

# **IND251 Documentation**

Presents basic principles used in the design and implementation in manufacturing work cells. Includes selection of the robot system, worksite, application cell sensors, development of cycle times, and economic analysis.

## **Getting Started:**

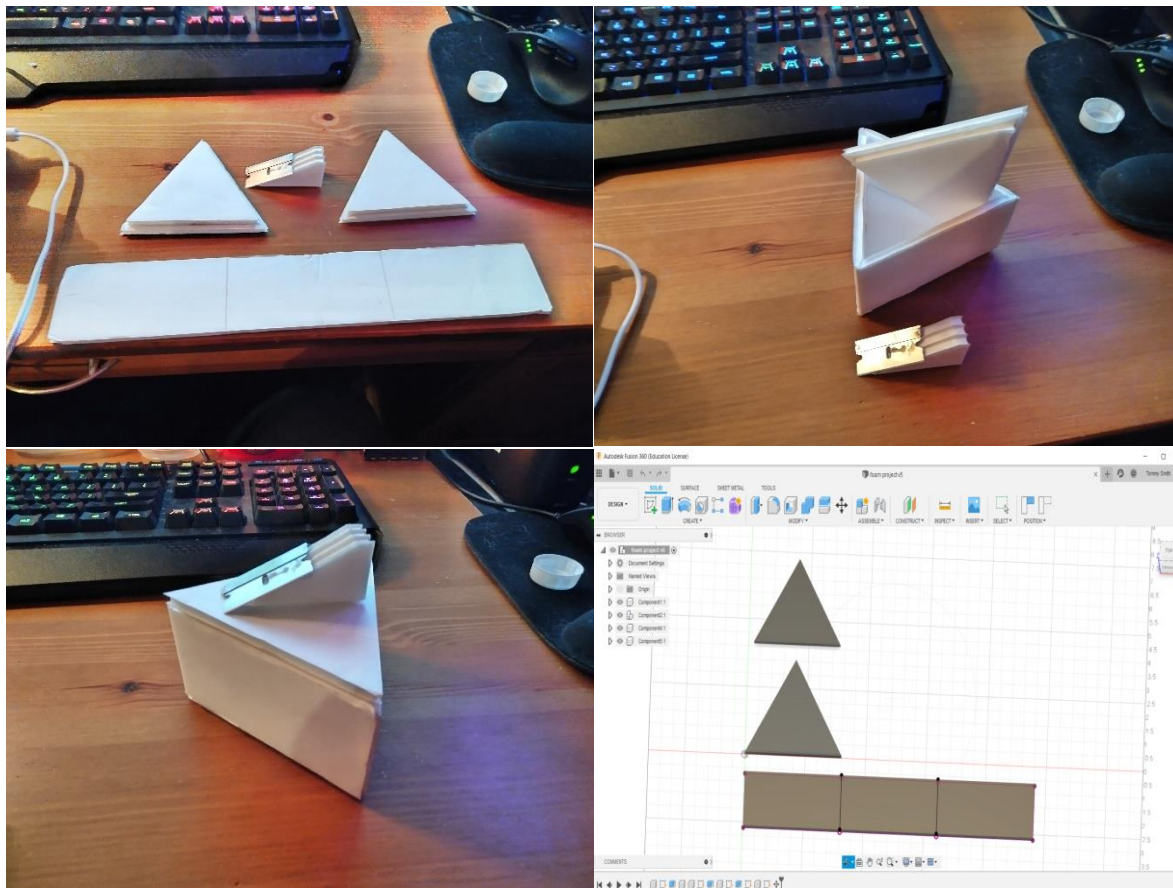
Create a simple 3D container using 3/16" foam core board that contains a continuous side panel

The container cannot have 4 flat sides, can be 3 or more than 4

Create a miter tool to meet the number of sides and the internal angle of the flat panel

