# Lathe Steady Rest
# With Instructions for any Lathe

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Instructions to build a 16 inch Steady Rest for a Nova 1624 Lathe on Shapeoko CNC. I include instructions to change the construction for any lathe you have. The examples are for a 16” Nova 1624 lathe. So change measurements as necessary for your lathe.

Material Preparation

1. Cut two .75” thick Maple, Oak or Birch plywood pieces to at least 17” x 17” for 16” lathe.
2. Glue the two pieces of plywood together and let dry.
3. Prepare 2 hardwood blanks to be machined on the CNC that are .75” thick and 3” X 21” . These will become the arms that will steady the turning.
4. Hardware Required. These are examples only order what you want.

Three 80MM Inline Skates Wheels with 8MM holes in bearings.
Three 80MM bolts that are 60MM Long (For Inline Skate wheels)
Nine 80MM washers (For Inline Skate wheels) Plus small washers that come with wheels
Three 80MM Nylon Nuts (For Inline Skate wheels)
Three 80MM Carriage Bolts that are 40MM Long (to secure arms to steady rest)
or Three 5/16” 1.5” Carriage Bolts
Three 80MM Female treaded knobs (to secure arms to steady rest)
or Three 5/16” female threaded knobs
Three 80MM washers (to secure arms to steady rest)
or Three 5/16” washers (to secure arms to steady rest)

If you change the hardware you will need to adjust plans to fit changes. 5/16” SAE bolts will also work in place of the 8MM bolts with no changes.

The CNC Carbide Create V7 files are on Google Drive and are public files anyone can download.

16” Steady Rest for Nova 1624: https://drive.google.com/file/d/1iYIZHiVSN-qIFymELtnziFYKwy1QrLvS/view?usp=sharing

12” Steady for Jet 1221VS:
https://drive.google.com/file/d/1XcUO2W2V_ptG59Lrttg_lUd46svYygZ9/view?usp=sharing

Steady Rest Arms: https://drive.google.com/file/d/10THXr2Lrc4FnuXQiPxHomEqSpO8K739L/view?usp=sharing

# How to construct the Steady Rests in Carbide Create

There are several lathe measurements you need before starting the creation of the steady rest in Carbide Create. Use a digital caliper for measurements.

Maximum size of lathe_____ (i.e. 10”, 12”, 14” 16”, 20” 24”)

Measurement of your lathe ways from outside to outside_____

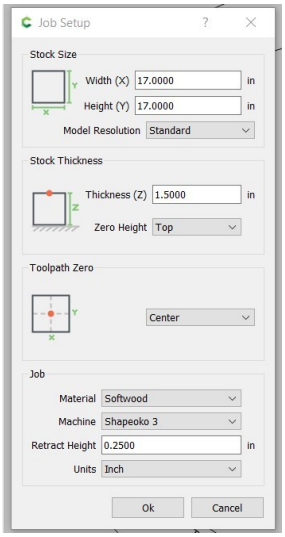
Measurement of your lathe between ways_____

Measurement of your lathe from top of ways to bottom of ways_____

You need these measurements to create a model of the steady rest in Carbide Create.

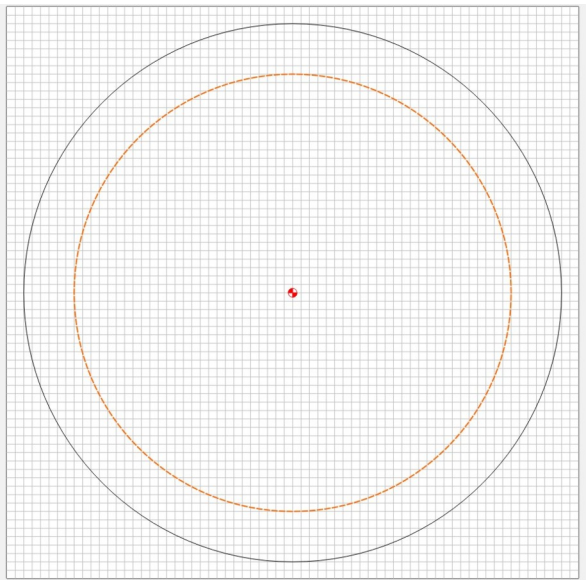
NOTE: My design will not allow maximum size of turned object on your lathe to be used. For instance a 16” lathe can have about a 13” maximum object held by the steady rest. You can make the steady rest bigger but the limitation is at the bottom and how long the steady rest arms can be without touching the inside of the ring. So I make my steady symmetrical but that reduces the maximum size of a bowl or other object that can be supported by the steady rest. Also the minimum size is about 1.5”. To make a steady rest for a smaller diameter object you would need to get smaller rollers to allow for a smaller diameter spindle to be held steady. With the instructions below you can make a custom steady rest for your lathe.

