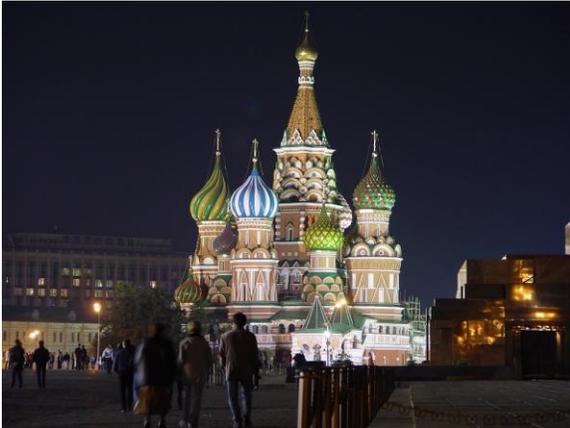


Woodturning Project – Onion Dome Box

By Ray Sandusky

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A turned box can be both a useful and decorative object, which invites someone to pick it up and feel its shape and discover what it is concealing. I have been making boxes since I became intrigued with woodturning. For me, turning a box is an exercise in planning a process, thinking ahead and staying on course to reach the goal. In many ways, turning a box is a test of one's ability to follow a set of steps as well as one's ability to perform a number of unique exercises with the turning tools!



I find inspiration for my turned objects of art in many different places. Recently, I was giving my daughter a geography lesson on Russia. Because she is only 5 2/3rds, she can learn more by actually seeing the various features of a geographic region. So, while we were doing a tour through some websites about Russia I came across a photo of the Kremlin, Russia's most beautiful building. The most unique features of the Kremlin are its ornate Onion Domes. I immediately

realized that I could emulate this architectural form in a turned object. Additionally, I could incorporate some carving, texturing and color to further enhance the work if I wanted to. So, this architectural gem that is half a world away can become the basis of a series of turned objects that can further spur my creativity and possibly help me to see other building forms as a turned object. The possibilities are endless in turning boxes – let's get started with turning this style of box.

Turning Tools

The tools that you will need to make boxes are no different than the tools you use to make other objects at the lathe. For this project, you will need a parting tool, a skew, a bedan, a round nosed scraper, a bowl gouge, calipers and a Jacob's chuck with a 2 1/8" Forstner Drill Bit . I have laid out all of the tools I actually used in this project so you can see the various sizes and shapes of the tools. I use a few specialized tools. The diamond parting tool, 1/16th thin parting tool, bedan and round nosed scraper



are especially useful for turning an onion dome shaped box. Each tool has its specific use along the way toward the final product.

Selecting and Orienting the Wood

When turning a box, you should try to select a species of wood that has a tight, straight grain that has some interesting figure but not so much figure that it interferes with the stability of the box where the lid and base come together. I like to use local hardwood species like Cherry, Sugar Maple, Sycamore or Rock Elm as these species have nice grain patterns but very little difference in the strength of the wood between the growth lines. To get a better idea of what I mean, look at wood from an Ash. The early or Spring growth in the annual rings are harder than the softer late or Summer growth. This difference in the wood grain often can cause the lid and base to not fit together properly.

For this project, I selected a piece of Cherry that was cut about 2 years ago, but left in a larger form to allow the wood to dry to some extent before use. The work piece should be oriented in the long grain form with the lengthwise growth lines running parallel to the bed of the lathe. When cutting the piece from a log, try to use the portion of the wood that has the smaller end checks and make sure there are no serious checks running the length of the piece of wood you select for the project. Note the larger checks in the end of the piece in the picture to the right. That piece is not the one I used for this project! The ends of the work piece should be relatively flat and square to ensure the piece is safely mounted and held between the drive center and the revolving tail stock center.



Let's Get To Turning!

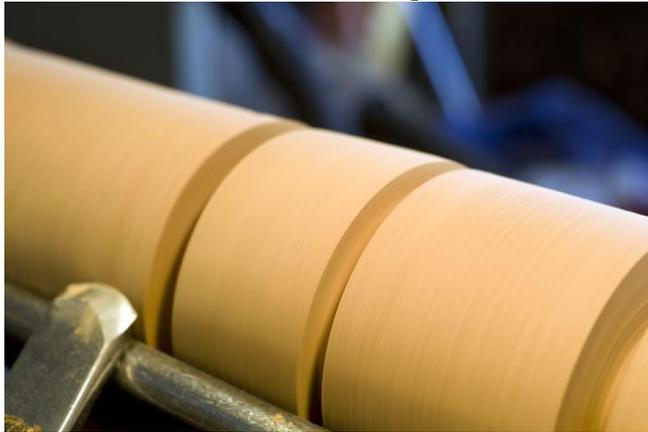


Find the center of each end of the piece of wood, make a mark or a divot to make it easy to find while holding the piece up to the lathe's drive center for mounting. Mount the piece of wood by pinching it between the drive center on the headstock and the revolving center on the tail stock. It is important that you spin the work piece a few times before you turn the lathe on to make sure the piece moves freely and does

