

Container Project Documentation

(Add Your Name Here)

Design Brief

Complete the container design constraints below for Design Strategy 1 or Design Strategy 2 using the information provided by your teacher. Note that Design Strategy 2 produces the base and lid out of the same piece of stock and needs to be separated after milling.

Design and create a unique container base and lid using the constraints and process that follows.

- a. Constraints
 - i. CAD models must match the exterior dimensions provided.
 - ii. The CAD model must have the clearance fit provided.
 - iii. The part machining should take less than 10 minutes.
 - iv. The milling operation must require at least one tool change.
- b. Process
 - i. Sketch preliminary designs in your PLTW Engineering Notebook.
 - ii. Create 3D CAD models of the part base, lid, and assembly.
 - iii. Create dimensioned drawings.
 - iv. Create a CAM model of the part.
 - v. Simulate the machining operation in CNCMotion.
 - vi. Produce the physical parts using a mill.

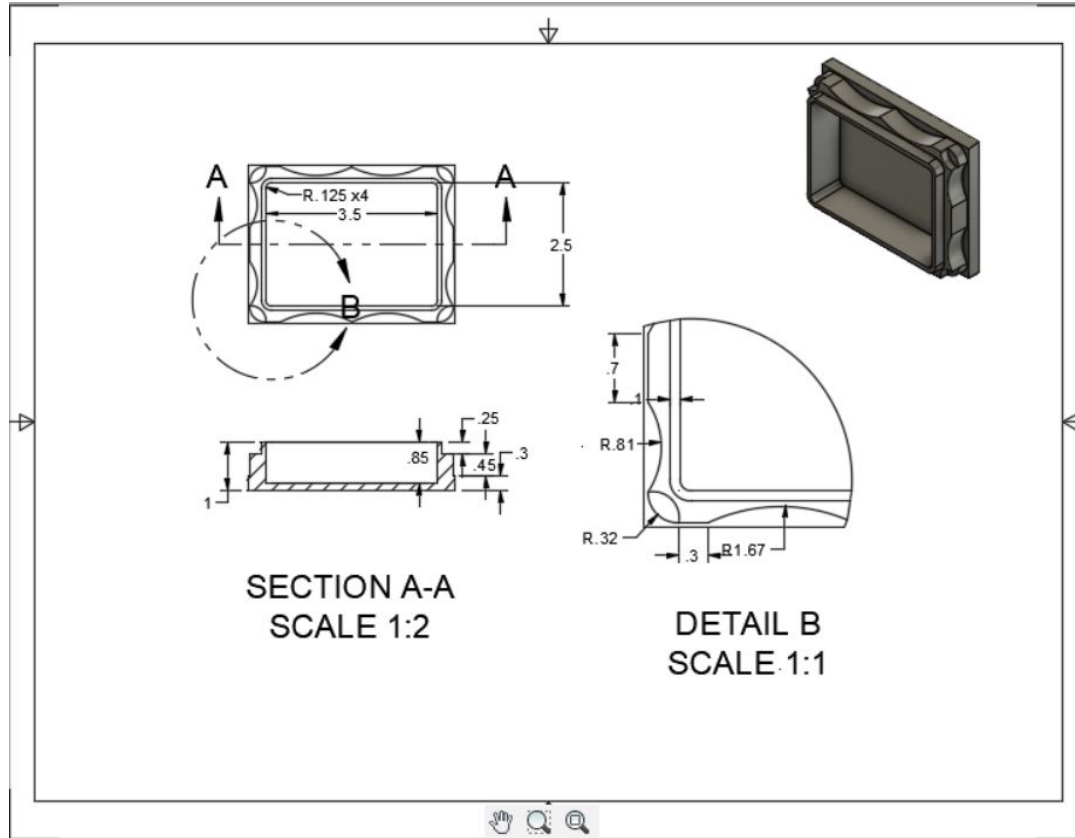
Submit a final report containing the following items:

- a. Report that uses the CIM Project Report Template.
- b. Screen capture of container base and lid models using the following software:
 - i. CAD model displayed as an isometric view.
 - ii. CAM model showing **toolpaths**.
 - iii. CNCMotion simulation with the cycle time displayed.
- c. Dimensioned drawings of container base and lid.
- d. Completed physical container base and lid.