1. Open Carbide Create and set up job.
    a. Set Stock Size. Use whatever size you glued up for your steady rest.
    b. Set Stock Thickness. Measure your glued up stock with calipers. Most plywood is not actually .75”. Also set top or bottom for zero height. In examples I set top.
    c. Set Toolpath Zero, I set Center, set to your preference. I use the center to set up all the parts of the project for centering of the objects.
    d. Job Setup
        1. Material: Softwood (Plywood)
        2. Machine Type: Shapeoko 3 (For me, set to your machine type)
        3. Set Retract Height: I set .25” (you set whatever will clear your work holding. The lower the retract the faster the job runs)
        4. Set Units: Inch/Metric (For me I set Inches)

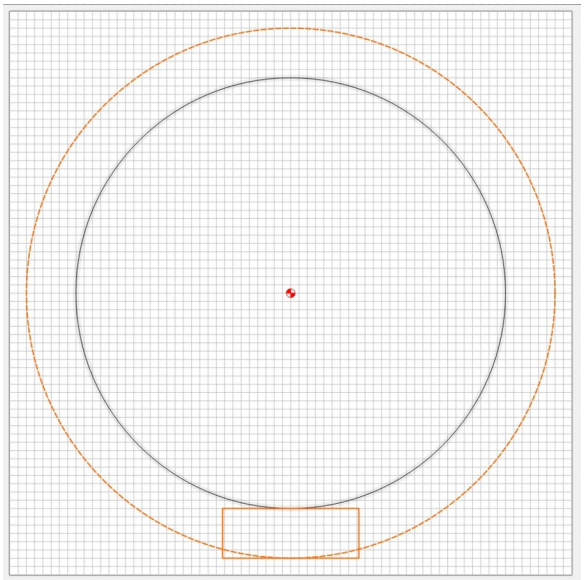



5. Set Grid to .25”
6. Under View check Snap to Grid

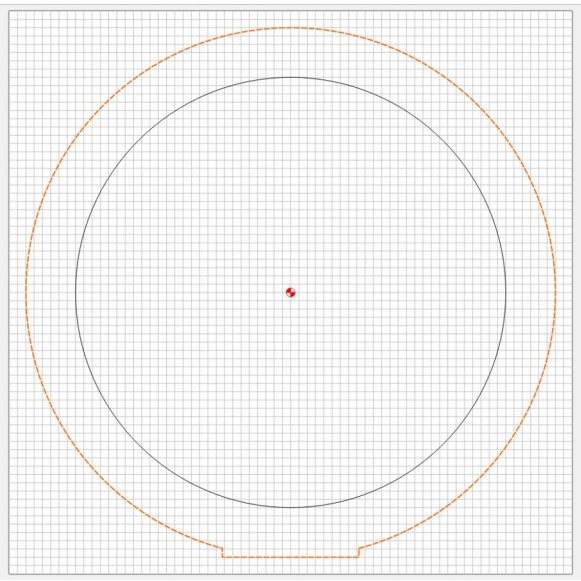
2. From you measurements start by drawing a circle the maximum size of your lathe. This example will be for a 16” lathe. Draw a circle with 8” radius. Then draw another circle with a 6.5” radius. The outside circle is the maximum size of your lather. The inside circle is 1.5” smaller than your maximum size and is a 6.5” radius. Make sure both circles are centered on the stock. Change these circles for your lathe but the inner and outer circles are 1.5” apart.



3. Create a rectangle the width of your bed ways. In my case 4.125” wide and 1.5” tall. The 1.5” is the width between the inner and outer circles. Place the rectangle aligned with the bottom edge of the outer circle and centered on the stock. Select the rectangle first and then hold down shift and select the outside circle.

