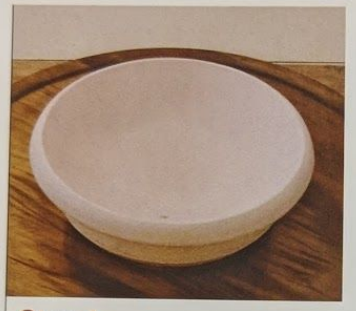
DEMONSTRATION 1 | Side-Hole Pot Drum

This simple drum can be built in as little as seven days. The total time depends on the size of the drum you make and the amount of time you spend finishing it. For this demonstration, a white, stoneware clay with medium grog was used. A manual extruder equipped with a 3/8-inch diameter coil die was used to make the coils. An extruder is certainly not necessary to make coils; you can roll them by hand. However, extruded coils make it easier to build a pot with walls of consistent thickness—a key element to a good sounding pot drum.



Step 1

Throw a heavy bowl-shaped mold (called a "puki" by Native American potters) on the wheel. This mold will be used to form the bottom of the pot drum and support it as you gradually build up its walls. The extra weight of the mold helps it stay in place as you are building the pot on top of it. However, when building the mold, note that the extra thickness of the clay requires substantially more drying time than a bowl this size of normal thickness. Failure to dry the mold thoroughly can cause it to shatter during firing. The interior surface of the mold should be shaped into a smooth arc and finished with a rib. Once it is completely dry, bisque fire the mold to cone 04.

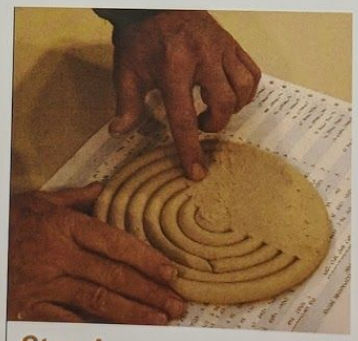
Note: A "lazy susan" or banding wheel will help to steadily rotate the drum and speed up the process of adding coils. This one was found in a second-hand store and was attached to a square piece of plywood. The plywood can be clamped to the table if necessary.

Step 2

For convenience of handling and storage, the ⅜-inch coils can be laid in lunch trays on top of paper sheets. The trays will be wrapped with plastic to keep them moist.

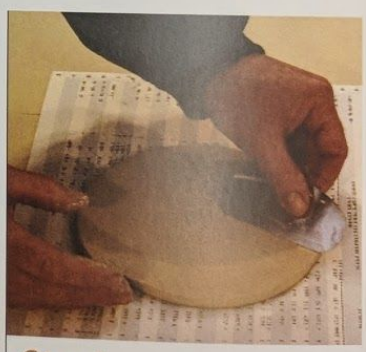
Step 3

Wind a coil concentrically to form the drum's base. Work with moist clay and use a sheet of paper to make it easier to lift and move it.



Step 4

After adding another coil, blend and smooth the coils to form a disk. Work carefully from the outer edge, inward, then back to the outer edge. Use moderate pressure to avoid distorting the shape of the base.

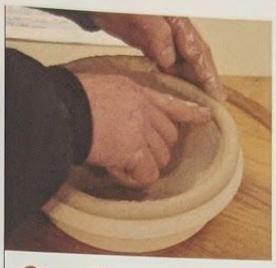


Step 5

Use a flexible rib to smooth the surface after the coils have been melded. Repeat on the underside of the disk.

Step 6
Lay the disk into the mold and press it evenly to conform to the shape. Use a metal rib to smooth the surface.

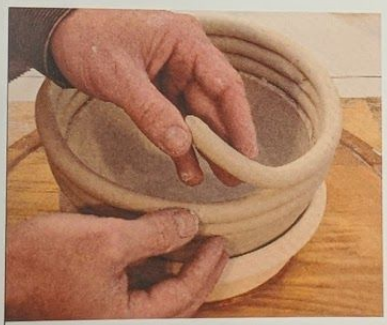
Step 7
Lay a coil on the base following the edge of the mold. Note the overlap of the end of the previous coil with the starting end of the new coil. The base and coils are very moist and can be melded without roughing the edges.



Step 8
Continue melding; first on the inside then on the outside. Take your time and do a thorough job of combining the coils. After each round with the fingers, follow with the rib. Save working the rib on the outside for later.