Screenshot of the bottom of your card box (Modeling only)

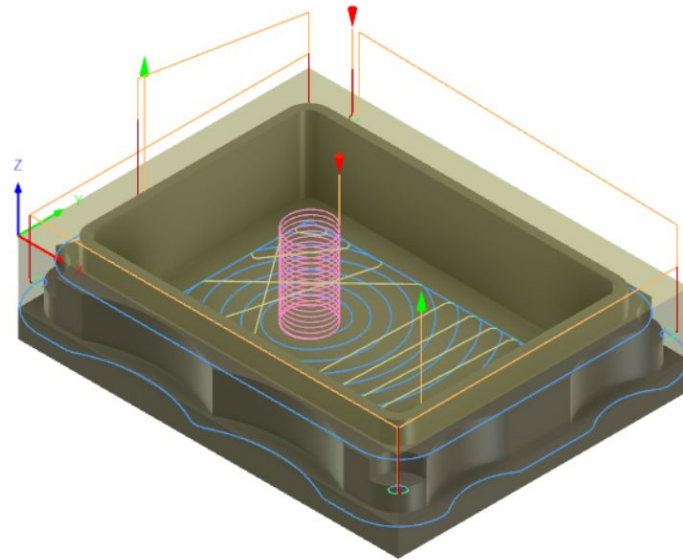
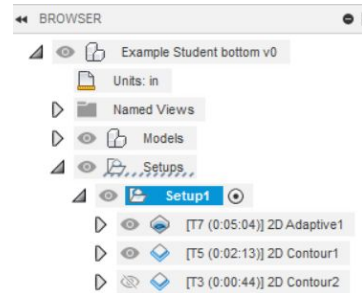


Drawing file of your bottom (Use Drawing Template)



Video of your Cam Simulation

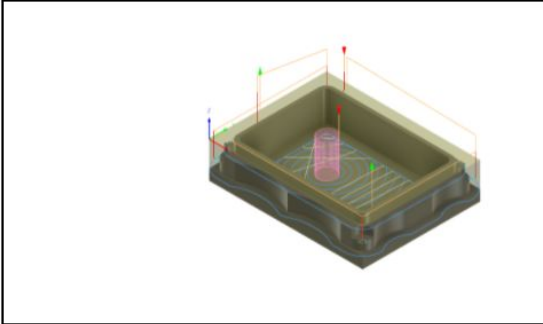

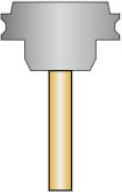
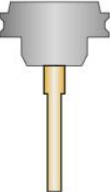
[Link to Video](#)