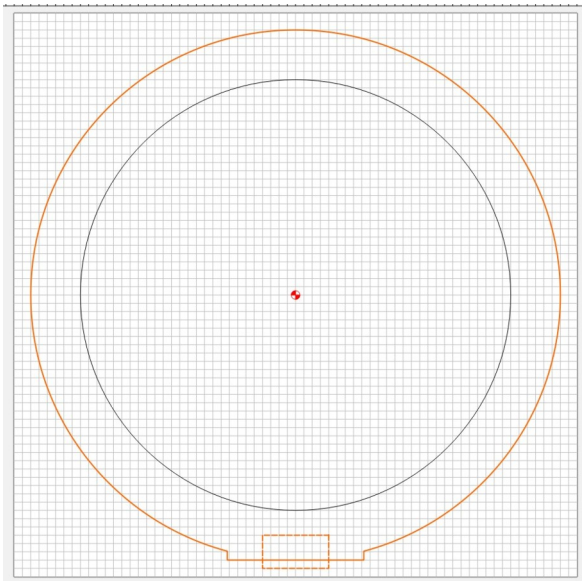


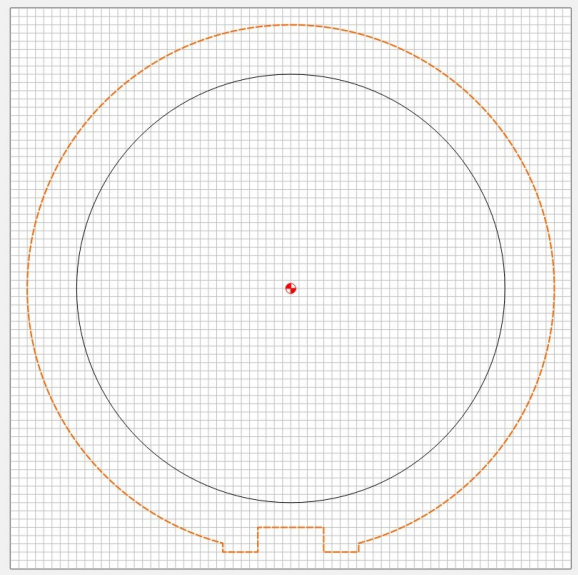
4. With the rectangle and circle selected create a Boolean Union.



5. From your measurements create a rectangle that is the width of the distance between your ways and the height of .75”+.25” to make the objects overlap for Boolean Subtraction to work. This will be used later to anchor your steady rest and keep the steady rest perpendicular to the bed ways. A piece of wood will be glued into this slot. In this example the width between my ways is 2.0”

Select the outer circle first and then the small rectangle and perform a Boolean Subtraction.



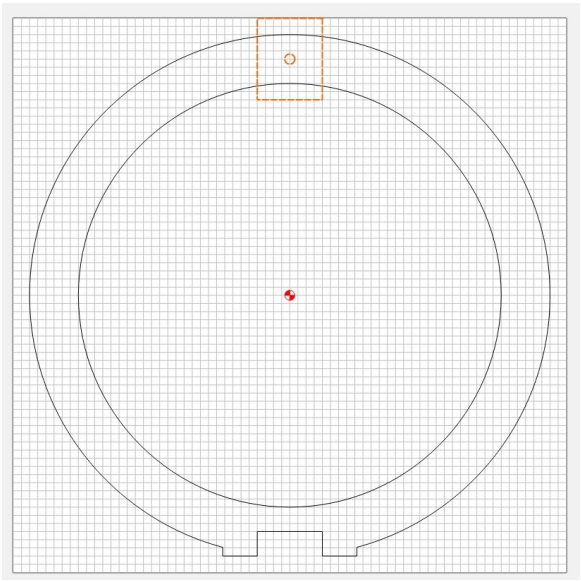


6. Now the basic steady rest is drawn. Next we will draw the recesses of the thee arms that hold your turning secure.

7. Draw a rectangle that is 2” wide by 2.5” height. Move the rectangle to overlap the top of the circles and center it. The reason for the overlap is when you pocket this object it will extend past the circles and have a straight side between the two circles.

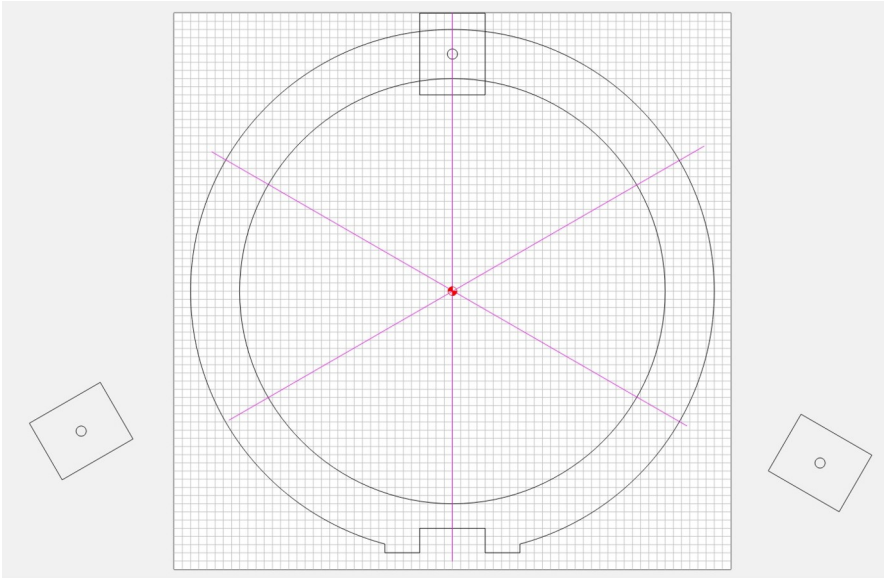
8. Now draw a circle that is 8MM (.31496”) (.157” Radius) This will become a through hole for an 8MM bolt that will anchor the arms on the steady rest.

9. Move the 8MM circle close to the center of the rectangle. Select the circle then the rectangle and align them left/right and top/bottom so the circle is centered in the rectangle. After aligned then group the rectangle and circle.