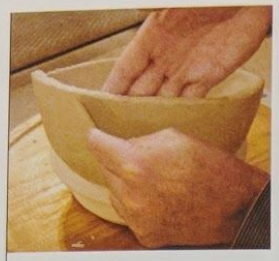
Step 9
At this stage, the clay will need to stiffen somewhat before more coils can be attached, so it is a good stopping point for the day. Cover with a bucket or plastic bag to prevent the clay from drying out too much.

Step 10
If the clay surface on the edge of the pot has dried too much when you return to the project, you can use the "luting" technique to join the next coil. Using a rib with a serrated edge, scrape and score the surface before adding the next coil. In some cases a brush load of plain water painted on after scraping will aid the adhesion of the clay.



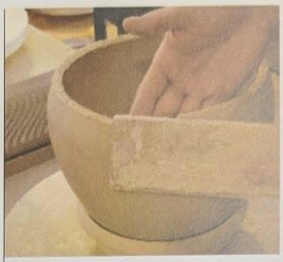
Step 11
Add two to three winds to the pot before melding inside and out. Lay each coil slightly to the outside of the previous coil to increase the pot's diameter. Look at the pot from the side to see that the coils are following the desired outer contour. Meld the coils on the inside first. Follow that with the rib employing a motion that smoothes while scraping and thinning the clay. As you draw the rib toward you, support the pot from the outside with your other hand.

Step 12
Now blend the outside of the coils while supporting them from the inside. The lazy susan makes it easy to turn the pot as you smooth. Start at the bottom and work your way up to the top. Follow with your rib using the same drawing/scraping motion employed previously. Work to achieve a uniform shell thickness of approximately ¼ of an inch throughout the entire pot (if you started with ⅜-inch coils).

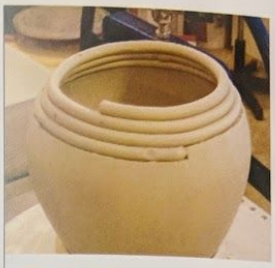


Step 13
After the lower part of the pot has firmed up, shift the pot in the mold to smooth and shape it from bottom to top. Double check your lower melds and hand smooth as necessary.

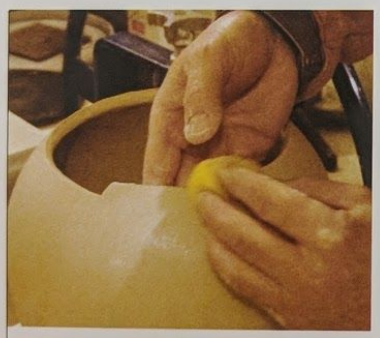
Step 14
Progress! Several coils have been added and the maximum diameter of the pot has been achieved. The coils are now laid toward the inside edge to reduce the diameter. Note that the old lazy susan got a little too lazy and had to be replaced with a sturdier, warp-resistant model. Give the pot a light misting before it goes back under the bucket.



Step 15
A paddle can be fashioned from a piece of scrap wood to fit nicely in your hand. Be sure to sand off any splinters. Use the paddle to shape the pot with light, rapid taps from the outside. Just as with the rib, support the inside of the pot directly opposite the area being paddled.

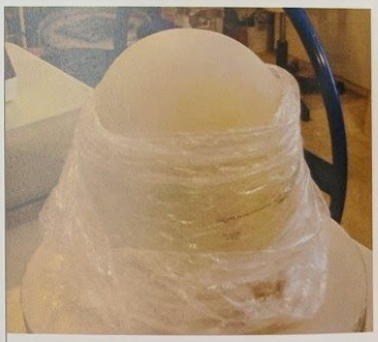


Step 16
Lay the coils very carefully toward the inside edge of the pot rim. The melding work on the inside gets tougher now. Do the inside first and give it a good visual inspection before proceeding with the outside. After the pot stiffens, use the rib and a paddle to help thin and shape the shoulder area of the pot.

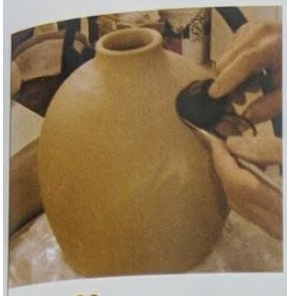


Step 17
Draw a moistened sponge from the bottom of the pot to the top edge in a smooth arc to help remove surface flaws. This also will help keep the clay supple. Do this inside and out.

Step 18
Allow the pot to firm up to just slightly below the leather-hard stage. A couple of hours of drying should be enough. When the pot is firm enough to support its own weight, turn it upside down. Place a rag over the mold before setting the pot on it to cushion the shoulder of the pot. As before, light, rhythmic paddling helps set the contour and symmetry of the pot. As you paddle, support the pot on the opposite side with your hand.

