

CNC SAFETY

- 1) Wear protective gear including eye protection, ear protection and steel toed boots. Avoid loosely-fitting clothing or dangling jewelry.
- 2) Keep eyes, hands, hair and clothing away from the ShopBot and router when it is operating. Tie long hair back. Do not use your hands to hold down parts that may come loose as they are cut out.
- 3) Read and follow the safety information that comes with your router, bits and other accessories. Unplug or shut down power to the router or spindle when changing bits.
- 4) Listen for changes in sound that may indicate a problem while running the tool. ALWAYS be near enough to the Remote Stop Switch or Space Bar on the computer keyboard to be able to stop the gantries should a problem arise. (Remember that you have to release the Remote Stop Switch before the gantries will move again.)
- 5) Use a bit that is appropriate to the task. Most bit manufacturing companies have information on their website and in their literature about what kind of bit is appropriate for what application.

- Buy good quality bits and take care of them. Inspect your bits for wear, burning, dullness and cracks each time you use them. Sharpen or replace them if they are not in good condition.
- Choose bit with the largest shank and the shortest bit length to fit the task to avoid excessive bit deflection and stress.
- Consider whether the bit will be pulling the material up and away from the holddown source (upcut spiral), or holding the material down (downcut spiral.) Is it the appropriate bit for the move (cutting) speed of the ShopBot, the RPM's of the router/spindle and the type of material you are cutting?
- Follow the manufacturer's recommendations for move speed through the material and rpm for the router, as well as for the configuration of the bit (for example, number of flutes, upcut, downcut, straight.)
- Never cut deeper than 1 1/2 times the diameter of the bit in a single pass. Not only will two passes make a cleaner cut but a shallower cut will cause less bit deflection and danger of breakage.
- Check your collets frequently. Collets do wear out, and a loose collet can result in greater deflection and shimmy which equal poorer quality cuts and greater chance of breakage.
- For more information on routers and bits www.onsrud.com
www.jesada.com www.mscdirect.com www.vortextool.com www.woodpeck.com
www.woodwork.com
 SBG00143060802Safety.doc
 Copyright 2006 ShopBot Tools, Inc
 Safety Reminders Page -2-
 An internet search will reveal a huge array of bit suppliers. Contact the companies and request their brochures.

- 6) Avoid unsafe holddown practices that can shatter a bit or allow parts to move during cutting. If you are using a vacuum table or fixture for your holddown solution, make sure that the vacuum is sufficient to hold down small parts. Create templates or use the tabbing feature to hold small parts in place until you are ready to remove the machined pieces. Avoid using mechanical holddowns such as clamps or sheet rock screws. If the router bit accidentally hits one, the bit may shatter sending pieces flying through the air and reminding you how important eye protection is. Vinyl nails www.raptornails.com will

not shatter a bit.

If you must use clamps or sheetrock screws,

- Locate them well clear of the cutting area. Design your files in such manner that the bit does not encounter the screws or clamps. For example: - Design your files with places for your holddown screws that are outside the cutting path. Write the holddown locations into the cutting file. Preview the cutting file using the PREVIEW (SP) mode of your ShopBot Control software. (VP command will change the parameters of the Preview screen...see the HC (Help Command Reference) for the most up-to-date information on any ShopBot Control software command.)
- Air cut your file before you put actually cut the file. (Here's how: Send the X and Y axes to the start location of your cutting file. Use the keyboard control (K, page up) to bring the Z up far enough that it will not cut into the material while running the file. Then when you load the file (FP) and the fill-in sheet pops up, use the Tab key and space bar to select 3D offset option. The file will run as if the Z were zeroed at the current set point. Remember to deselect the 3D offset when you are ready to really run the file.)
- Countersink your holes for holddown screws, then run your file at a depth that will cut higher than any holddown screws. (You can change the proportion of the X, Y or Z axis in the fill in sheet that pops up when you load a file. If your file is set to cut at -1/2" and your countersunk screws are 1/4" below the surface, set the Z proportion to .4 in the fill in sheet, and the file will cut less than 1/4" deep. When you are sure that no screws will be hit, rerun the file at the full Z proportion.)

7) Create cutting files that avoid small parts flying out when being cut. Make use of the tabbing feature that can be activated with the fill-in sheet when you load a parts file (FP). If you are cutting all the way through, check the Tab box in the fill in sheet when you load the file (Use the Tab key on your keyboard to get to the selection, then the Spacebar to choose it.) On the final pass, the file leaves thin tabs where the part remains attached to the substrate at various locations. Then you can pop out the pieces at the end of the cutting file. The VB command will pull up a fill-in sheet that allows you to determine the size and frequency of the tabs...see HC or your manual for more details.

Another option is to leave a thin skin at the bottom of the cut file to hold the piece in place until you are ready to pop it out. This option requires that you Zero the

SBG00143060802Safety.doc Copyright 2006 ShopBot Tools, Inc
Safety Reminders Page -3-

Z accurately before starting the cut file, and know exactly how thick the material is.

If you are clearing a small part (for example, a circle) that will become waste, spiral from the inside out so that you are machining away the waste as you cut. Flying pieces released from their substrate can get caught in the dust collection system or become effective shrapnel when set into motion by a router rotating at 16K rpm.

Plan your toolpaths so that you cut out details and small parts before cutting out the big parts. For example, if you wanted to cut out a rectangular serving tray with a circle pocketed or cut out to hold a drink glass, design the file to cut out or pocket the circle first, then cut out the larger rectangle. That will reduce the problems with holding down small parts while machining them. Likewise, drill any holes in a file while the material is intact and positioned properly, then go back and cut out the pieces.

8) Make the production routine as safe as you can for you and your employees.

- Make sure that everyone understands the safety rules. Emphasize that hands are to be kept away from the router and ShopBot. Keep extra protective gear at convenient locations.
 - Create program files that require an active command to restart when interacting with tool or router. If you are changing bits between runs, write that program files so that the new routine must be restarted as a new file. If you do put a 'PAUSE' command in, write the file so that you must input at least two key stroke commands before the file restarts. See the Parts Programming section of your manual for details.
 - Create a physical barrier between the ShopBot and the operator to help prevent dangerous practices while operating the ShopBot.
 - Don't ask too much of yourself, your employees or your equipment. Remember that time spent handling emergencies and changing broken bits could be better spent doing production work with safe and efficient practices.
- SBG00143060802Safety.doc Copyright 2006 ShopBot Tools, Inc

I have read and understand the following documents. I agree to follow the safety rules provided:

Name: _____ Student ID# _____

Signature: _____ Date: _____