

# Appendix E. - - - CNC Chair Seat

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## Instructions:

### Part 1 Preparing the Blank

1. Position the seat template on the top of the seat blank. Stay at least  $1\text{-}3/16$  from the edges in the X direction (the width) and  $3/4$  inch from the edges in the Y direction.
2. Mark around the outline of the template.
3. Tap an ice pick through the five template mid-point holes
4. Draw centerlines all the way around (the bottom too) the blank in both the X and Y directions.
5. Construct rip lines 9 inches from the X centerline and a crosscut lines  $11\text{-}11/16$  inch from the Y centerline. The seat's outline should be centered within these lines.
6. Rip the blank on the lines 18 inches wide
7. Cross cut the blank on the lines  $23\text{-}3/8$  long
8. With the seat upside down on a flat surface, check for teeter. If the teeter is small, fix it with a hand plane. If it's big it can be fixed on the CNC

## Part 2 Surfacing the Seat's Bottom

Note: If the blank has been surfaced on both sides, go to Part 4.

1. Vacuum the CNC table.
2. Turn on the power and check water flow.
3. Zero the CNC X and Y using the "HOME" method with 12 inch offset.
4. Move to 0,0 at the CNC's center of travel
5. Put a small cutter in the spindle
6. Put the blank on the CNC table bottom side up with the front of the seat blank pointing in the minus Y direction. Move the blank until it is centered under the cutter and square with the CNC table.
7. If the blank teeters, put equal size wedges under the opposite corners.
8. Without moving the blank, put strong holding fences against the sides of the blank in two directions. Use cam clamps or wedges on the sides to press the blank against the fixed fences.
9. Install the 2-inch surfacing bit. A 3/4-inch extension is good for chip collection
10. Establish zero Z using the Z-zeroing plate on top of the blank.
11. Put on the dust hood.
12. Put on ear plugs
13. Start the dust collector
14. Load file "chSeaSurf03125V09a-surfE2000.tap" or "chSeaSurf01562V09a-surfE2000.tap". The first file makes 1/32-inch cuts and the second makes 1/64-inch cuts.
15. Touch "START". Both files stop after each pass. A pass takes 3 minutes. Click "Resume" if more surfacing is needed.

### Part 3 Surfacing the Seat's Top

1. Vacuum the CNC table.
2. Zero the CNC X and Y using the "HOME" method with 12 inch offset.
3. Move to 0,0 at the CNC's center of travel
4. Put a small cutter in the spindle. A 3/4-inch extension is good for chip collection
5. Put the blank on the CNC table **top side up** with the front of the seat blank pointing in the minus Y direction. Move the blank until it is centered under the cutter and square with the CNC table.
6. Without moving the blank, put strong holding fences against the **sides** of the blank in two directions. Use cam clamps or wedges on the **sides** to press the blank against the fixed fences.
7. Install the 2-inch surfacing bit. A 3/4-inch extension is good for chip collection
8. Establish zero Z using the Z-zeroing plate on top of the blank.
9. Put on the dust hood.
10. Put on ear plugs
11. Start the dust collector
12. Load file "chSeaSurf03125V09a-surfE2000.tap" or "chSeaSurf01562V09a-surfE2000.tap". The first file makes 1/32-inch cuts and the second makes 1/64-inch cuts. Both files stop after each pass. Click "Resume" if more surfacing is needed.
13. Touch "START". Both files stop after each pass (3 minutes). Click "Resume" if more surfacing is needed.
14. **When finished, do not turn the power off or unclamp the blank.**

## Part 4 Drilling dowel holes in the Seat's Top

1. Vacuum the CNC table.
2. If the power has been on, and the blank in place since Part 3, skip to step 6, else turn on the power and check water flow.
3. Zero the CNC X and Y using the "HOME" method with 12 inch offset.
4. Move to 0,0 at the CNC's center of travel
5. Put the blank on the CNC table top side up with the front of the seat blank pointing in the minus Y direction. Move the blank until it is centered under the cutter and square with the CNC table.
6. Without moving the blank, put strong **hold down** clamps on the waste areas of the four corners.
7. Put a 0.250-inch diameter end mill cutter in the spindle with a 1-1/8 exposure.
8. Establish zero Z using the Z-zeroing plate on top of the blank.
9. Put on the dust hood.
10. Put on ear plugs and dust mask
11. Start the dust collector
12. Load file "chSeaTopDxCctV12-dwIE0250.tap" - - - This file drills three 3/8-inch holes 0.7 inches deep in the top of the seat.
13. Touch "Start". This takes about 1 minute.
14. **When finished, do not turn the power off or unclamp the blank. The dowel holes are registered to the top carving.**