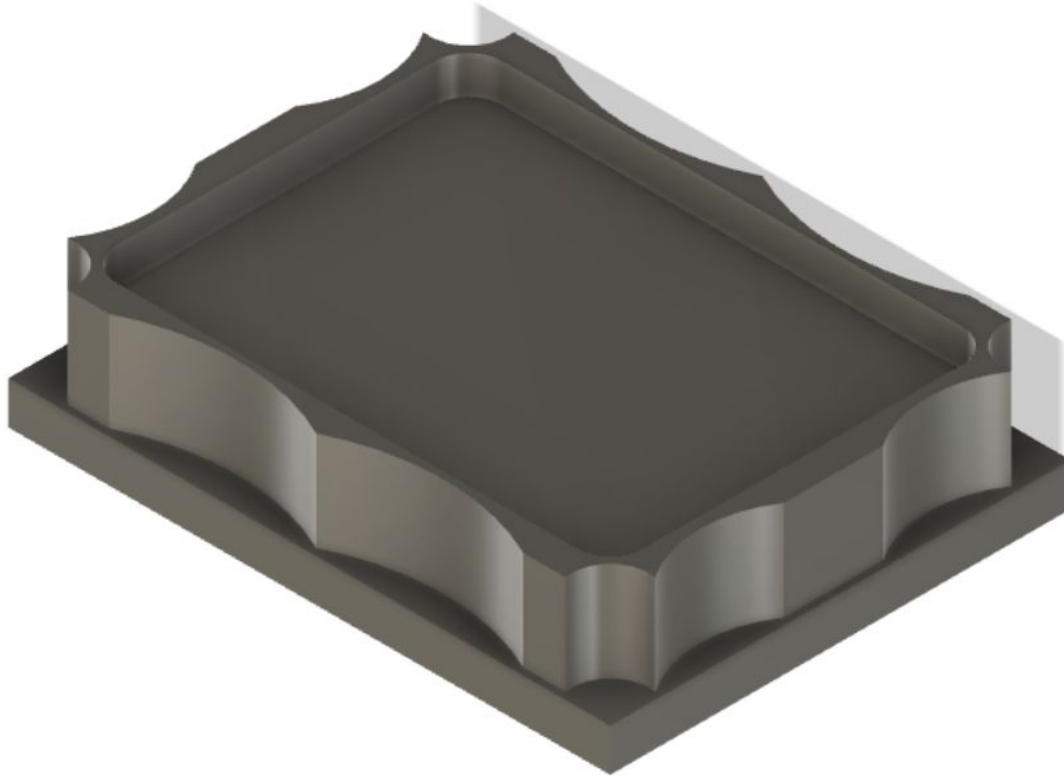
Bottom Setup Sheet

JOB DESCRIPTION: Setup1

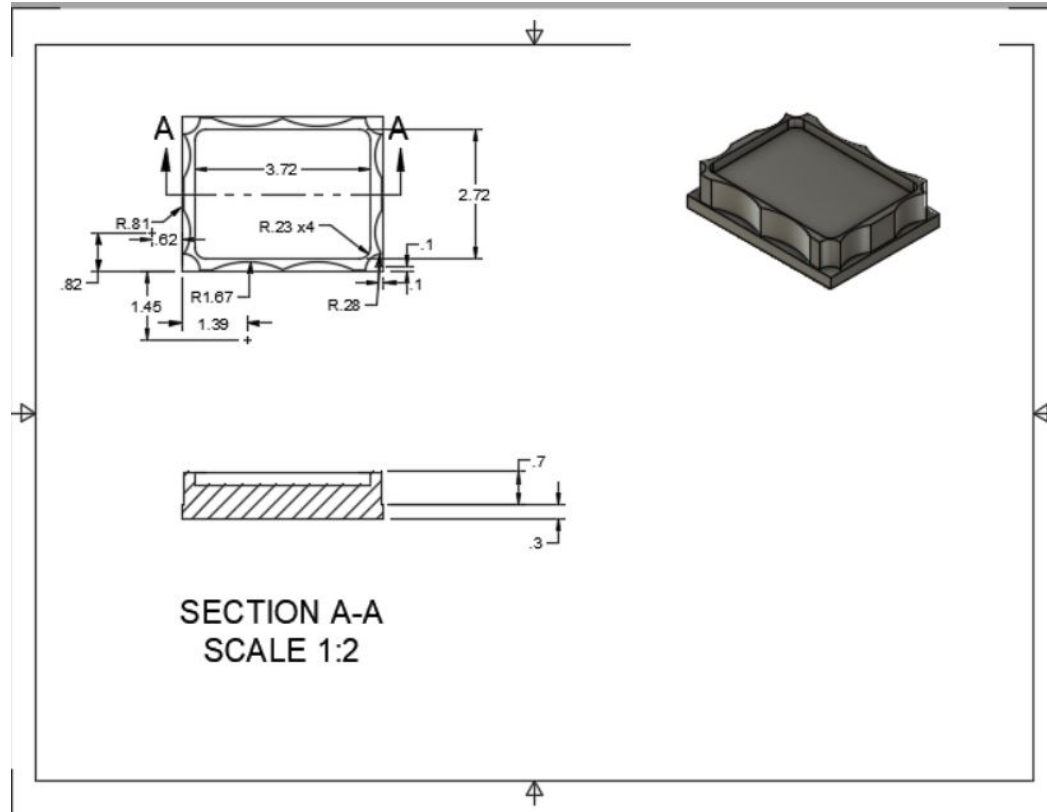
DOCUMENT PATH: Example Student bottom v1