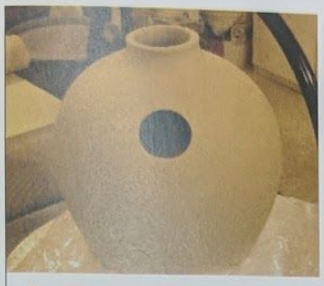


Step 19
Wrap the pot with the bottom exposed. This keeps the side workable while allowing the bottom to reach leather-hard state. Do this before adding the final coils to the neck of the pot.



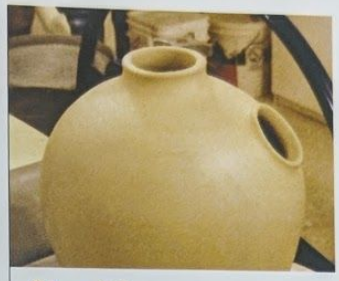
Step 20

The coiling work has been completed. The neck is approximately two inches in diameter at the inside and just about an inch high. More coils can be added for a taller neck and a different sounding drum. Here, the bottom of a flashlight is used to mark a side-hole circle that is about the same diameter as the neck. A small knife is used to remove the clay from the side hole. The plastic between the mold and the bottom of the pot helps prevent over-drying.



Step 21

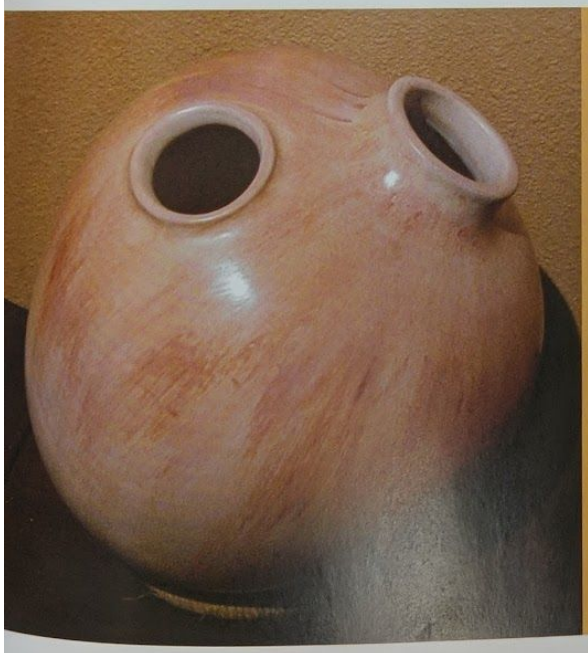
The finished neck and side hole. The top hole has been given a slight bead and has been smoothed with a sponge for the comfort of the hand when the drum is played.



Step 22

This detail shows the lip that has been added to the side hole with a small coil of clay. This is an optional step. If you do add the lip, take extra care to meld it well with the surface of the pot and smooth the edge for the comfort of your hand when playing.

The wall of the pot is thick enough so that some light carving or sgraffito-style designs can be made on it. No matter what decoration method you employ, it is important that this hand-built pot drum be allowed to dry very slowly and evenly under loosely fitting plastic for at least a week. Once it is bone dry the drum can be once-fired, upside down, in a kiln to cone 06. Optionally, the drum can be fired the first time to cone 09 then fired raku-style to cone 05 and treated with post-fire reduction.



Final Steps

The demonstration pot was painted at the leather-hard stage with five coats of terra sigillata and burnished with a stone to give it a high polish. Red iron oxide was mixed into the final coat and streaked on with a sponge before the final polish.

A display stand was made from an extra coil of clay shaped into a ring, fired, then wrapped with jute.

To play your drum, tap the shell with your fingertips for pinging sounds, and slap your palms on the side and top holes to create haunting and bubbling liquid tones.

More information on playing styles and traditional construction techniques can be found in the "Plosive Aerophones" section of Chapter 4.

DEMONSTRATION 2 | Ocarina

Ocarinas can be easily fashioned from clay in a variety of ways. This demonstration illustrates a popular method in which two small "pinch pots" are joined to create the body of the ocarina. You can make your ocarina bigger or smaller by adjusting the size of the ball of clay.