not fall off due to it not being properly held between the centers. When the piece is ready, move the tool rest up so it is parallel to the work piece and give the piece a few more spins to make sure the wood spins freely. Select your roughing gouge and begin by laying the tool on the rest and lifting the handle so the blade begins to make contact and cut as it is lifted and slowly pushed into the work piece. Make roughing cuts along the length of the wood until the entire length of wood is round and free from any flat spots or other potential trouble spots – like splits, metal or knots that you did not see prior to mounting the work piece.

Once the piece is turned to round, you can begin to lay out the box's top and bottom. When laying out the box, remember to include about 1/2" on both the top and the bottom for tenons to be used for holding the work piece in the jaws of a chuck.

The tenons are made using the Bedan Tool – the tenon on each end should be about 2 1/2" in diameter and be cut flat and square to be accepted by the chuck jaws. Next, determine which end of the work piece will be the bottom and which will be the top. Use the Bedan to make a 1/2" deep groove about 2/3^{rds} of the way up the work piece. Then



use the bedan again to expand the width of the groove toward the part that will become the base by about 1/16th so the top and bottom can be separated without the parting tool marring the portion of the tenon that will be used to join the two sections of the box.

At this point, you may turn off the lathe and remove the work piece to make the parting cuts on the band saw (make sure you properly support and block the round work piece at the bandsaw to keep it from rolling into the blade). If you want to cut the pieces apart at the lathe, use the 1/16th thin parting tool to separate the top from the bottom, making sure the tenon is left on the portion of the piece that will become the top of the box.

Unlike Richard Raffan and other famous turners, I always make my boxes so the lid fits down inside of the base. I make my boxes this way because I think the base looks better, (this is my opinion) without the tenon protruding from the top rim of the base when the lid is removed.

Inspect the two pieces of wood to ensure that there are no defects or trouble spots that you will have to work on or around as you move forward. Up to this point, the project has been pretty straight forward with no real areas of trouble or potential project redirecting issues. When making a box, there are many steps to take and one step leads to another later in the projects, so you must think ahead and follow the steps without skipping or taking out of order. It is similar to following a map. If you take a wrong turn at Albuquerque, you may wind up in the Himalayas instead of Palm Springs! (This is a reference to Bugs Bunny, for you younger turners out there!!) We want to end up with a box and not a bowl or an egg cup, so let's get back to the project!

Turning the Lid

Mount the piece of wood that will become the lid in the chuck with the smaller tenon so the jaws actually close down over the wood and the bottom of the lid is facing the tail stock end of the lathe. Since this is to become a box with an onion dome shaped top, you must begin to shape the top of the box immediately. Using a skew, shape the bottom edge corner of the lid (not the tenon edge) into a bead by rounding off the corner. The bead should begin at the point where the tenon ends and the lid begins. This rounded shape should flow in one continuous arc from the tenon to the point where the chuck jaws meet the lid. Please note that the top point of the dome shape will actually be formed at a point that is currently inside of the chuck jaws. Try to visualize that point when forming the dome shape. By placing the tip of the dome inside what is currently a tenon, you are actually giving yourself more space in the wood to produce a more flowing form.



When the outside of the lid is formed, it is time to begin clearing out the wood from the inside of the lid. I like to use a 2 1/8" Forstner bit to make the initial hole and save time in clearing out the material. This will give you an easier starting point and allow you to



use a round scraper to clear out a significant amount of stock more quickly.

One way to ensure that your tool will not skate across the face of the lid and mar the tenon's outer edge, is to score a thin kerf about 3/8ths" in from the edge of the tenon. This will act as a backstop in case your gouge or skew gets pulled across the lip of the lid toward the outside of

the work piece. Using the bowl gouge or scraper, clear out the interior of the lid, making sure you take a moment to measure the thinness of the dome's wall. The wall thinness should be between 1/4" and 3/8" – this will keep the box walls strong and reduce the weight of the finished product.

