

Easel X-Axis offset when tiling

Description

When carving a tiled project, people have experienced misaligned toolpaths when shifting materials between tiles. Vertical toolpaths are not aligned on the x-axis at the tile boundary. This happens when using last work zero position.



Problem explanation

We have initially thought this to be a software issue. Through testing in Easel we have realized the toolpaths sent to the machine were correct, but the material was not lined up correctly between carved. Even small deviations between how the material is aligned propagate to large values when material is large enough.

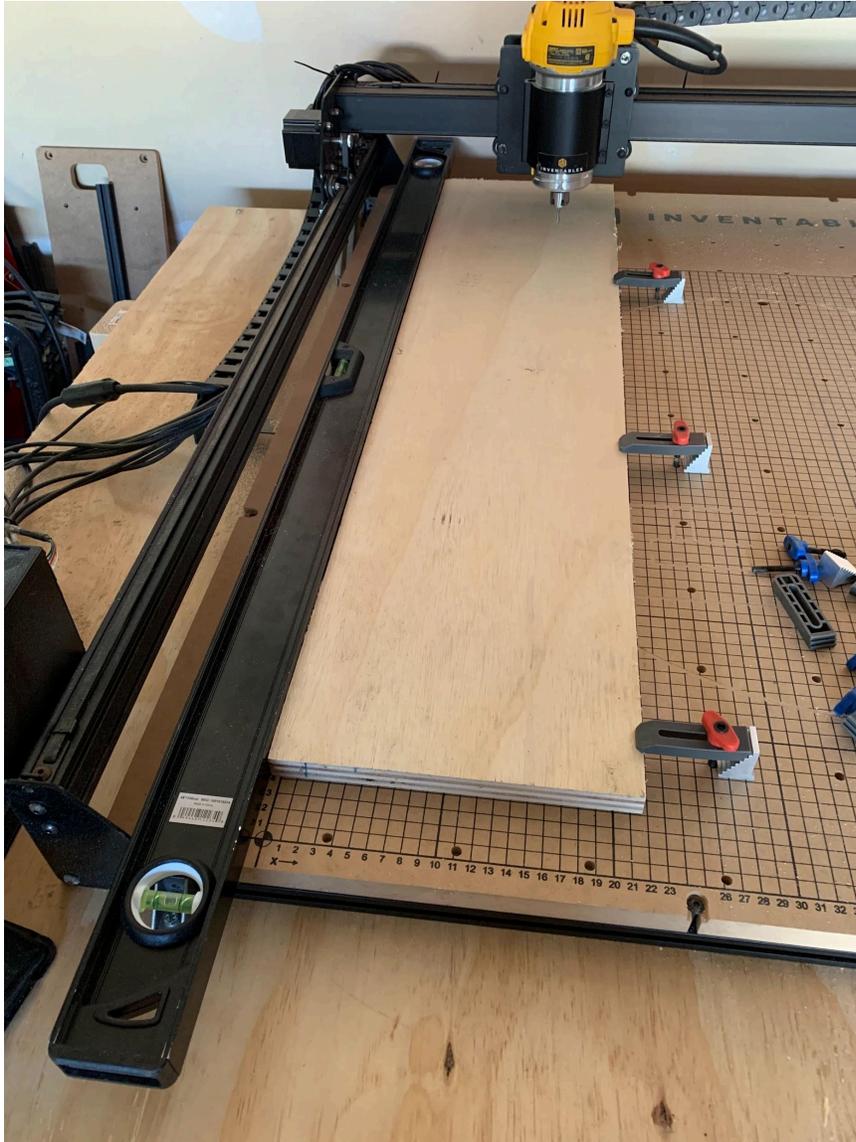
There are 2 potential problems with material alignment:

- Material does not have a straight edge (bowed and/or cupped materials, especially common with dimensional lumber)