## Part 5 Roughing the Seat's Top Profile

1. If the power has been on, and the blank in place since Part 4, skip to step 4, skip to step 4, else turn on the power and check water flow.
2. Zero the CNC X and Y using the "HOME" method with 12 inch offset.
3. Move to 0,0 at the CNC's center of travel
4. Put a 0.500-inch diameter end mill cutter in the spindle. A bit exposure of 1-1/8 inch is best for chip collection.
5. Establish zero Z using the Z-zeroing plate on top of the blank.
6. Put on the dust hood.
7. Put on ear plugs
8. Start the dust collector
9. Load file "chSeaTopDxCctV12-rufE0500.tap".
10. Touch "Start". This takes about 1.5 hours.
11. When finished, **do not** turn the power off or unclamp the blank

## Part 6 Finishing the Seat's Top Profile

1. If the power hasn't been turned off and the blank has not moved, skip to step 4, else turn on the power and check water flow.
2. Zero the CNC X and Y using the "HOME" method with 12 inch offset.
3. Move to 0,0 at the CNC's center of travel.
4. Put a 0.500-inch diameter round nose cutter in the spindle. A bit exposure of 1-1/8 inch is best for chip collection.
5. Establish zero Z using the Z-zeroing plate a flat top surface of the blank.
6. Put on the dust hood.
7. Put on ear plugs and dust mask
8. Start the dust collector
9. Load file "chSeaTopDxCctV12-finB0500.tap".
10. Touch "Start". This takes about 2 hours. The smoothing can be stopped at 90% with no harm.
11. Closely watch the cutter's early progress as it passes the first roughing steps. If the finish cutter does not clean up the roughing steps, then Z-zero needs to be lowered, and the file restarted.
  - a. Touch "STOP". Raise Z above any trouble. Move to 0,0.
  - b. In the finished area, measure the remaining height, "H", of the roughing steps.
  - c. Type in  $-(H + 0.015)$  into the Z position and touch "MOVE"
  - d. After the cutter arrives at minus  $(H + .015)$ , touch "ZERO Z"
  - e. Go back to step 9. Above.
12. When finished, **do not** turn the power off.

## Part 7 Drilling Dowel Holes in the Waste Boards

1. If the power has not been turned off, skip to step 4, else turn on the power and check water flow.
2. Zero the CNC X and Y using the “HOME” method with 12 inch offset.
3. Move to 0,0 at the CNC’s center of travel.
4. Put a 0.250-inch diameter end mill cutter in the spindle
5. There is no blank on the CNC table during this step. Establish zero Z using the Z-zeroing plate on the waste board.
6. Put on the dust hood.
7. Put on ear plugs
8. Start the dust collector
9. Load file “chSeaBotDxCcwV09-dwlSpoilE0250.tap” - - - This file drills three 3/8-inch holes in the waste board 0.4 inches deep. If the waste board is not that thick, move Z-zero up accordingly.
10. Touch “Start”. This takes about 2 minutes.
11. When finished, **do not** turn the power off.
12. These three dowel holes are only drilled for the first seat, and this instruction, Part 7, can be skipped for subsequent seats.

## Part 8 Roughing the Seat's Bottom Profile

1. Put three 3/8-inch short dowels in the spoil board holes drilled in Part 7.
2. Wiggle the blank (bottom up) until drops onto the dowels.
15. Put strong hold down clamps on the waste areas of the four corners.
3. If the power has not been turned off, skip to step 6, else turn on the power and check water flow.
4. Zero the CNC X and Y using the "HOME" method with 12 inch offset.
5. Move to 0,0 at the CNC's center of travel.
6. Put a 0.500-inch diameter end mill cutter in the spindle. A bit exposure needs to be 1/8 inch greater than the seat's thickness. Expect a mess of chips.
7. Establish zero Z using the Z-zeroing plate atop of the blank (the seat's bottom is now up).
8. Put on the dust hood.
9. Put on ear plugs
10. Start the dust collector
11. Load file "chSeaBotDxCctV12-rufE0500.tap".
12. Touch "Start". The roughing can be stopped at 80% in an hour and 10 minutes with no harm.
13. When finished, **do not** turn the power off or unclamp the blank

## Part 9 Finishing the Seat's Bottom Profile

1. If the power hasn't been turned off and the blank has not moved, skip to step 4, else turn on the power and check water flow.
2. Zero the CNC X and Y using the "HOME" method with 12 inch offset.
3. Move to 0,0 at the CNC's center of travel.
4. Put a 0.500-inch diameter round nose cutter in the spindle. A bit exposure needs to be 1/8 inch greater than the seat's thickness. Expect a mess of chips.
5. Establish zero Z using the Z-zeroing plate on the atop of the blank (the seat's bottom is now up).
6. Put on the dust hood.
7. Put on ear plugs
8. Start the dust collector
9. Load file "chSeaBotDxCctV12a-finB0500.tap".
10. Touch "Start". This takes about 50 minutes.
11. When finished, turn the power off.