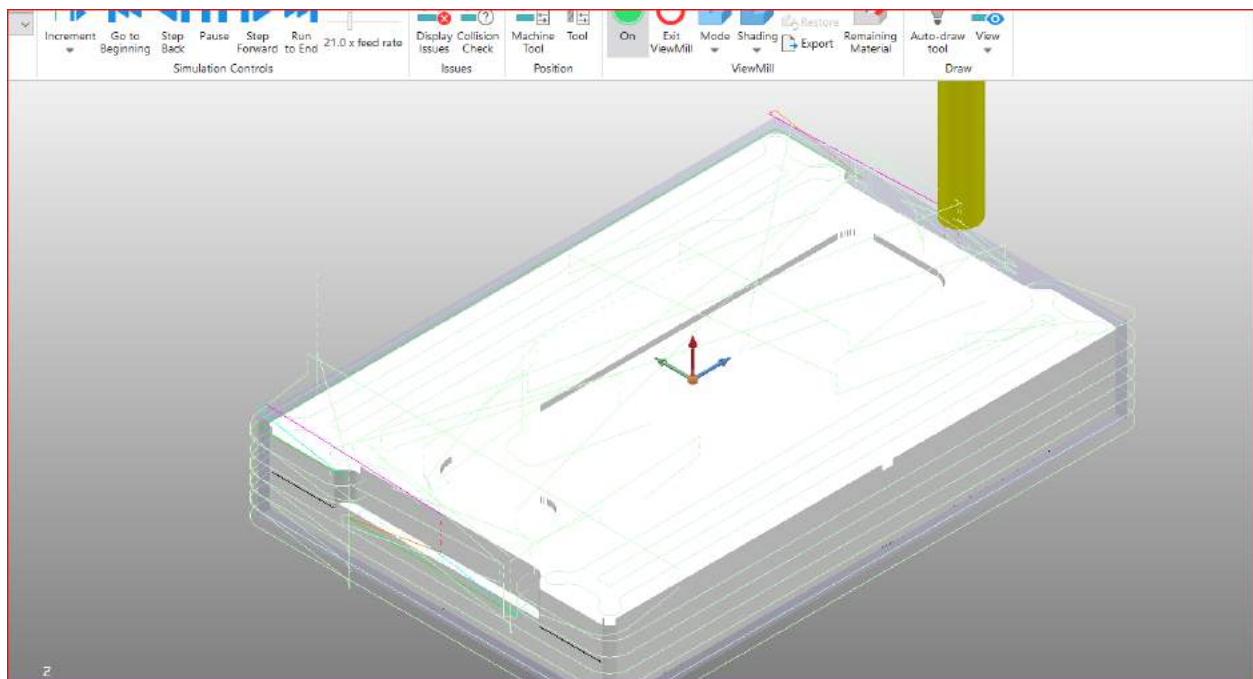
So the total time in Face Milling will be 9 minutes 18 seconds.

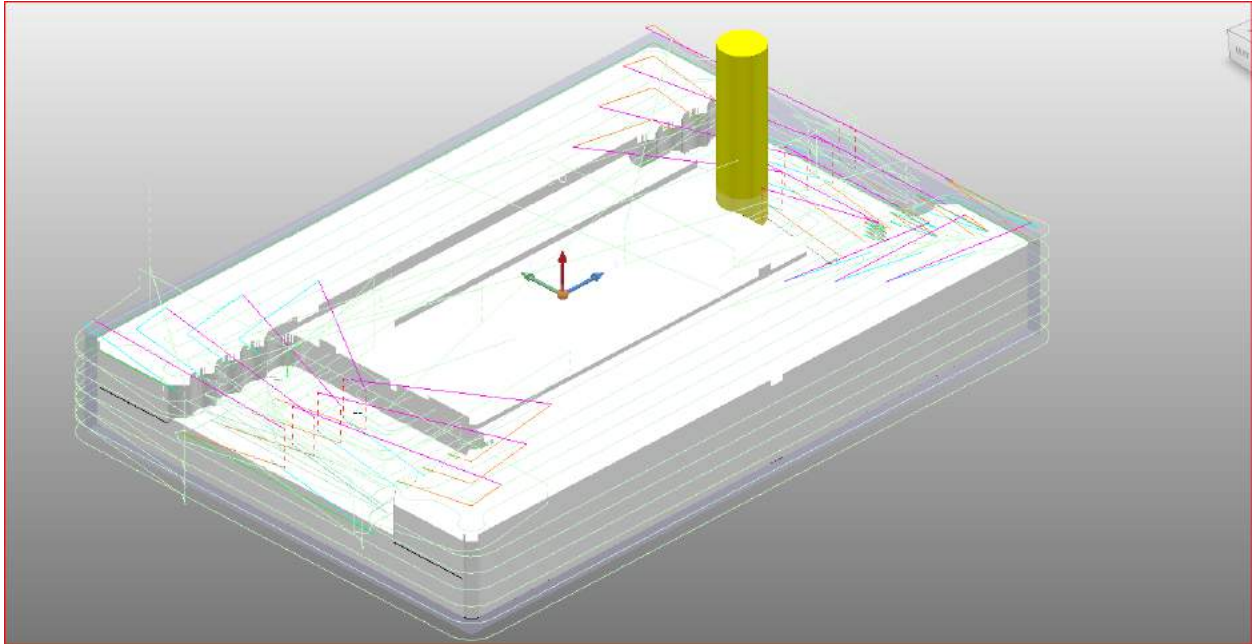
Step11: Now another new Toolpath will be created for 3D Offset Finishing.