Step 1

Gather your tools. A metal rib with a serrated edge will be used for scoring clay. The sponge and cup of water will be used to keep the clay moist and help you smooth the surface. The tool with the orange handle is a countersink. It is found at hardware stores and is used to make nice beveled edges on the finger holes. The red plastic stick was a ceramics supplier giveaway item. It has a nice flat blade useful for smoothing the clay and shaping the sound hole. One of the wooden sticks is from an ice cream store and the others are Popsicle sticks. In addition to these, you'll need a needle tool for scoring the clay, and drill bits or a hole-cutting tool to make the finger holes.

Step 2

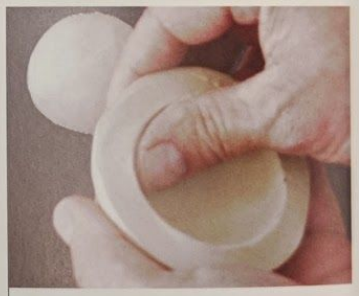
Bevel the tips of your wooden sticks to make them effective cutting tools. If you have access to an electric bench sander, you can easily put beveled edges on the ends of your sticks. You can get similar results by rubbing the edge of the stick over a sheet of medium grade sandpaper held on a flat surface.

Step 3

Make a clay ball. Shape a piece of fresh clay into a smooth ball. The ball shown weighs about a pound and will make an ocarina about the size of a medium orange.

Step 4

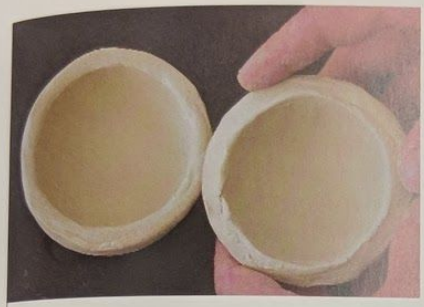
Cut the ball in half through its middle, using the serrated rib or a wire tool.



Step 5

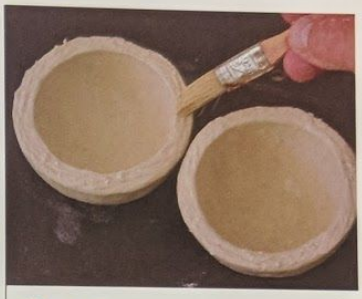
Shape the clay "bowls." Cradle the clay in one hand and shape it with the thumb and index finger of the other. Turn the clay in your hand frequently and keep the thickness of the wall as even as possible. If the clay begins to dry and crack, use your sponge and water to remoisten it.

Note: If the rim of your small pot gets ragged as you do your shaping, you can even it out by lightly tapping the rim on a smooth porous surface such as a piece of wood or plasterboard.

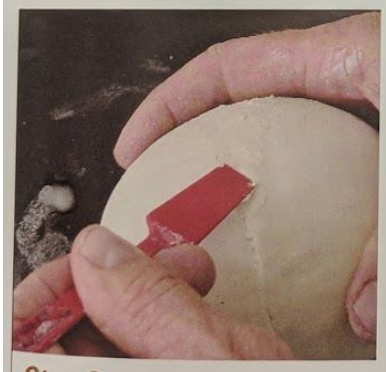


Step 6
When you have finished the first half, open the other half in the same fashion. Compare the diameters of the two pieces as you go. You're trying to make two bowl shapes that will match up perfectly, edge to edge.

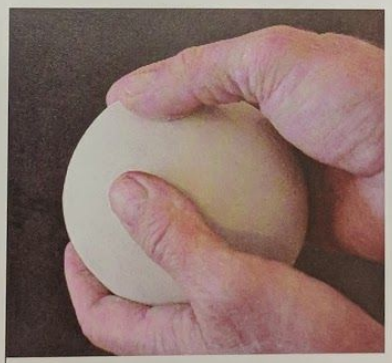
Step 7
It looks like the diameters of the halves match up well. Next, fuse them together into one hollow shape.



Step 8
Use the serrated rib to rough up the rim of each half and paint on an even coat of water. Allow the clay to soften a bit before joining the halves.



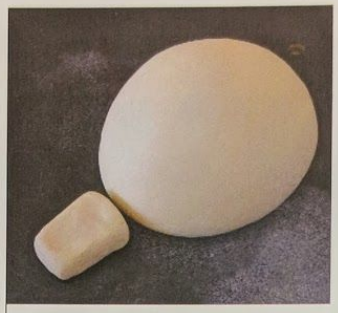
Step 9
Press the halves together. A slight twisting motion will strengthen the bond. Next, meld the seam. The gap is filled in with the fingers followed by a small, flat stick, as shown.