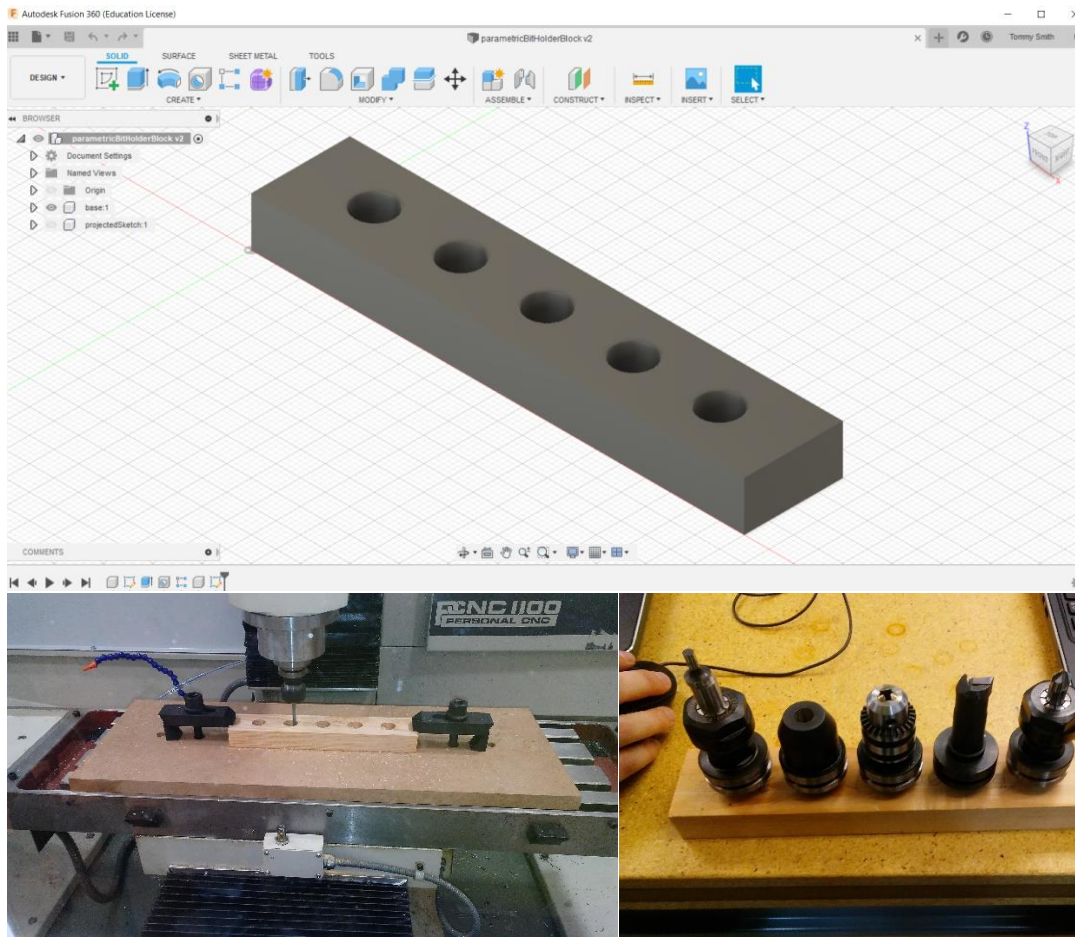
Determine the angle you need to cut in the material using your created tool and razor blade

Create a minimal base and hot/CA glue to flat layout walls to create your 3D container



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Use the Path Pilot HUB to import a DXF from Fusion 360. Create your GCODE and then work the conversational tool on the Tormach 1100. Create your tool holder during class. Manipulate your design in Fusion 360 to suit your needs. Fit the material chosen. Start the tool library and post processor for the Tormach CNC1100. Work to design a full extra tool holder and two in process TTS tool holders for each project. Use the conversational facing, DXF and drilling to make your parts on the 1100. Sand and finish your parts. Make sure you add your settings appropriately to the Feeds and Speeds Google Doc.