Setup		Operations		
<p>WCS: #0</p> <p>STOCK: DX: 4.25in DY: 3.25in DZ: 1in</p> <p>PART: DX: 4.25in DY: 3.25in DZ: 1in</p> <p>STOCK LOWER IN WCS #0: X: 0in Y: 0in Z: -1in</p> <p>STOCK UPPER IN WCS #0: X: 4.25in Y: 3.25in Z: 0in</p>		<p>Operation 1/3 DESCRIPTION: 2D Adaptive1 STRATEGY: Adaptive 2D WCS: #0 TOLERANCE: 0.004in STOCK TO LEAVE: 0.02in OPTIMAL LOAD: 0.2in LOAD DEVIATION: 0.02in</p>	<p>MAXIMUM Z: 0.6in MINIMUM Z: -0.83in MAXIMUM SPINDLE SPEED: 3000rpm MAXIMUM FEEDRATE: 24in/min CUTTING DISTANCE: 93.565in RAPID DISTANCE: 1.878in ESTIMATED CYCLE TIME: 5m:4s (57.9%) COOLANT: Off</p>	<p>T7 D7 L7 TYPE: flat end mill DIAMETER: 0.5in LENGTH: 2.75in FLUTES: 4 DESCRIPTION: T7 1/2 End Mill COMMENT: T7 1/2 End Mill</p> 
		<p>Operation 2/3 DESCRIPTION: 2D Contour1 STRATEGY: Contour 2D WCS: #0 TOLERANCE: 0in STOCK TO LEAVE: 0in MAXIMUM STEPOVER: 0.356in</p>	<p>MAXIMUM Z: 0.6in MINIMUM Z: -0.7in MAXIMUM SPINDLE SPEED: 3000rpm MAXIMUM FEEDRATE: 18in/min CUTTING DISTANCE: 35.512in RAPID DISTANCE: 21.757in ESTIMATED CYCLE TIME: 2m:12s (25.1%) COOLANT: Off</p>	<p>T5 D5 L5 TYPE: flat end mill DIAMETER: 0.375in LENGTH: 2in FLUTES: 4 DESCRIPTION: T5 3/8 End Mill COMMENT: T5 3/8 End Mill</p> 
		<p>Operation 3/3 DESCRIPTION: 2D Contour2 STRATEGY: Contour 2D WCS: #0 TOLERANCE: 0in STOCK TO LEAVE: 0in MAXIMUM STEPOVER: 0.238in</p>	<p>MAXIMUM Z: 0.6in MINIMUM Z: -0.85in MAXIMUM SPINDLE SPEED: 3000rpm MAXIMUM FEEDRATE: 18in/min CUTTING DISTANCE: 12.232in RAPID DISTANCE: 1.825in ESTIMATED CYCLE TIME: 44s (8.4%) COOLANT: Off</p>	<p>T3 D3 L3 TYPE: flat end mill DIAMETER: 0.25in LENGTH: 2.25in FLUTES: 4 DESCRIPTION: T3 1/4 End Mill COMMENT: T3 1/4 End Mill</p> 
Total				
<p>NUMBER OF OPERATIONS: 3 NUMBER OF TOOLS: 3 TOOLS: T3 T5 T7 MAXIMUM Z: 0.6in MINIMUM Z: -0.85in MAXIMUM FEEDRATE: 24in/min MAXIMUM SPINDLE SPEED: 3000rpm CUTTING DISTANCE: 141.309in RAPID DISTANCE: 25.46in ESTIMATED CYCLE TIME: 8m:46s</p>				

Screenshot of your Bottom of Top (Modeling Only)