Step 10
Use the fingers of both hands to remove surface imperfections. The clay should be kept moist and free of cracks. Use the dampened sponge to wipe over the surface of the clay.

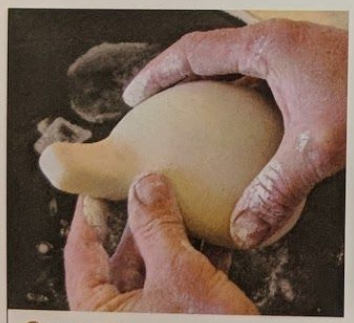
Step 11
Create a flattened bottom by pressing the hollow form onto the table surface. This surface should be porous or textured enough so that the clay does not stick. A plastic bat is used here but any smooth, porous surface is suitable.

Step 12
Set aside the body of the ocarina for a moment to create the mouthpiece. This piece shown is approximately 1 inch wide, 1½ inches long and ¾ of an inch thick.

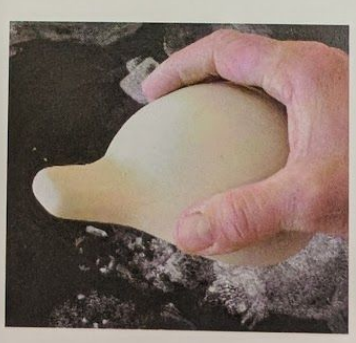


Step 13
Notice, here, that the mouthpiece shape has squared sides with a slight taper from back to front. The mouthpiece is thick enough to allow for the later insertion of the stick that will be used to create the windway. The shape of the mouthpiece can be smoothed after it has been attached to the body. Lay the mouthpiece next to the body to determine the best place for attachment.

Step 14
Use the needle tool to thoroughly score the area where the mouthpiece will be attached. Brush on a liberal coating of water. Allow the clay in this area to soften. Score and wet the end of the mouthpiece in the same fashion. Set the mouthpiece and body on the table and press them together. The mouthpiece must be aligned with the flat side of the body.



Step 15
After the mouthpiece is attached, pick up the body and smooth away the seam. Complete this step thoroughly to minimize the risk of cracking later.



Step 16
Carefully insert the Popsicle stick into the mouthpiece to create the windway. Care must be taken to ensure that the stick passes through the mouthpiece parallel to the top and bottom surfaces and squarely with the sides. Slow even pressure is best.

Step 17

With the stick used to create the windway still in place, use another beveled-edge stick to cut the aperture, or window, on the underside of the ocarina. The aperture should be located so that the side closest to the mouthpiece is just inside the interior of the wall of the body. If the hole is cut too close to the mouthpiece, the aperture will be blocked by the wall. Make a squared opening and remove the small piece of clay. Cut all the way down to the stick underneath. Make clean, squared cuts on all four sides.

Next, with the beveled edge of the stick facing down, make a square cut at a 45° angle, moving toward the mouthpiece, as shown in the illustration. Press the stick in until it reaches the other stick. Follow through, removing the small piece of clay. Your objective is to create a sharp beveled edge on the side of the aperture farthest from the mouthpiece. This sharp edge splits the air from the windway and creates the sound. (See figure 4.16 for a cross-section view of how this should look.) Carefully withdraw the stick from the windway.

Step 18

Bring the ocarina to your lips and give it a test blow. If it whistles, you can move on to the next step. If there is no whistle, reinsert the stick in the airway and check the sharpness of the bevel.

Withdraw the windway stick, being careful to keep the stick flat. Do not raise or lower it, as this will misalign the bevel.

Hold the ocarina up and look into the windway while under an overhead light. You should see the beveled edge right in the middle of the windway. If you do not, reinsert the windway stick and lay the ocarina on the table with the flat side down. Press down on the body and mouthpiece to ensure that both are in full contact with the table. Remove the stick and recheck the alignment.

Step 19

Use a drill bit or a hole cutter to create the finger holes on the top of the ocarina. Use the countersink tool to smooth the edges of the holes.

It is most common to create 4-6 holes, but you may do as you like. Depending on the precision of your mouthpiece assembly, at some point as you add more holes, your ocarina may stop sounding. If this happens, either adjust your windway and bevel until it works again, or fill in your last finger hole and declare success!

If you want to tune your ocarina to a specific scale, cut and tune one hole at a time. Enlarging a hole raises its pitch, so start small and enlarge each hole until you achieve the pitch you want.