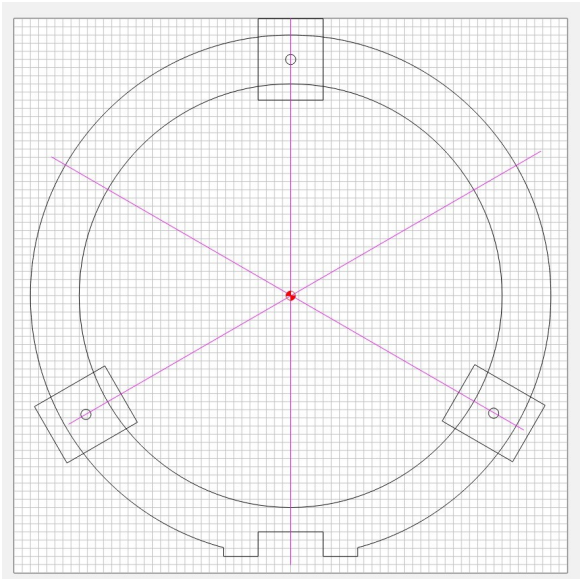


10. With the grouped rectangle and circle copy and paste them for a total of 3 objects.

11. Draw a poly line from the top of the material to the bottom using the Ctrl key to keep the line straight. Use the alignment tool to make the poly line centered on the material. Then copy and paste the line to have three poly lines. Take the second poly line and rotate it 120 degrees. Then rotate the third poly line 120 degrees and then 120 degrees again. Then align the three poly lines so they cross in the center of the material. Also select the second rectangle and circle and rotate it 120 degrees and then rotate the third rectangle and poly line 120 degrees and then 120 degrees again.



12. You need to unselect snap to grid under View. Now move the second rectangle and circle to align with the poly line on the lower left side of the material. Then move the third rectangle and circle to align with the poly line on the lower right side of the material. After aligning the rectangle and circle you can delete the three poly lines.



13. The construction of the 16” steady rest is complete. Now to make the toolpaths. I used the Tool #251 for an example but that tool only has a .75” cutting capacity. I used a 1.5” cutting capacity bit which is a Melin AMG-808-E 14030 ¼” bit. I ordered it from zoro.com

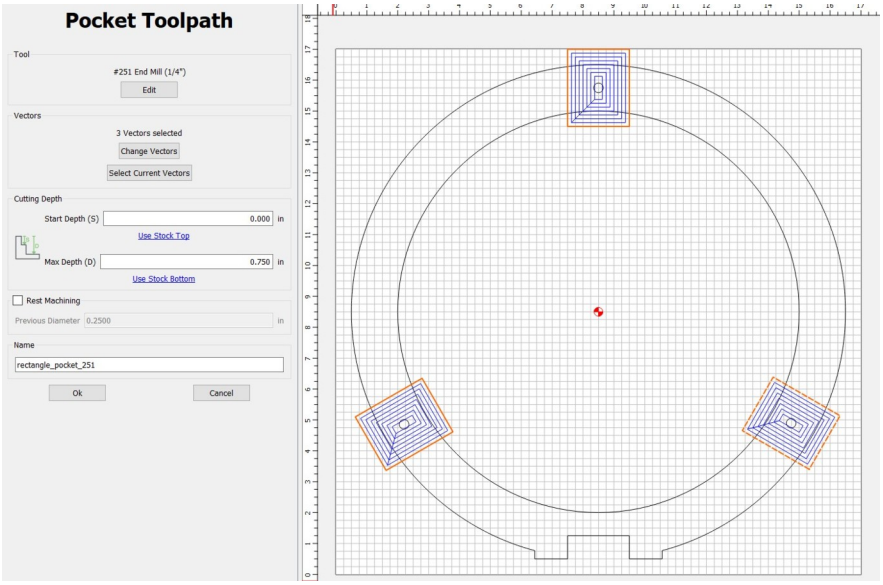
https://www.zoro.com/melin-tool-company-end-mill-carbide-gp-square-14-x-1-12-amg-808-e/i/G4963353/?q=melin%2014030

The price as of July 18, 2022 was $33.04 each. This is an upcut bit bit it has two flutes and is most similar to the #251. You can make a custom tool in Carbide Create if you want.