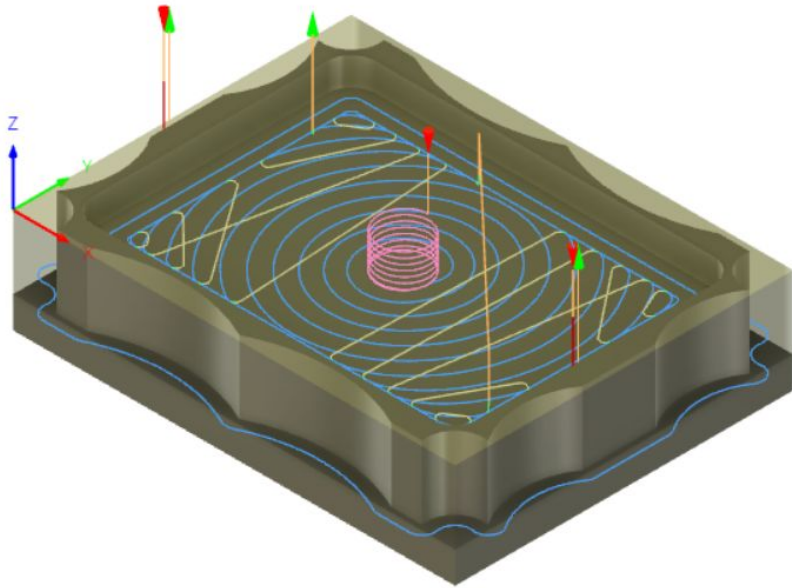


Drawing file of your Bottom of Top (Use Template)



Video of your CAM Strategies for the Bottom of the Top

[Link to Video](#)



Setup sheet for the Bottom of the Top

DOCUMENT PATH: A period example top v8

Setup

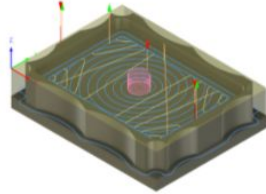
WCS: #0

STOCK:
DX: 4.25in
DY: 3.25in
DZ: 1in

PART:
DX: 4.25in
DY: 3.25in
DZ: 1in

STOCK LOWER IN WCS #0:
X: 0in
Y: 0in
Z: -1in

STOCK UPPER IN WCS #0:
X: 4.25in
Y: 3.25in
Z: 0in



Total

NUMBER OF OPERATIONS: 3
NUMBER OF TOOLS: 2
TOOLS: T3 T7
MAXIMUM Z: 0.6in
MINIMUM Z: -0.7in
MAXIMUM FEEDRATE: 24in/min
MAXIMUM SPINDLE SPEED: 3000rpm
CUTTING DISTANCE: 110.403in
RAPID DISTANCE: 7.549in
ESTIMATED CYCLE TIME: 6m:3s

Operations

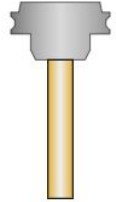
Operation 1/3

DESCRIPTION: 2D Adaptive1
STRATEGY: Adaptive 2D
WCS: #0
TOLERANCE: 0.004in
STOCK TO LEAVE: 0.02in
OPTIMAL LOAD: 0.2in
LOAD DEVIATION: 0.02in

MAXIMUM Z: 0.6in
MINIMUM Z: -0.25in
MAXIMUM SPINDLE SPEED: 3000rpm
MAXIMUM FEEDRATE: 24in/min
CUTTING DISTANCE: 81.61in
RAPID DISTANCE: 4.629in
ESTIMATED CYCLE TIME: 3m:53s (64.1%)
COOLANT: Off

T7 D7 L7

TYPE: flat end mill
DIAMETER: 0.5in
LENGTH: 2.75in
FLUTES: 4
DESCRIPTION: T7 1/2 End Mill
COMMENT: T7 1/2 End Mill



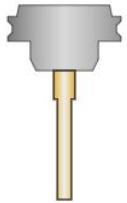
Operation 2/3

DESCRIPTION: 2D Contour2
STRATEGY: Contour 2D
WCS: #0
TOLERANCE: 0in
STOCK TO LEAVE: 0in
MAXIMUM STEPOVER: 0.238in

MAXIMUM Z: 0.6in
MINIMUM Z: -0.27in
MAXIMUM SPINDLE SPEED: 3000rpm
MAXIMUM FEEDRATE: 18in/min
CUTTING DISTANCE: 12.336in
RAPID DISTANCE: 1.245in
ESTIMATED CYCLE TIME: 43s (11.7%)
COOLANT: Off

T3 D3 L3

TYPE: flat end mill
DIAMETER: 0.25in
LENGTH: 2.25in
FLUTES: 4
DESCRIPTION: T3 1/4 End Mill
COMMENT: T3 1/4 End Mill