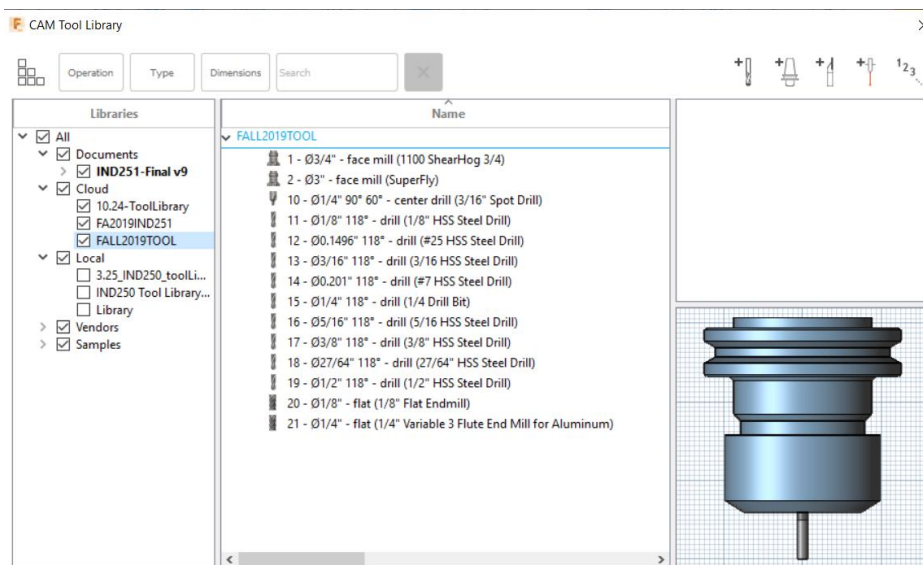


What are the top few lines of GCODE in our program that we reverse engineered?  
Break down each command and write down its meaning.  
Create a simple program for a block on your own using G0 commands.

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G-Code words			
<b>G0</b>	Rapid Linear Motion	<b>G59.2</b>	Select Coordinate System 8
<b>G1</b>	Linear Motion at Feed Rate	<b>G59.3</b>	Select Coordinate System 9
<b>G2</b>	Arc at Feed Rate	<b>G80</b>	Cancel Modal Motion
<b>G3</b>	Arc at Feed Rate	<b>G81</b>	Canned Cycles – drilling
<b>G4</b>	Dwell	<b>G82</b>	Canned Cycles – drilling with dwell
<b>G10</b>	Set Coordinate System Data	<b>G83</b>	Canned Cycles – peck drilling
<b>G17</b>	X-Y Plane Selection	<b>G85</b>	Canned Cycles – boring, no dwell, feed out
<b>G18</b>	Z-X Plane Selection	<b>G86</b>	Canned Cycles – boring, spindle stop, rapid out
<b>G19</b>	Y-Z Plane Selection	<b>G88</b>	Canned Cycles – boring, spindle stop, manual out
<b>G20</b>	Length Unit inches	<b>G89</b>	Canned Cycles – boring, dwell, feed out
<b>G21</b>	Length Unit millimeters	<b>G90</b>	Set Distance Mode Absolute
<b>G28</b>	Return to Home	<b>G91</b>	Set Distance Mode Incremental
<b>G30</b>	Return to Home	<b>G92</b>	Coordinate System Offsets
<b>G53</b>	Move in Absolut Coordinates	<b>G92.1</b>	Coordinate System Offsets
<b>G54</b>	Select Coordinate System 1	<b>G92.2</b>	Coordinate System Offsets
<b>G55</b>	Select Coordinate System 2	<b>G92.3</b>	Coordinate System Offsets
<b>G56</b>	Select Coordinate System 3	<b>G93</b>	Set Feed Rate Mode units/minutes
<b>G57</b>	Select Coordinate System 4	<b>G94</b>	Set Feed Rate Mode inverse time
<b>G58</b>	Select Coordinate System 5	<b>G98</b>	Set Canned Cycle Return Level
<b>G59</b>	Select Coordinate System 6	<b>G99</b>	Set Canned Cycle Return Level
<b>G59.1</b>	Select Coordinate System 7		

Generate Tool Library in Fusion 360:



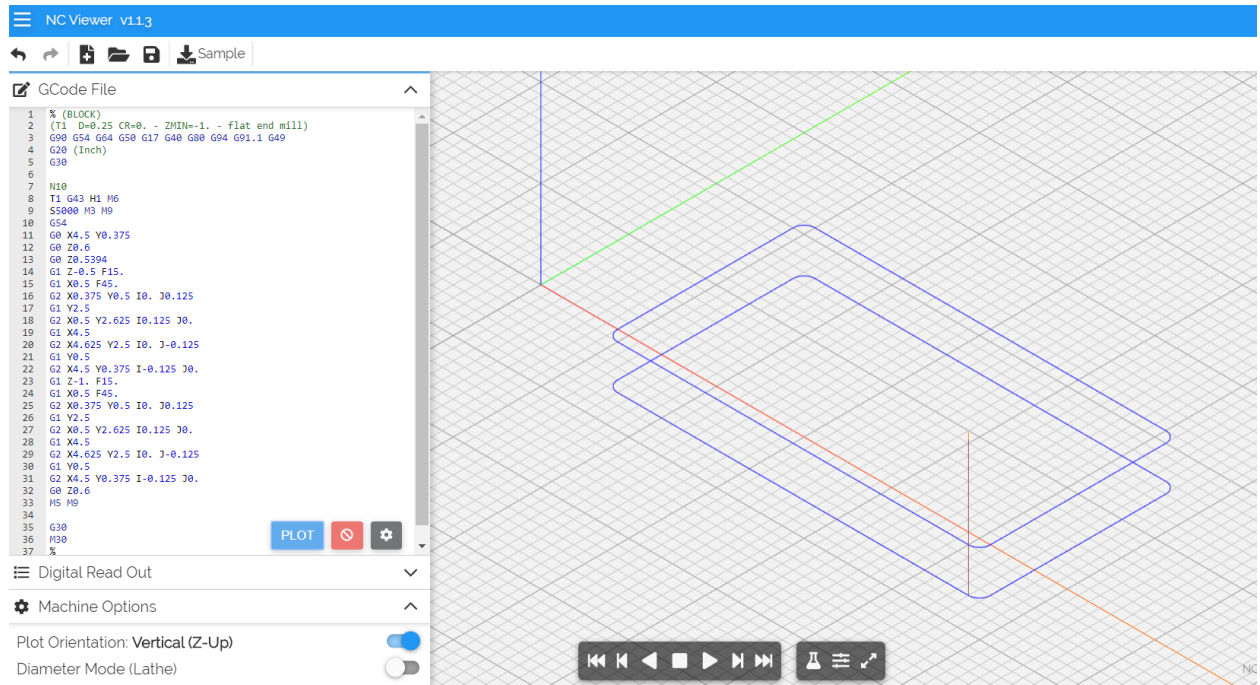
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```
% (BLOCK)|  
(T1 D=0.25 CR=0. - ZMIN=-1. - flat end mill)  
G90 G54 G64 G50 G17 G40 G80 G94 G91.1 G49  
G20 (Inch)  
G30
```

```
N10  
T1 G43 H1 M6  
S5000 M3 M9  
G54  
G0 X4.5 Y0.375  
G0 Z0.6  
G0 Z0.5394  
G1 Z-0.5 F15.  
G1 X0.5 F45.  
G2 X0.375 Y0.5 I0. J0.125  
G1 Y2.5  
G2 X0.5 Y2.625 I0.125 J0.  
G1 X4.5  
G2 X4.625 Y2.5 I0. J-0.125  
G1 Y0.5  
G2 X4.5 Y0.375 I-0.125 J0.  
G1 Z-1. F15.  
G1 X0.5 F45.  
G2 X0.375 Y0.5 I0. J0.125  
G1 Y2.5  
G2 X0.5 Y2.625 I0.125 J0.  
G1 X4.5  
G2 X4.625 Y2.5 I0. J-0.125  
G1 Y0.5  
G2 X4.5 Y0.375 I-0.125 J0.  
G0 Z0.6  
M5 M9
```