The interior of the box needs to emulate the exterior of the lid, so special attention needs to be taken when clearing out the section of the lid that is opposite the outer most arc of the dome's curve. To effectively clear out the under-lip of the lid, select the smaller round nosed scraper, reduce the speed of the lathe and begin by making a scraping cut

just above the tenon in the inside of the lid. Be sure to measure often and try not to be too aggressive in scraping out this portion as you want it to remain structurally sound. Both the interior and exterior of the onion dome are shaped like a Roman Ogee curve. Knowing this will help you to visualize this feature as a more familiar shape.



Once the inside is cleared out, it is time for sanding – I use a drill and 3” hook & loop sanding discs. You may have to sand the deepest portion of the interior by hand, so be sure to check to see if you are able to reach all of the places with the sanding disc, if not turn off the drill and use the sand paper by hand with the lathe running at a slower speed – approx 200-300 RPM’s. This will keep the paper cool enough to hold with your hand and allow you to pull out in case of a catch or slip with the paper. When sanding be certain to move the tool rest away from the work piece to all easy access and avoid having your hands between the work and the tool rest.

Completing the Dome

When you are satisfied with the results of scraping and sanding on the interior of the lid, it is time to flip it around and mount it on the chuck. You may want place a paper towel



between the chuck jaws and the finished interior of the lid to ensure that the inside surface does not get damaged by the expanding chuck jaws. To ensure that the lid does not fly off the chuck, it is a good idea to bring the tailstock up to add a small measure of safety. Since I want to make the dome’s point as high as possible, I do not want to push the point of the live center into the center point of the lid, so I made a cover to fit over the point that has a

flat surface. This gives me safety and the ability to preserve the material in the center of the lid as a design feature.

The next step is to finish shaping the exterior of the dome, bringing the very top of the lid to an upwardly curving point. To emulate the onion shape, the very last portion of the dome’s tip must curve upward. This is a key design feature that must be attained! If you fail to bring the dome surface to a point, then your intentions of making it look like an onion are lost and you will wind up with something other than an onion dome shaped lid.

If you think you need to, you may stop the lathe and remove the lid from the chuck to measure or feel the thinness of the wood to ensure that you have achieved the proper curve and that you have enough material left to execute the design. Be certain to remount the lid exactly as it was on the chuck – if you change the jaw positions, you may find that your lid is no longer spinning in exactly the same way.

When you are happy with the exterior shape of the lid, it is time to sand it. Be very careful when sanding the point as you do not want to flatten it or round it over – you want the point to come to a point, not a nub or a mesa! So watch how your sanding disk is making contact with the wood and especially watch how you are affecting the curve with the paper – you do not want to overwork the lid with the sanding – I start at 220 and step to 320 and stop at 400 grit. If your gouge cuts, shear scraping and skew work left the surface with very little tear out, then you really do not need to sand too much. Sanding is basically a smoothing of the surface not a redesign or shape refining opportunity. When you are done sanding, it is time to move on to the base of the box.



The Most Important Step!

With the tenon of the base firmly held in the chuck jaws, get your calipers and the lid. It is time to take the most important step in the whole process of making a box – measuring the width of the lid's opening and transferring it to the top of the base. When measuring the opening of the lid, remember to measure across the lid where the growth rings run from one side of the lid to the other. If you measure anywhere else, the measurement may not be taken at the lid's widest points as the tensions in the wood cause it to be stretched a minute amount. Make sure you measure so the calipers are touching the widest points of the lid's tenon and lock the measurement by screwing down the caliper's set screw.



Next, you need to transfer the measurement to the top of the base. Move the tool rest up to the flat surface of the base and set it so it is about 1/16th of an inch below the centerline. Turn on the lathe at a medium speed and lay the calipers on the tool rest without engaging the wood. Your calipers should have two metal points that are exactly

opposite the measuring jaws. These can be used to score a mark on the surface of the base to indicate where the tenon on the lid should seat perfectly into the base. When scoring the line, make sure you engage the wood with the left point first and then the right, moving the calipers slowly and working the points slightly so you end up with a



concentric circle. This is your line of absolute inside diameter and should not be crossed if you want the lid to properly fit the base. To ensure that you do not cross this line, use your 1/16th inch parting tool and cut a kerf into the base that is about 1/16 inside of the line that you just scored with the calipers. This will allow you to sneak-up on the final diameter of the hole and give you more of a probability of

success in making a lid that fits perfectly. Now that the measuring marks are made, we can go back to taking care of the more heavy handed tasks.