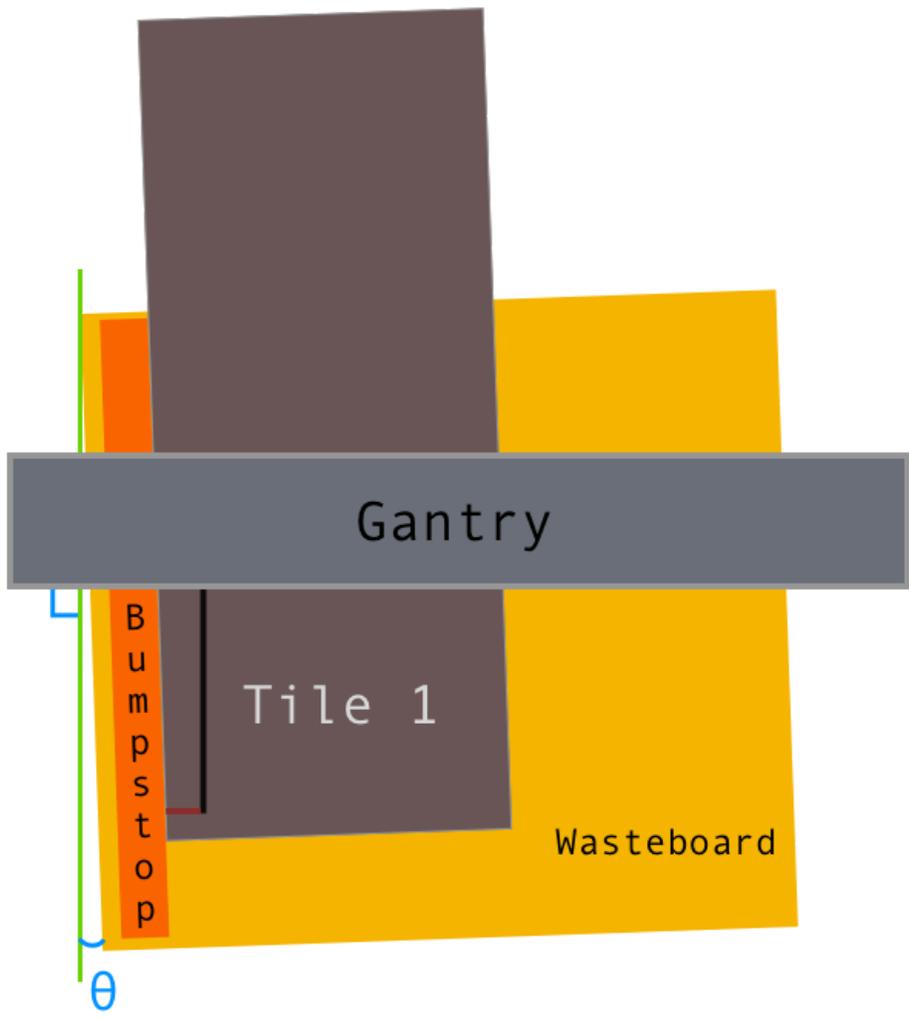
- Gantry is not square to the machine frame

There is limited action we can do with 1st problem. Having the material on which you are carving with straight edge is one of the fundamental requirements of tiling as explained on the [feature page](#).