Final Steps

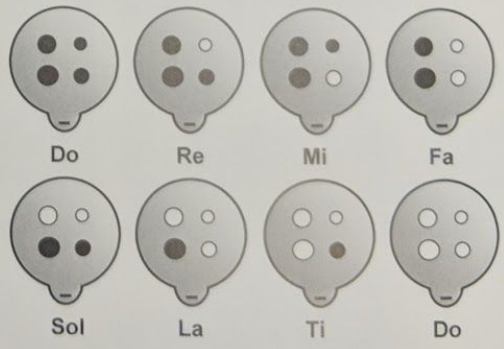
You can fire and finish your ocarina in almost any way imaginable. If you elect to glaze it, be careful not to get any glaze in the windway, which will clog it. It is also advisable not to glaze the beveled edge of the aperture. Very slight changes to your mouthpiece assembly can alter the ocarina's sound, or make it stop working altogether.

Many makers low fire their ocarinas so the clay retains some porosity. This helps to avoid moisture buildup in the windway.

You can also turn your ocarina into an animal or other form by adding components to the exterior of its body. Most of the fanciful ocarinas shown in this book started with a basic shape such as this one. Have fun!

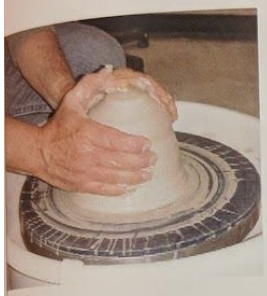
The Four-Hole "English" Ocarina Tuning

One of the simpler fingering systems for an ocarina requires only four holes to play an entire octave of pitches. The fingering for a major scale is shown to the right, where white circles indicate open holes and black circles indicate closed holes. To create this tuning on your ocarina, start by cutting the hole in the upper right corner. Start small, and enlarge the hole until it produces the second scale tone ("re"). This will, of course, be relative to the first scale tone ("do") that is produced when the hole is covered. Then cut the hole below it, and continue to the rest of the holes one at a time, following the fingering pattern shown and testing your notes as you proceed. As shown in the diagram, each hole you create will be larger than the previous one. As with the tubular flute, enlarging a hole raises the pitch it produces. Unlike the flute, the position of the hole relative to the mouthpiece has virtually no effect. This is because an ocarina is a globular flute, rather than a tubular flute (see the Aerophones chapter for more information on the differences between tubular and globular instruments).



DEMONSTRATION 3 | Goblet Drum

Although it is traditionally handbuilt from coils, this drum is also fun to make on the potter's wheel. It is suited to intermediate and advanced potters, but its two-piece design makes it a project that even novices can try. Just about any type of clay can be used. For this demonstration a white stoneware with medium grog was selected.



Step 1

Throw the base of the drum first. It requires 8 to 10 pounds of well-wedged clay. It is crucial that the clay be perfectly centered on the wheel before moving on to the next step.

Step 2

Open the clay all the way down to the wheel head. At the bottom, move the clay outward very carefully to keep it centered. Create a wide flare at the bottom and draw the clay up to a narrow mouth at the top.

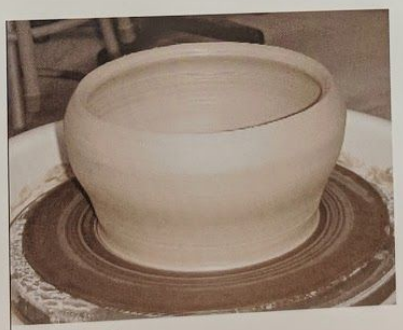
A top view of the drum's base showing the open bottom. Note that the top edge is broad and has been trimmed flat. This will aid the attachment of the drum's bowl later.

A side view showing the base near completion. A wooden rib is used to smooth the outer surface and to thin the wall evenly from bottom to top.

Step 3

Use a wooden tool to trim away excess clay from the bottom of the base. After the trimmings are removed, the edge can be smoothed with a sponge.

At this point the base can be set aside to firm to the leather-hard state before being cut from the bat with a wire.



Step 4

Use 4 to 5 pounds of clay for the second piece of the goblet drum. Just as with the base, the clay for the bowl should be well wedged and perfectly centered before shaping it.

Step 5

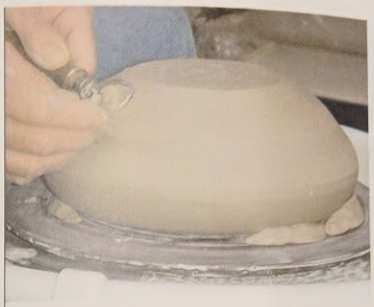
Roll the mouth of the bowl inward slightly. Use a sponge to smooth the outer wall.