Shaping the Outside of the Base

When you consider it, the base of the box should be sturdy and stable, yet an accent to the lid with an identity of its own. If the lid should be lost or damaged, the base can stand alone and still be a useful and attractive object. In my home, I have 3 or 4 orphaned box bases that act as crayon, keys and paperclip holders. So, when considering the design of the base, I like to think of how it would look and function as part of the box as well as a stand alone object. The other consideration from a style stand-point is how the item will look when standing on a surface – will the exterior line be perpendicular, curved or angled? I have studied the books about boxes by Raffan, Stott & others and have found that I have an affinity for stout, sturdy forms that resemble castle turrets. So, I like to make my boxes with a wider base than top.



To ensure that I make clean cuts, I like to use my curved edge skew, which I hold flat on the tool rest. This tool, when used properly, can provide a surface that is clean and smooth, reducing the amount of sanding that is required. To make the base wider than the top, watch the top edge of the work piece as it spins. You will be able to see how your skew is shaping the edge as you move from the bottom toward the

top of the work. This is called watching the horizon and it allows you to watch the result of your cuts while you are making them. Too often, we focus all of our attention to the

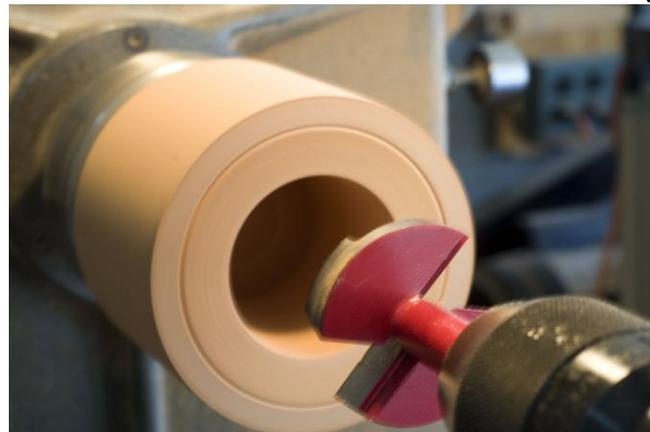
point where the tool touches the wood and ignore the effects until the lathe is turned off. Although it is important to watch the tool where it touches the wood, that spot does not allow you to see what is happening while the tool is cutting.

Proceed by making continuous passes from the bottom to the top in one motion. The result of this series of cuts should be a straight line that has a bit of a sloped angle from the bottom to the top. The surface should be smooth and free from torn grain or unintended undulations across the surface of the exterior. I like to make a little chamfer at the base that is accentuated with a line that is scored around the bottom of the base. This thin line and chamfer lifts the box off of the table surface and starts your eye moving from the bottom, up the side of the object. One thing to note is the thinness of the exterior with respect to the line and kerf that is scored around the top surface that will eventually be the point where the lid joins the base. This should measure approximately $3/8$'s", a little thicker is OK, but not more than $1/2$ ".



Inside The Base

It is now time to clear out the inside of the base. Again, I like to use the Jacob's Chuck and Forstner bit to remove the core of the base. By using the Forstner bit, I can make a straight side on the inside wall with very little effort. This then allows me to use my bowl gouge to make pull cuts from bottom to top and from the inside toward the outside. I also use a spear point scraper to make long scrapes into the bottom corner, which gives me a well defined corner at the base of the box's interior. One issue to be aware of is chatter. The scraping action inside of a narrow cylinder causes the tool to be pushed downward at a very steep angle which pushes the tool back toward the center on the tool rest. To alleviate this, one way I try to mitigate this trouble is I lower my tool handle and scrape at a point that is above the midpoint of the work piece. Another is to use a heavier hand to hold the tool down on the tool rest. These two things help to eliminate the chatter. When scraping out the inside, always keep an eye on where you are with respect to the lid measurement mark you scored earlier. It is a good idea to stop the scraping about $1/8$ th inch inside of that mark. After all, if you mess that



up now, you will wind up with a lid and a base that have no chance of making a fit. Instead that error will cause you to have a fit as you throw the ruined project out the studio door!

Be a Sneaky Turner!

Now that you have a nice flat bottom and a square corner on the interior of your box, the time has come for you to perform the coup-de-grace in box making – getting the perfect fit! There really is not a trick to getting the box to go perfectly together; rather it is process that requires you to have patience and a light hand. The last 1/8th of an inch is critical because all is lost if you go 1/9th of an inch instead, so scrape lightly and test often. It usually requires you to cut and stop and cut and stop about 4 times until you get to the point where the lid just barely slips down inside of the base. Once that is achieved, then all you need to do is continue to extend that ability to sink in until the lid fits down on the



base all of the way around the rim. At first the fit will be tight – that is OK, because you still need to lightly sand the inside of the base.