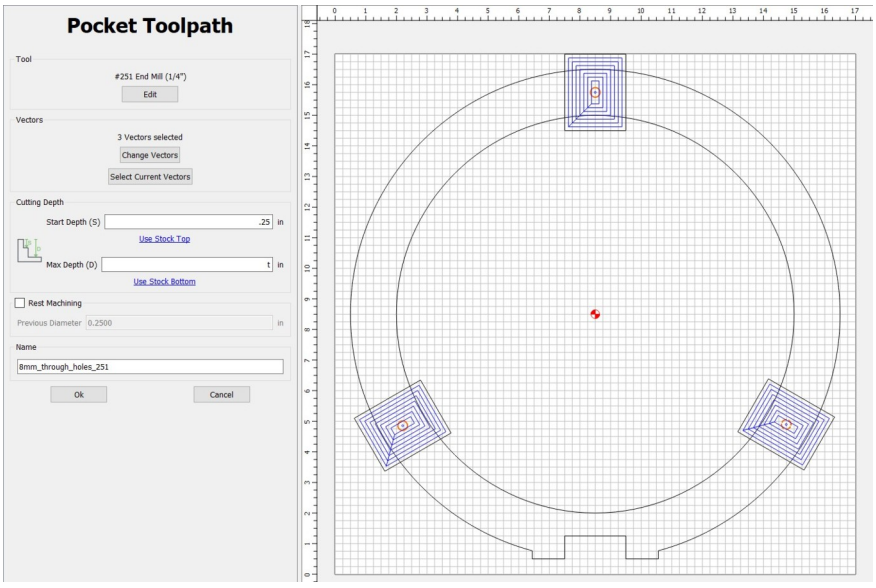
Please get a bit that has a 1.5” cutting depth and substitute your custom tool for the #251 in the examples.

14. Always start with the least intrusive cuts first. So in this case we will cut the three rectangles out then the 8MM holes, then the inner circle and then the outside circle.

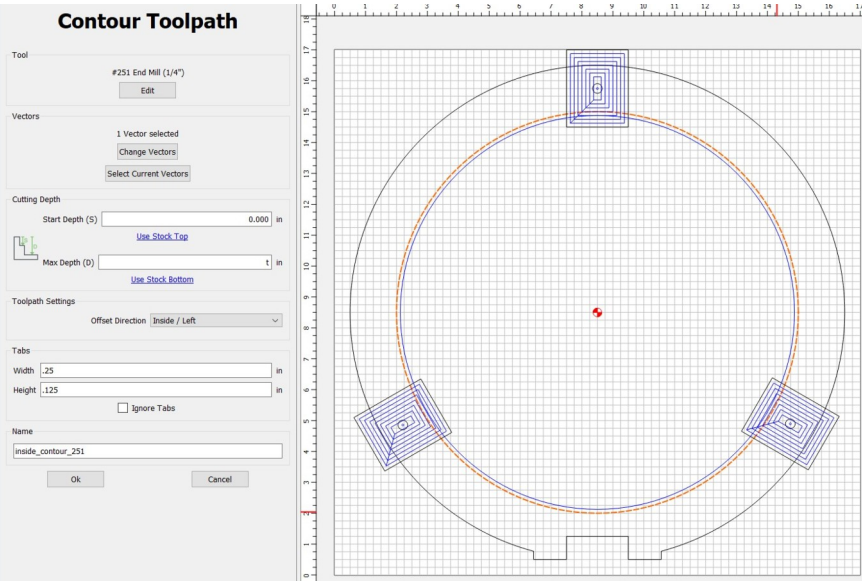
15. You will need to ungroup the three rectangles and circles. Select the three rectangles and create a pocket toolpath. Select your tool. I selected the #251 down cut end mill. Then start at top and cut .75" deep.



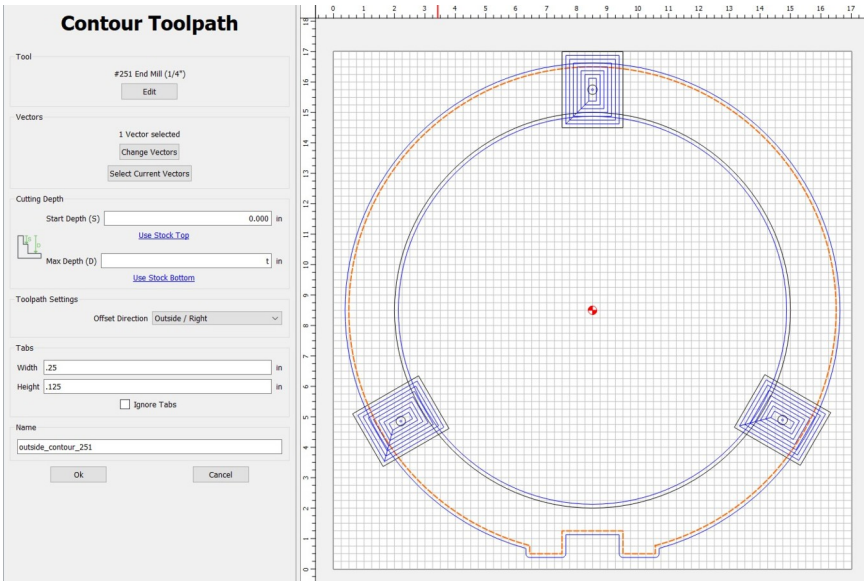

16. Now select the three 8MM circles. Select the #251 tool. Select a pocket with a starting depth of .75" and either use stock bottom or input the character "t". Starting in V6 of Carbide Create a variable was created and the variable t means stock bottom. The advantage of using "t" is if you change the stock thickness the toolpaths are updated. You must save the c2d file to incorporate the changes in stock height.