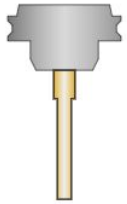
Operation 3/3

DESCRIPTION: 2D Contour1
STRATEGY: Contour 2D
WCS: #0
TOLERANCE: 0in
STOCK TO LEAVE: 0in
MAXIMUM STEPOVER: 0.238in

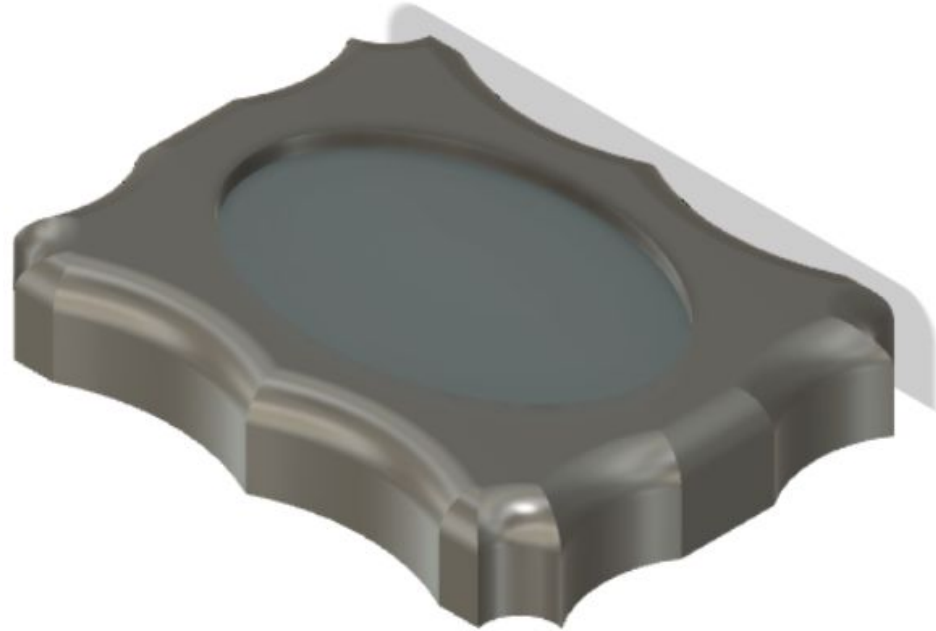
MAXIMUM Z: 0.6in
MINIMUM Z: -0.7in
MAXIMUM SPINDLE SPEED: 3000rpm
MAXIMUM FEEDRATE: 18in/min
CUTTING DISTANCE: 16.457in
RAPID DISTANCE: 1.675in
ESTIMATED CYCLE TIME: 58s (15.9%)
COOLANT: Off