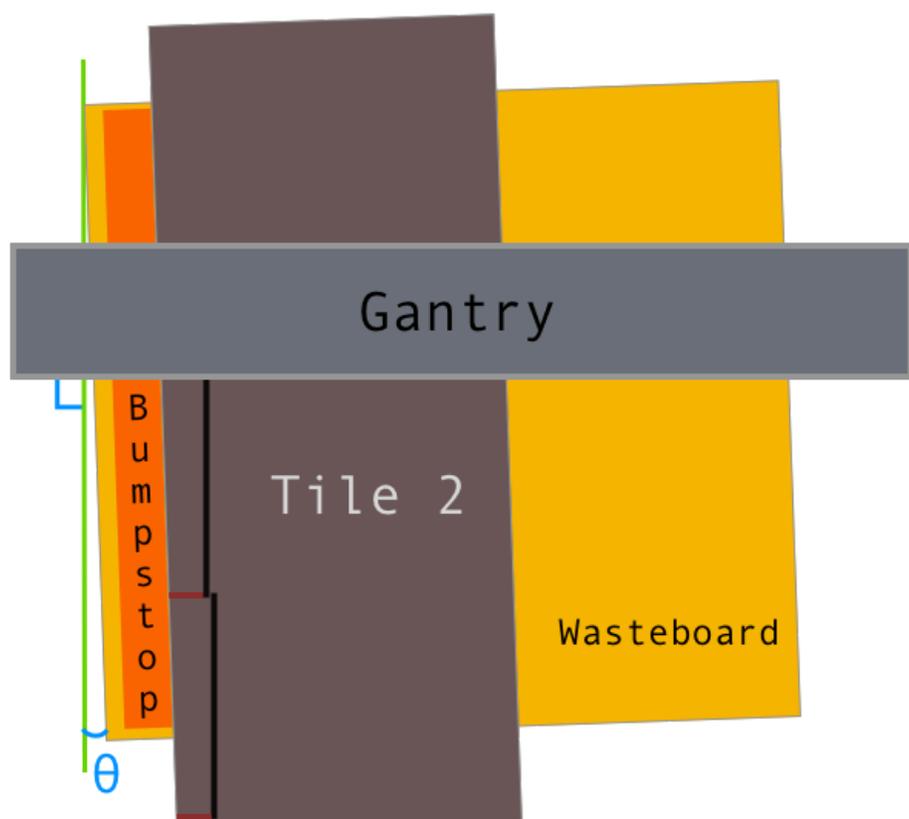
Second problem seems to not be such an issue for a lot of our users who assume the gantry and machine frame are perfectly square. Here is one of the example setups with 48" long level bumped against the machine frame, which might not be perfectly square with the gantry



Drawing below shows how the angle relates to the machine and material. The rectangle below represents the material tilted from the gantry squareness.



Square Line (w.r.t. the gantry)



Marking the edge of material for alignment.



Potential Alignment Pins Solution for Tiling

On the X-Carve Pro, utilized bushings and pins to ensure that stock pieces have a straight edge to work from when the user is tiling. The solution discussed below showcases a test on MDF with a $\frac{1}{8}$ " bit and a 90 deg V-Carve bit on 6" tiles.

Setup

- Open Easel Project: <https://easel.inventables.com/projects/BrgL5j83fCixBrzC1HH-Hw>
- Use a $\frac{1}{8}$ " bit to make 6 circular pockets on the wasteboard with a 0.370" diameter and 0.25" depth
 - Note: Depth at 0.25", because the grommets are 0.27" down from the wasteboard

- Fit in 0.375" OD and 0.25" ID bushings into the holes. (May need to hammer it in)
 - Note: Kept the hole smaller such that there is a tight fit
- Insert 6 of the 0.25" pins into each bushing. (May need to hammer it in)
 - Note: This is a tight fit and quite sturdy. So, to take out the pins, use a drill or vise grips
- Grab a long stock piece that has been run through the table saw to ensure there is one flat side
- Place the flat side of the stock piece against the pins and screw in clamps to secure the piece.

Bill of Materials

- Prices are based off of McMaster Carr. Typically, other vendors can be 50% lower cost.
 - Total cost from other vendors could be as low as \$25

Total Cost for Testing			\$49.67		
Type	Part	Qty	Price	P*Q	Link
Bushing	ID: 0.25" OD: 0.375" Length: 0.25"	6	6.52	39.12	https://www.mcmaster.com/8491A099
Pin	D: 0.25" Lg: 2" Pack of 25	1	10.55	10.55	https://www.mcmaster.com/98381A550/

Picture of Setup



Procedure

- Insert $\frac{1}{8}$ " bit and run a line across the stock piece at 6" tiles each for 24" or 48" depending on the size of the machine and stock piece. Utilize the easel document above.
 - Note: For this test, I ran at 6" tiles, feel free to edit the size of the tile/stock by changing the machine/stock size in Easel
- Repeat above with a 90 deg V-Carve Bit

Results

- Both the $\frac{1}{8}$ " bit and V-Carve bit has little to no deviation when tiled at 6" tiles
- Furthermore, the V-Carve bit test had one tile at 5 pins and that showcased a little to no deviation as well.

Pictures of Results

1/8" Bit, the horizontal line is where the tiles intersect



90 Deg V-Carve Bit, the horizontal lines are where the tiles intersect (Left line is a Rectangle on Easel and right line is a Line on Easel)