17. Select the inner circle. Make a toolpath that is a contour. Select the #251 tool. Select a contour with a starting depth at the top and use stock bottom and/or “t”. Use the inside for the offset direction.

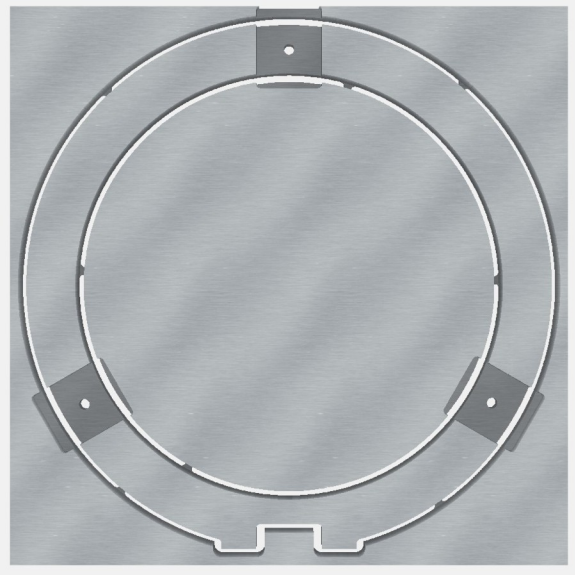



18. Select the outer circle and create a tool path. Select the #251 Tool, Select a contour with a starting depth at the top and use stock bottom and/or “t”. Use the outside for the offset direction.



19. Go to the Design tab and add tabs to the inner and outer contours.

20. The toolpaths are finished now show a simulation. I like to use the aluminum as material because many of the wood backgrounds are distracting to me. I also like to turn off the tool paths to see the object more clearly.



21. Save your c2d file.

22. Take your prepared stock and secure it to your spoil board. This object is rather large so I sunk 4 screws in the 4 corners outside the cutting area and two screws in the inside circle. I added tabs to hold the inner and outer circles in place after cutting. You can use any method you like to secure your stock.

23. Since the entire project was created with a #251 Downcut bit there will be no bit changes.

24. Start Carbide Motion, initialize and then zero your stock X Y and Z zeros.

25. Start your project with your dust collection. I used the Tool #251 that tool only has a .75" cutting capacity. I used a 1.5" cutting capacity bit which is a Melin AMG-808-E 14030 ¼" bit. I ordered it from zoro.com

https://www.zoro.com/melin-tool-company-end-mill-carbide-gp-square-14-x-1-12-amg-808-e/i/G4963353/?q=melin%2014030

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Please get a bit that has a 1.5" cutting depth and substitute your custom tool for the #251 in the examples.

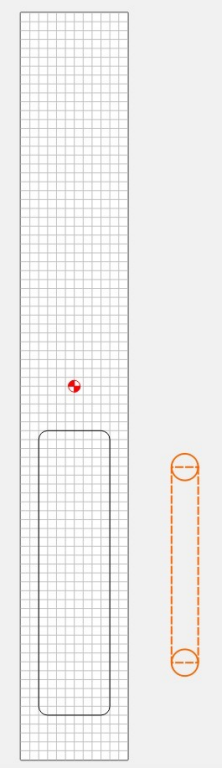
# How to construct the Steady Rest Support Arms in Carbide Create

1. Open Carbide Create and create a new file. Start with setting up the material.

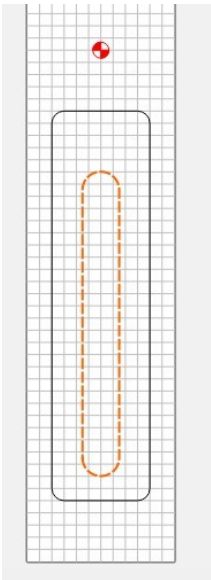
    a. Set Width to 2” and Height to 21”
    b. Thickness set to .75” and Zero Height to Top
    c. Set Toolpath Zero to Center
    d. Set material to Hardwood, Machine Type, Retract Height and Units

2. Create a rectangle that is 2” wide and 8” height. Select fillet and .25” radius. Place rectangle on lower half of material. Make sure the rectangle is centered on the material. We will create one of the support arms and then copy and paste it for the second.

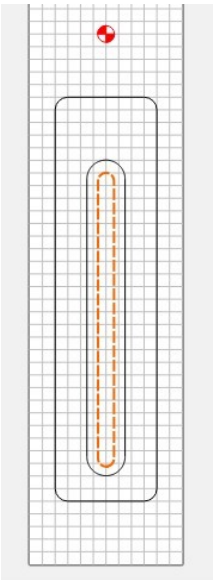
3. Create a rectangle that is 5.5” height and .75” width. Then create two circles that are .75” round (.375 Radius) and move them to the top and bottom of the rectangle so the circles overlap the top and bottom half way.