```
G30  
M30  
%
```

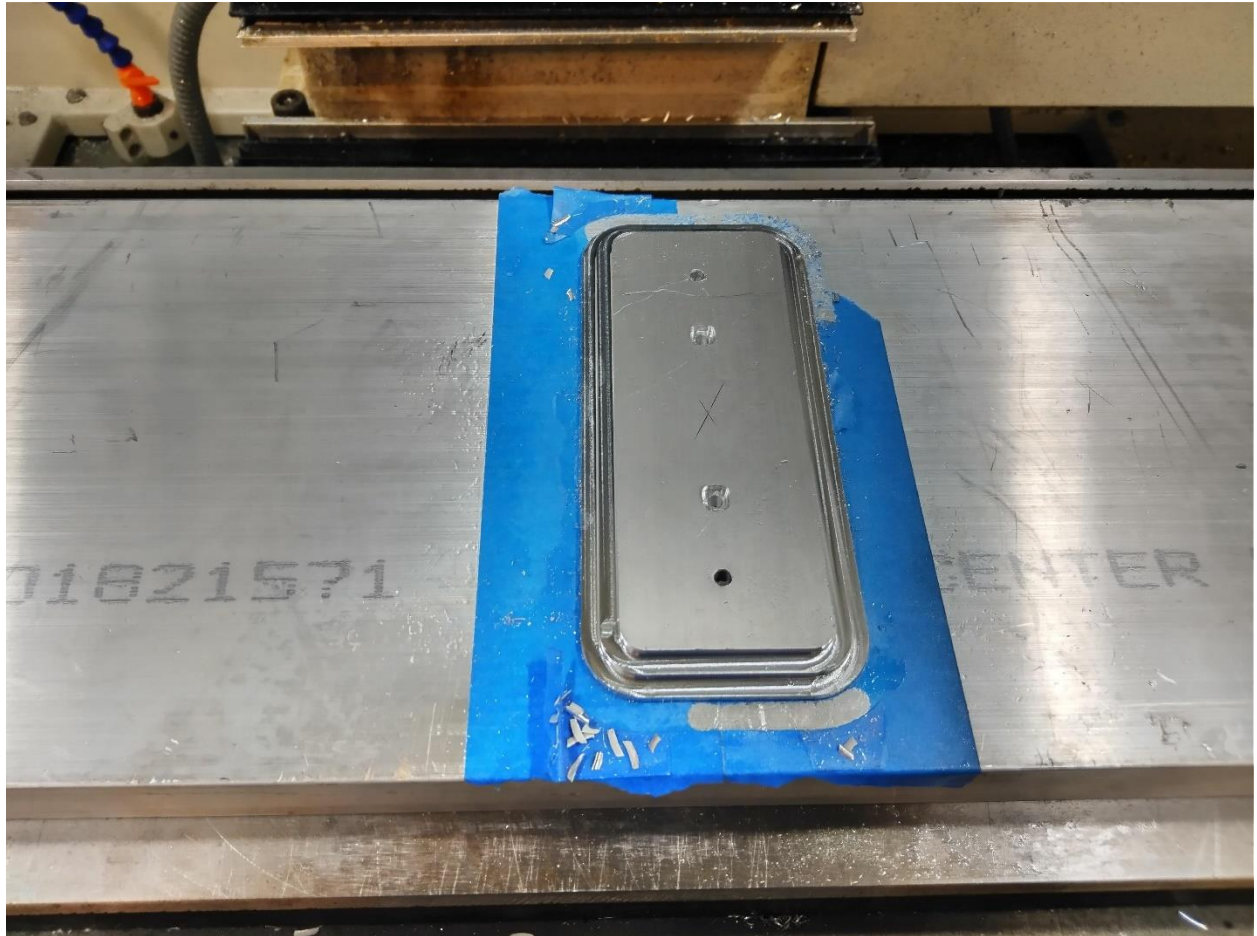
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- The technical drawing illustrates the design of a Bird Feeder Holder through three distinct views:
- Front View (Top):** Shows the main profile of the holder. It features a series of five circular feed ports along its length. Key dimensions include a total length of 11.57, individual segment widths of 1.5, 1.25, 1.25, 1.25, 1.25, and 1.38, and a height of 2. The bottom edge tapers from left to right.
  - Side View (Bottom Left):** Provides a cross-sectional view of the holder's body. It shows a rectangular shape with rounded corners (R.5 and R.35) and internal structural details like holes (Ø.13, Ø.15) and slots. Dimensions include a width of 1.95, a depth of .28, and overall heights of 1.83 and 1.75.
  - Perspective View (Right):** A 3D rendering of the assembled bird feeder holder, showing its L-shaped form and how it would be used to hold a bird feeder.
- A title block at the bottom right contains the following information:
- |                              |  |              |               |               |            |
|------------------------------|--|--------------|---------------|---------------|------------|
| <b>PROJECT</b>               |  |              |               |               |            |
| <b>IND-251 FINAL PROJECT</b> |  |              |               |               |            |
| <b>TITLE</b>                 |  |              |               |               |            |
| <b>Bird Feeder Holder</b>    |  |              |               |               |            |
| <b>APPROVED</b>              |  | <b>SIZE</b>  | <b>CODE</b>   | <b>DWG NO</b> | <b>REV</b> |
| <b>CHECKED</b>               |  |              |               |               |            |
| <b>DRAWN</b> Tommy Smith     |  | <b>SCALE</b> | <b>WEIGHT</b> | <b>SHEET</b>  |            |

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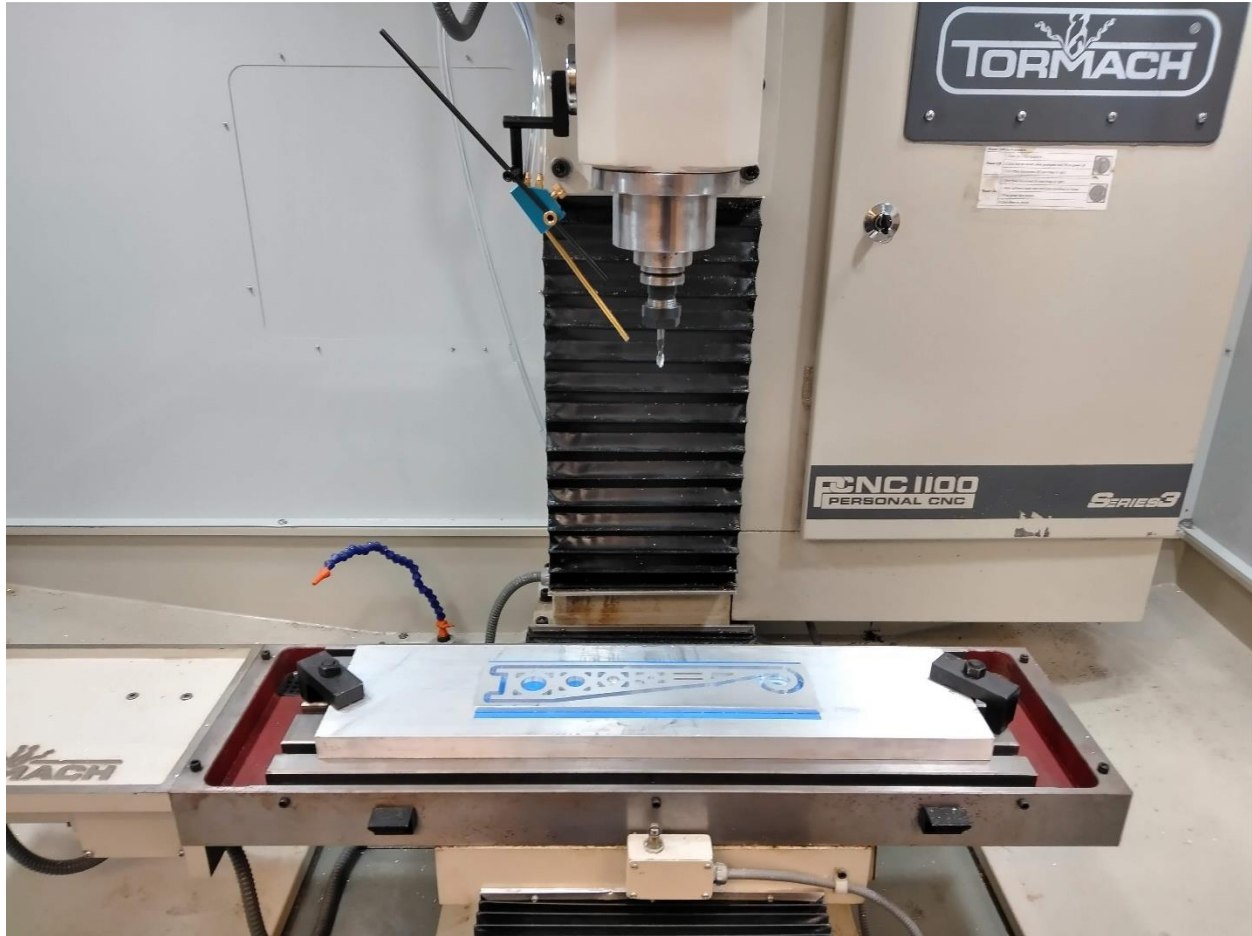


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