A view of the bowl showing how the wall has been widened while maintaining the rolled rim. The rim of the pot should not be too thin, since this is where the drum will be repeatedly struck with the hands and fingers.

Draw a cut wire across the bat and set the bowl and bat aside. After the bowl firms up, it can be lifted and inverted.

Step 6

Center the bowl upside down on a bat or directly on the wheel head. Once centered, use several pads of soft clay to hold it in place.



Step 7

Use a trimming loop to remove excess clay from the bowl. Trim enough clay away so that the walls are of even thickness from top to bottom and so the drum will not be too heavy. Be careful not to trim through the pot.

Step 8

Use calipers to measure the INNER diameter of the base. A ruler or other straight stick can be used if calipers are not available.

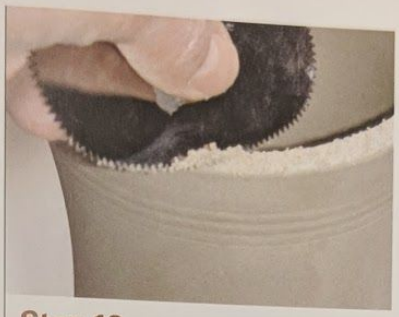
Step 9

Set the calipers on the bowl with the center of the bowl at the midpoint between the caliper tips. Lightly press the tips into the clay to indicate the width of the hole to be cut.

Step 10

With the bowl spinning, use a needle tool to cut out a disk of clay. Remove the disk of clay. It isn't necessary to clean up the edge.

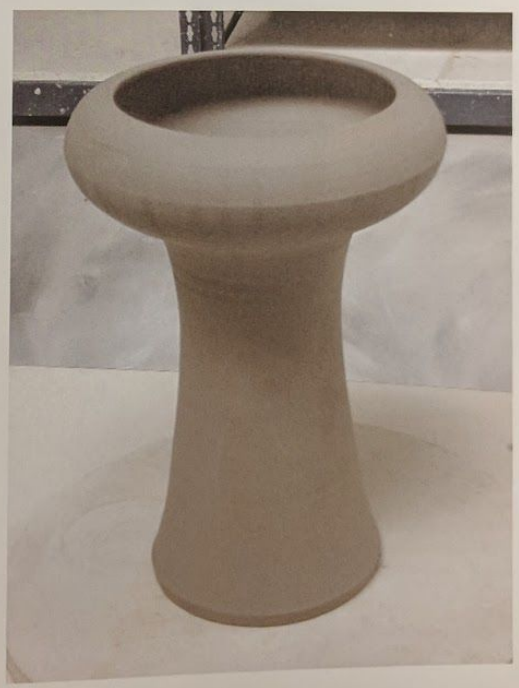
Step 11
Use a needle tool to thoroughly score the area around the edge of the cut. The scored band should be about ¼" wide. Then paint an even coat of water or slip on the scored area, allowing it to soften.



Step 12
Score the top of the base piece as well. A serrated rib is ideal for this. After scoring this surface, paint it with water or slip and allow it to soften.

Step 13
Invert the base and lightly place it over the bowl's scored area. Slowly turn the wheel to gauge how well the base is centered on the bowl. Slide the base front to back or side to side, until it is centered on the bowl. Once it is in the proper position, apply firm, even downward pressure to meld the two pieces. Smooth the seam with your fingers as the wheel slowly spins.

Step 14
Wind a coil of clay around the seam area to give added strength. Overlap the ends of the coil and draw a knife through both to remove the excess. Thoroughly smooth the coil into the forms with your fingers.



Let the goblet drum dry slowly. Bisque fire and then glaze. After the glaze firing, the drum is ready for the skin to be attached.

Notes on Heading Your Drum

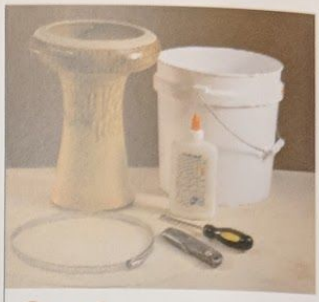
When putting a skin head on a ceramic drum, almost any rawhide animal skin can be used, but those most commonly used for drums come from goats and cows. The skins of different animals have varying properties that will impact the sound of your drum. Goat skin is widely used for drums because it is thin, strong and very flexible.