T3 D3 L3

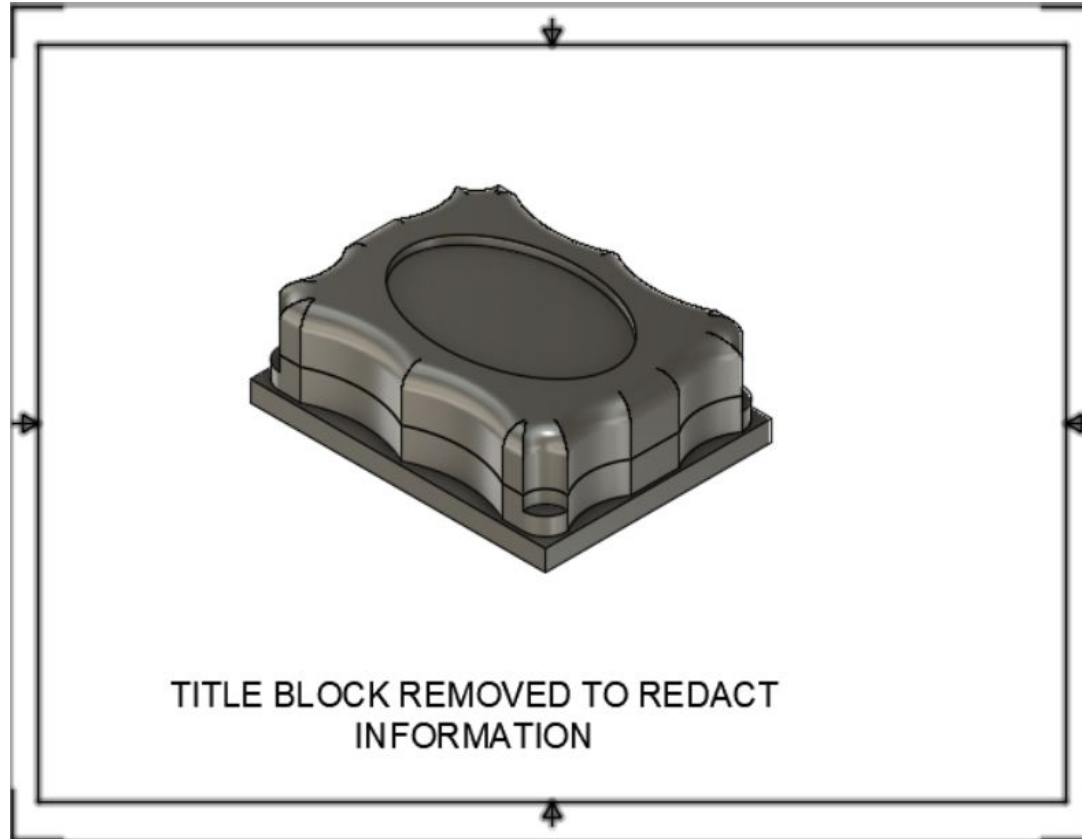
TYPE: flat end mill
DIAMETER: 0.25in
LENGTH: 2.25in
FLUTES: 4
DESCRIPTION: T3 1/4 End Mill
COMMENT: T3 1/4 End Mill



Screenshot of the Top of the Top of your Box

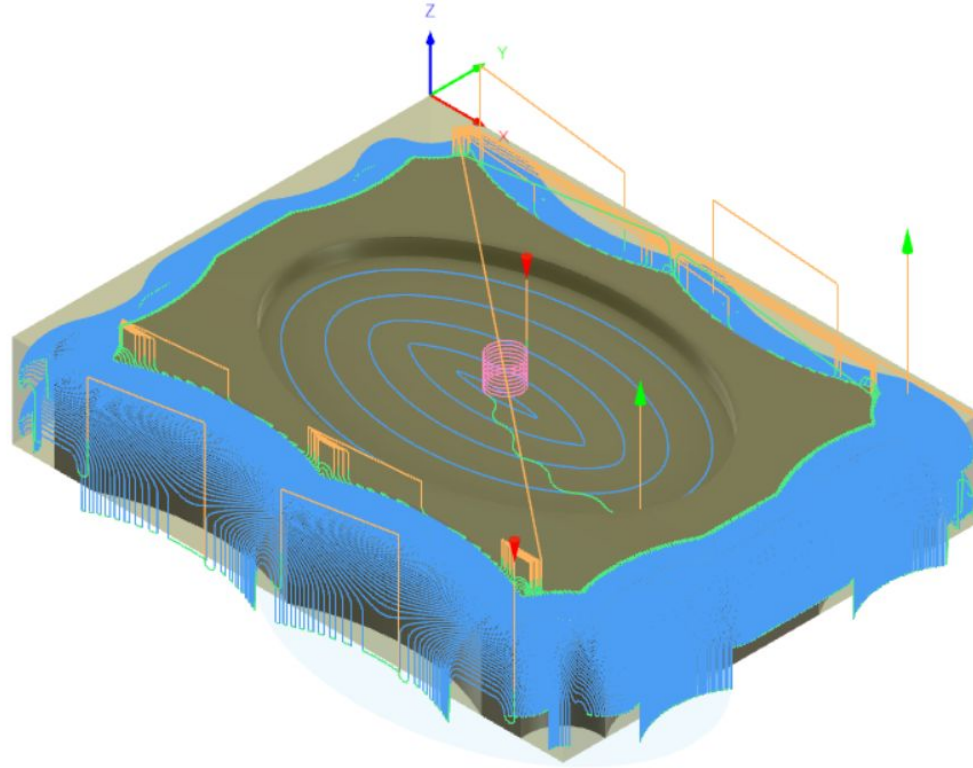


Drawing File of the completed box. (Use Template)