Sanding the Inside - Lightly Around the Rim Please!

Once again, it's back to the drill with the 3" sanding pad and sanding disks to smooth the interior. Again I begin with 220 grit, then 320 and end up at 400 grit. I never run the drill up to the top of the interior; I remove the 400 grit disc from the drill and use it by hand to lightly smooth the portion of the interior where the lid's tenon fits into the base. I usually try the fit of the lid after just a few revolutions with the sandpaper to ensure that I am not changing the interior diameter too much that it negatively affects the fit. Once I am satisfied with the smoothness of the interior, it is time to finish the bottom of the box. The project is nearing its' conclusion, stay focused and beware of the final pitfall!

Cleanly Removing the Nub!

It is our tendency to become a bit eager to get the project completed now that the lid is fitting into the base so beautifully. It is not time to do the victory lap yet; you still have to cleanly remove the tenon at the base! So, remove the work piece from the chuck jaws and flip it around. Before you mount the piece on the chuck again, take one last measurement of the thickness at the bottom of the box. The goal here is to have an interior that stops about 3/8's of an inch above the bottom of the box that we established earlier with the chamfer and line. Now, using a paper towel or other material of choice, place the open mouth of the base on the chuck jaws and expand them so they hold the

base snugly. Please do not use a heavy hand here as you can easily split the work piece. Again, bring up the tailstock with the revolving center. This time, the live center cover



does not have to be used as I am trying to get as deep into the center of the base possible to reduce the remaining nub to a very tiny point by the end of the process.

I like to finish my box bases with a small recess in the bottom with a line scored about halfway across the bottom. I usually turn off the lathe when there is just a nub left in the middle and make one final check of the bottom's surface. I do not like to

make my bottom as smooth as the other surfaces as it is the bottom and I think it gives a person something unique to feel when they run their finger across that side of the box. I turn the machine back on and hand sand using the 220 grit paper. Then using the skew, I make a series of small cuts with the long point of the skew down which brings the nub down to a very small point of about $1/32^{\text{nd}}$ of an inch. Then I turn off the lathe, remove the piece from the chuck jaws and cut the nub off with a palm chisel. Then I get the sanding drill with the 220 grit disk and run it quickly across the bottom to smooth it all together.

Not Quite Done



At this point I get down my engraving Dremel and write my name, the species of wood and the year I made the piece inside of the center circle that I scored on the base of the box. After the signature is engraved, I use a Sharpie or an Indian ink pen (Eberhard Faber) to add black pigment to the bottom of the letters. This helps the interested person to more clearly see my name in low light situations. The

signature is not too important now, but may be the difference in someone paying someone else \$100,000 in the year 2276 for this wonderful piece of art. Respect your work and hold it in esteem, as it the work of your hand and no one else can do what you just did the way you just did it.

One Last Step – For Now

I like to move the lid inside of the base a few times before I actually take the first step in

the finishing process. This gives the box a bit of use and improves its usability. Then I apply a few coats of Danish Oil to the entire box – inside and out. This makes the wood grain and figure pop out to be prominently seen and acts as a sealant against mold or fungi that like to inhabit dark spaces.

The Finishing Step

After the box is completed and the saw dust is swept up, it is time to run up the steps and show off my handiwork! Which goes something like “Look, Honey, at what I made!” holding the Onion Dome Box out on the palm of my hand for my bride to see. She says “Oh, um, that’s nice, did you sweep up your mess?” With a bit of a sulking frown on my face, I say, “Yes, dear.” and run to my “pieces in the drying process” cabinet to carefully place it inside to dry without having any cracks develop.



In a few weeks, I will take it back to the lathe and buff the box with Pure Beeswax. Sometimes, I use the 3 step Bealle Buffing process, but I want people to use this box in their kitchen, on their mantle or even on their desk, so I want it to have a satin finish that is durable and

beeswax does the job quite well, in my opinion.

I know I am not the first person to make this kind of box, but I do enjoy the planning, the process and the execution of each step. If you think I should make my boxes differently or if you think I should more closely follow the masters, please remember that this is my way of doing it and I expect you to do it differently than I do anyway. So it’s probably best that we agree that we love wood turning and the rest of the opinions and petty arguments be left in the saw dust pile!