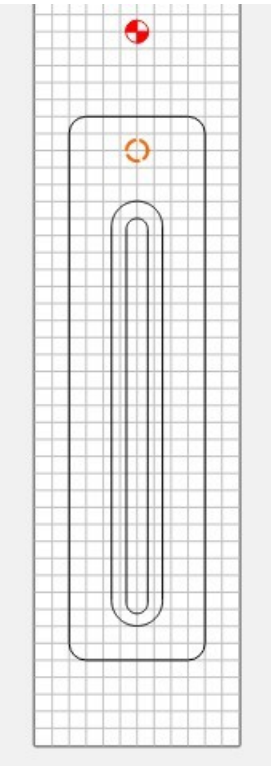
4. Now select the two circles and the rectangle and do a Boolean Union. The Boolean Union object is moved toward the bottom of the larger rectangle. Make sure the object is centered.



5. Now create a rectangle that is .314” wide by 5.5” height. Then create two circles that are .314” (.157” Radius). Move those circles to the top and bottom of the rectangle and center them on the top and bottom. Select all 3 objects and create a Boolean Union. Move the Boolean Union and center it on the larger Boolean Union made earlier.



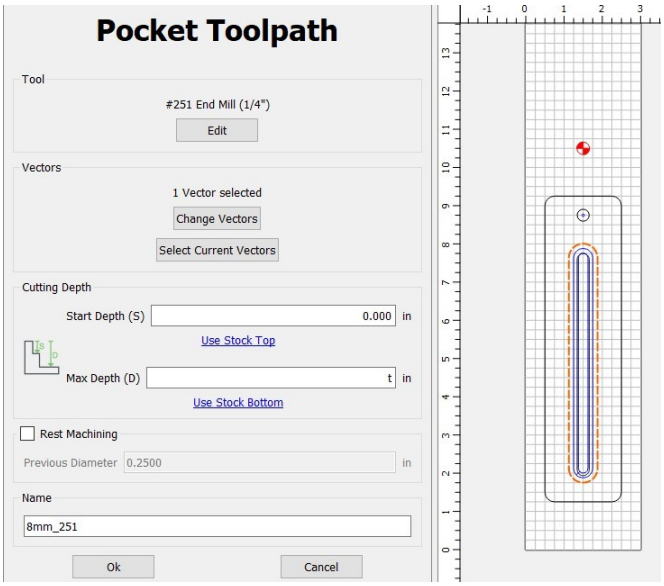
6. Now create a circle that is .314” (.157” radius). Place the circle towards the top of the larger rectangle .5” from top of rectangle. This is the hole to secure the skate wheel for the support arm.



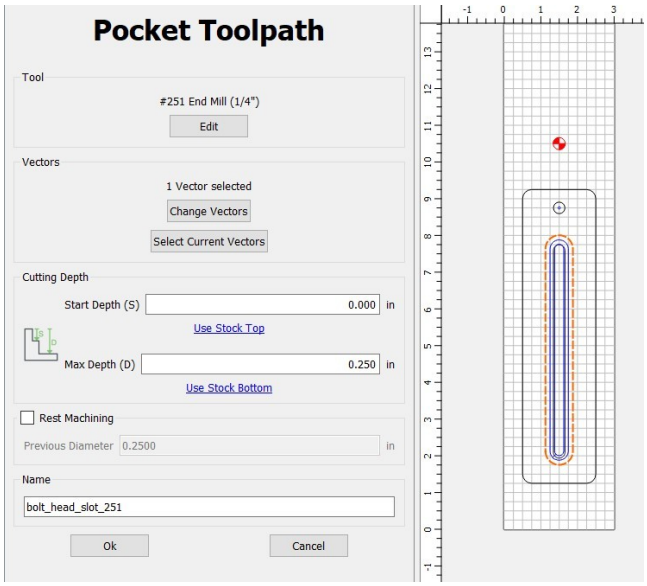
7. The construction of the support is finished. Now to make toolpaths.

8. There will be four toolpaths. Always start with the least intrusive paths first. First is the 8MM bolt hole for the roller blade. Next is the slot for the bolt head. Then the slot for the bolt to pass through and then the arm cutout.

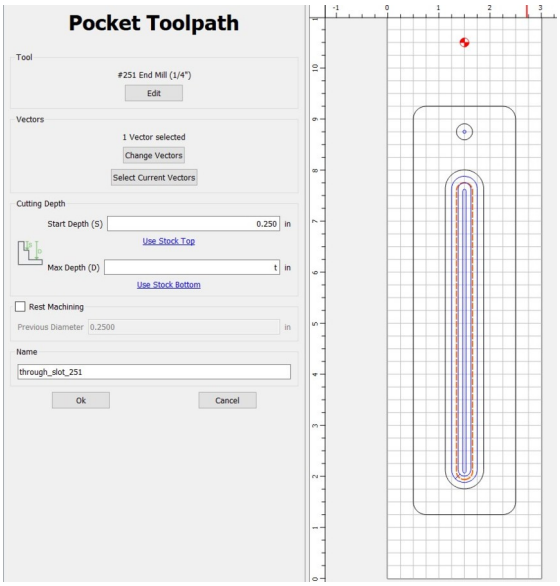
9. Select the 8MM hole and select a Pocket toolpath. The start depth is 0 (top) and the max depth is stock bottom and/or “t”.