Some snaps during Simulation.





Toolpath Statistics ? X

Entity:  5

Leads and Links	
	Length
Rapid	1256.737005
Plunge	20.0
Ramp	814.357248
Others	802.259747
Total	2893.354

Leads and Links	
	Time
Rapid	0:00:25
Plunge	0:00:02
Ramp	0:01:37
Others	0:00:48
Total	0:02:53

Cutting Moves	
	Length
Linear	2839.08404
Arcs	0.0
Total	2839.08404

Cutting Moves	
	Time
Linear	0:02:50
Arcs	0:00:00
Total	0:02:50

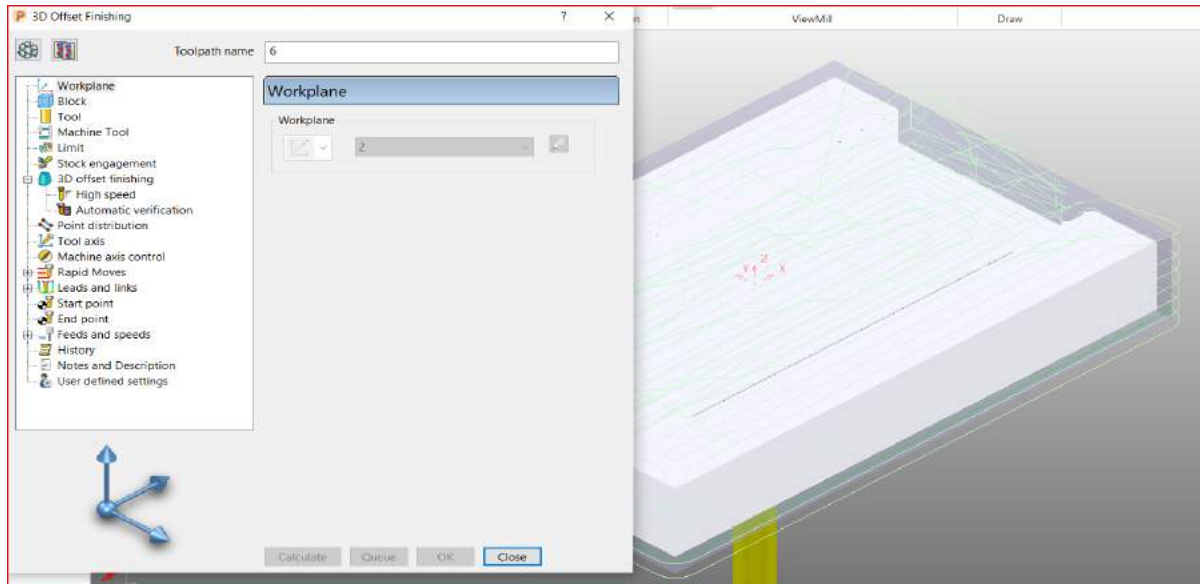
Dwells	
	Time
Total	0:00:00

Total	
Length	Time
5732.43804	0:05:43
Number lifts	25

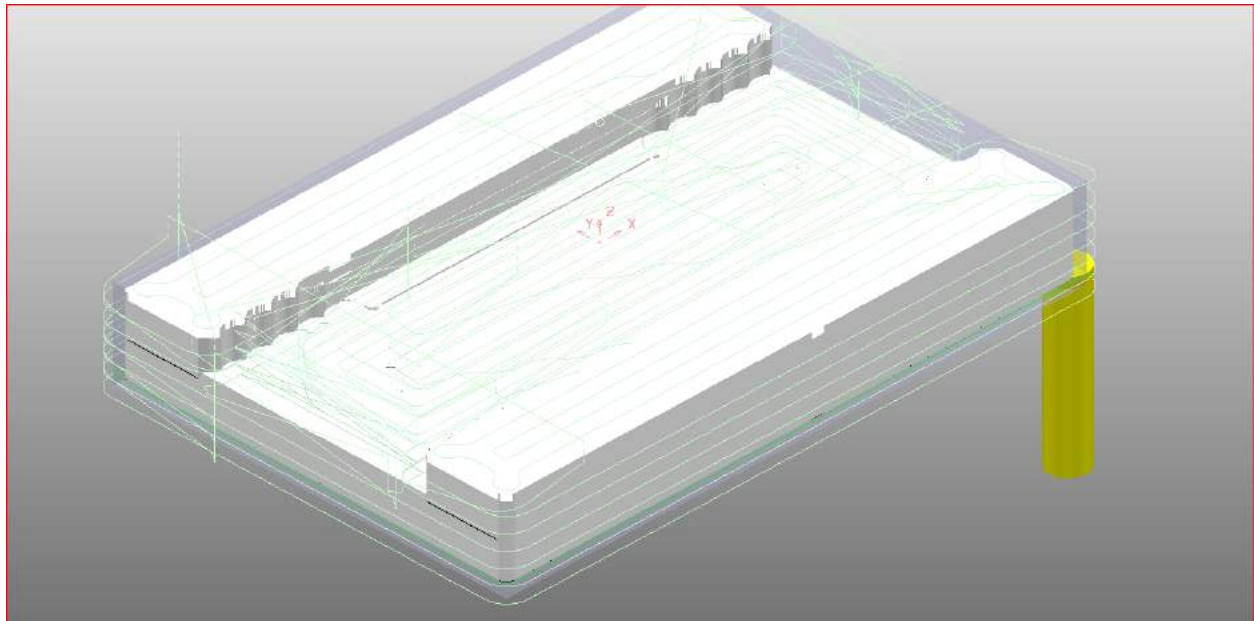
Close

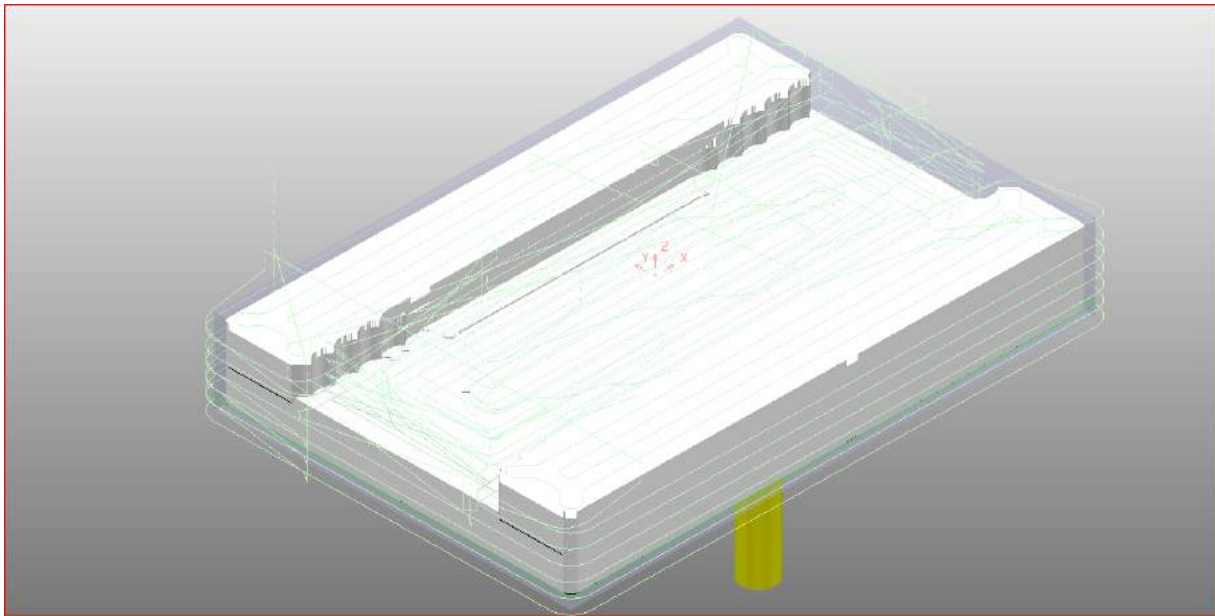
Total time taken for workplace1 will be 5 minutes 43 seconds.

Follow the same procedure for workspace2.




Some snaps during Simulation.





Toolpath Statistics ? X

Entity:  6

Leads and Links	
	Length
Rapid	490.111255
Plunge	20.0
Ramp	230.350819
Others	230.350819
Total	970.812893

Time	
	0:00:09
	0:00:02
	0:00:27
	0:00:13
Total	0:00:53

Cutting Moves	
	Length
Linear	2619.164327
Arcs	0.0
Total	2619.164327

Time	
	0:02:37
	0:00:00
Total	0:02:37

Dwells	
	Time
Total	0:00:00

Total	
	3589.97722
Total	0:03:30
Number lifts	8

Close

Total time taken for workplace1 will be 3 minutes 30 seconds.

S.NO	Machining operation	Selection of tools and dimensions			Process Parameters			Cycle Time (Sec)
		Tool Type	Diameter	Length	Speed	Feed	Down Step	
			(mm)	(mm)	(rpm)	(mm/min)	(mm)	
1	Model Area Clearance	End Mill	10	50	1500	1000	7	1080
2	Face Milling option	End Mill	10	50	1500	1000	7	558
3	3D Offset Finishing	End Mill	10	50	1500	1000	7	553