Video of Cam Strategies for machining Top of Top

[Link to Video](#)



Setup sheet for Top of Top

DOCUMENT PATH: Example Student Sample TOP v3

Setup

WCS: #0

STOCK:

DX: 4.15in
DY: 3.15in
DZ: 0.7in

PART:

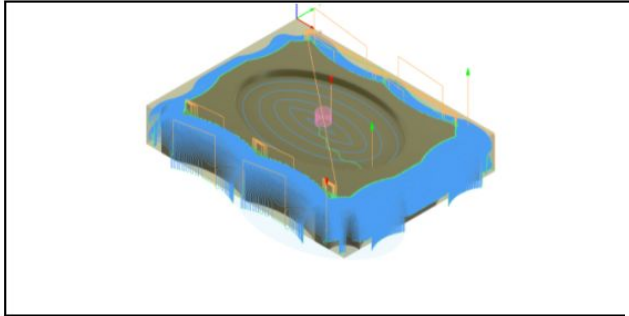
DX: 4.15in
DY: 3.15in
DZ: 0.7in

STOCK LOWER IN WCS #0:

X: 0in
Y: -3.15in
Z: -0.7in

STOCK UPPER IN WCS #0:

X: 4.15in
Y: 0in
Z: 0in



Total

NUMBER OF OPERATIONS: 2

NUMBER OF TOOLS: 2

TOOLS: T3 T6

MAXIMUM Z: 0.6in

MINIMUM Z: -0.737in

MAXIMUM FEEDRATE: 18in/min

MAXIMUM SPINDLE SPEED: 3000rpm

CUTTING DISTANCE: 1053.105in

RAPID DISTANCE: 49.98in

ESTIMATED CYCLE TIME: 59m:23s

Operations

Operation 1/2

DESCRIPTION: Parallel2

STRATEGY: Parallel

WCS: #0

TOLERANCE: 0in

STOCK TO LEAVE: 0in

MAXIMUM STEPOVER: 0.009in

MAXIMUM Z: 0.6in

MINIMUM Z: -0.737in

MAXIMUM SPINDLE SPEED: 3000rpm

MAXIMUM FEEDRATE: 18in/min

CUTTING DISTANCE: 1023.96in

RAPID DISTANCE: 48.88in

ESTIMATED CYCLE TIME: 56m:54s (95.8%)

COOLANT: Off

T6 D6 L6

TYPE: ball end mill

DIAMETER: 0.375in

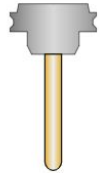
CORNER RADIUS: 0.187in

LENGTH: 2.625in

FLUTES: 4

DESCRIPTION: T6 3/8 Ballnose

COMMENT: T6 3/8 Ballnose



Operation 2/2

DESCRIPTION: 2D Pocket3

STRATEGY: Pocket 2D

WCS: #0

TOLERANCE: 0.004in

STOCK TO LEAVE: 0in

MAXIMUM STEPOVER: 0.238in

MAXIMUM Z: 0.6in

MINIMUM Z: -0.125in

MAXIMUM SPINDLE SPEED: 3000rpm

MAXIMUM FEEDRATE: 18in/min

CUTTING DISTANCE: 29.145in

RAPID DISTANCE: 1.1in

ESTIMATED CYCLE TIME: 1m:59s (3.3%)

COOLANT: Off

T3 D3 L3

TYPE: flat end mill

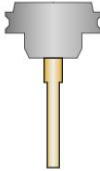
DIAMETER: 0.25in

LENGTH: 2.25in

FLUTES: 4

DESCRIPTION: T3 1/4 End Mill

COMMENT: T3 1/4 End Mill



Speeds and Feeds Calculations for the Machining

Renshape Cutting Speed 355

Renshape	355	0.25	5427	1/4 Flat	4	0.001	22
Renshape	355	0.5	2713	1/2 flat	4	0.004	43
Renshape	355	0.375	3618	3/8 Ball End	2	0.002	14
Renshape	355	0.125	10854	1/8 Flat	3	0.001	33

Videos and pics of the machining process(You should have more than one.)

[Link to Video](#)



Pictures and videos of the completed box