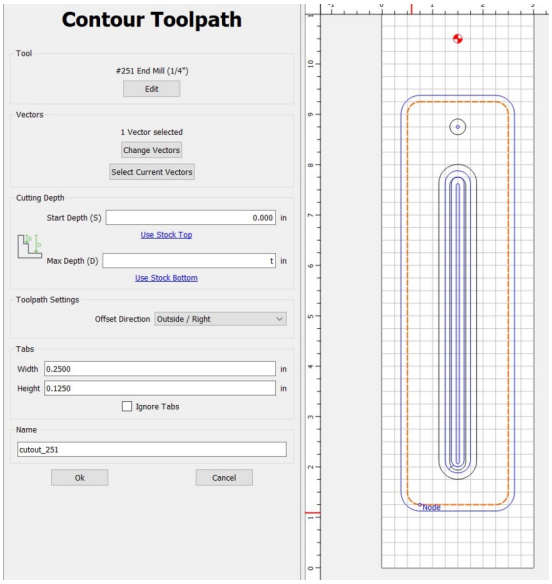

10. Next select the larger Boolean Union which is the bolt head slot. Select a pocket toolpath. The start depth is 0 and the max depth is .25”.



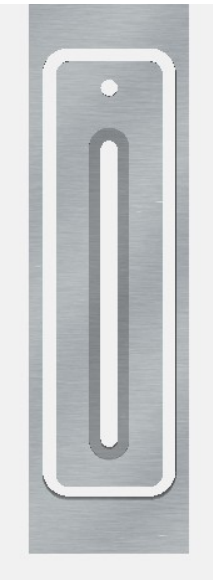
11. Now select the smaller Boolean Union which is the through slot for the bolt. Select a Pocket toolpath with a starting depth of .25” and stock bottom and/or “t”.



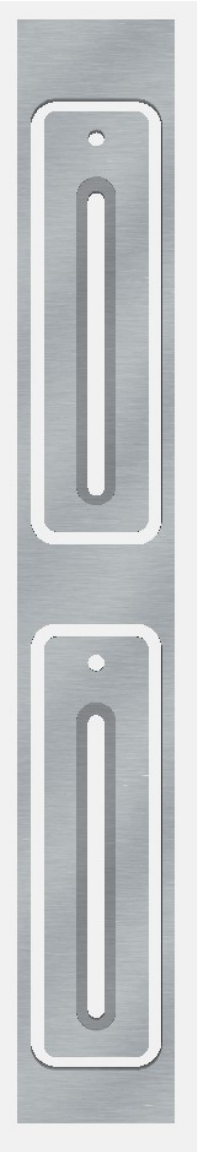

12. The last tool path is to select the large rectangle. Select a Contour toolpath. Start depth is 0 and max depth is stock bottom and/or “t”. Offset direction is outside. If you are going to use tabs set your tab width and depth. In the design I set tab width at .25” and height at .125”. If you use painters tape and super glue you do not need tabs. If using tabs go to the Design and add your tabs.



13. The four toolpaths are created now show a simulation to verify your work.



14. Now select all objects and group and then copy and paste. Place the new support arm at the top of the material. Now view a simulation. In my example there are no tabs. If you are using tabs they should be visible in the simulation.



15. When the object was copied and pasted the toolpaths were updated. Now save your c2d file.

16. The support arms are ready to be cut out on your CNC. I used painters tape and super glue but if you are using other clamping solutions place your material on the spoilboard and prepare for cutting. Since the only tool used is #251 there will be no tool changes.

17. I created two of the support arms at a time. I was creating support arms for two steady rests but if you are only making one steady rest then you machine two support arms, then remove one of the support arms in Carbide Create, save your file and then cut only 1. If you remove one of the support arms then change the material size but keep the center as the origin. Personally I like to have spares.

18. You will need to make a piece of wood that will fit in the steady rest that was made back in step 5 of the steady rest construction. The piece needs to be the width of the space between your ways wide and needs to be .75” + the depth of your ways from top to bottom. You will need to square up the corners in the steady rest with a chisel or round off your piece to fit. Glue this piece in and let dry. Drill a hole through the piece you glued in through the steady rest in the center of the steady rest. Then make a piece of wood that is the width of the underside of your ways. Drill a hole through the center. Carve the bolt head pattern in the bottom piece. Put your bolt in the bottom piece and place the steady rest over the bolt and use a female threaded knob to secure the steady rest to the lathe. Check that the knob stays tight during turning operations.

Here are two almost finished lathe steady rests. I need to make the parts in step 18 above to use them.