Rawhide animal skins can be purchased from a variety of sources (see "Resources and Materials".) If you are more adventurous and have access to fresh animal skins, you can scrape and dry the hide yourself. This is a very messy and smelly process, so many drum makers prefer to obtain pre-stretched and dried skins.

Skins come in different thicknesses. Some drums, such as congas and drums played with sticks, use thick skins, while other drums such as doumbeks and frame drums usually sound better with thin skins. Regardless of whether the head is thick or thin, the best sound will come from a skin that is a uniform thickness throughout. It is also important to choose skins that do not have holes or other potentially weak spots. An easy way to inspect a skin for flaws is to hold it up to a light. Since skins are usually translucent, weak spots or holes will show up clearly.

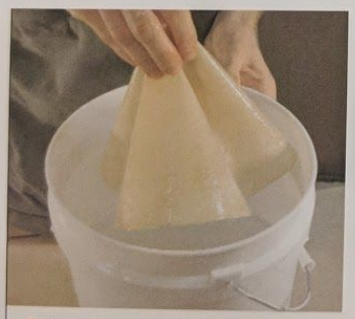
The hair on a hide can be left on the drum or removed. Any remaining hair will dampen the drum's tone, which is desirable on some types of drums and avoided on others. Even if you use a hairless skin, it is desirable to position the side of the skin that used to have hair facing outward (the striking side of the head). The hair side has a smoother and more durable surface, and can be identified on hairless skins by looking closely for pores or small hairs.

This demonstration uses glue and clamps to attach the skin to the drum shell. The recommended glue is either polyvinyl acetate (commonly called white glue) or aliphatic resin (yellow carpenter's glue). These adhesives are water-soluble, which means they will enable you to remove the drum head, when necessary, by soaking it in warm water.



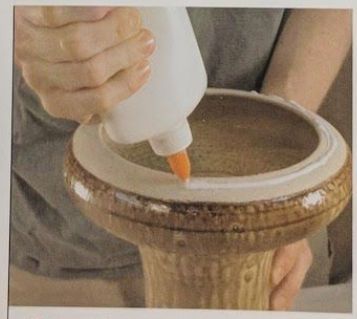
Step 1

Materials needed: The glazed and fired drum body, rawhide goat skin (at least 4 inches larger in diameter than the widest part of the drum), hose clamp or large rubber bands, water-soluble glue, and a sharp knife for trimming.



Step 2

Soak the rawhide skin in cold water until it becomes limp and stretchy—about 30 minutes to an hour, depending on its thickness. Remove it from the water and shake it dry, or lightly pat it with a towel to remove any excess water on its surface.



Step 3

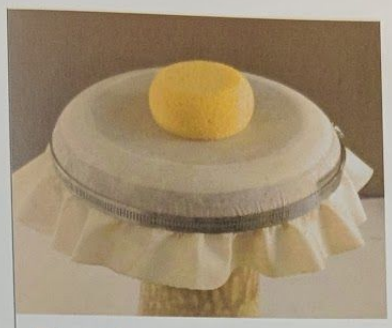
Spread a thin layer of glue on the rim of the drum. Note the portion of the drum rim that was left unglazed in order to improve adhesion of the glue.

Step 4

Drape the skin over the drum, with the hair (exterior) surface on top. Hold the skin in place with a hose clamp or rubber bands. Do not tighten the clamp all the way yet.

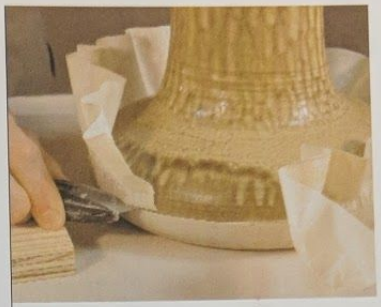
Step 5

Gently pull the edges of the skin down under the clamp while removing any folds or buckles from the skin that occur underneath the clamp. Your objective is to pull the skin as tight as the clamp or rubber bands will hold it. You should alternate several times between tightening the clamp and pulling the skin tighter in order to put as much tension as possible on the skin.



Step 6

Once the skin is pulled as tight as you can get it, allow the glue and skin to dry thoroughly. Depending on your skin, drum and location, this will probably take 1-2 days. Do not play the drum or disturb it in any way while the glue and skin are drying or it will lose tension. To achieve an even tighter head, leave a damp sponge resting on the center of the head as it dries. This will inhibit the center of the head from shrinking until after the glued rim has dried.



Step 7

When the skin is completely dry, remove the clamp and trim the excess skin with a knife. Be very careful; the skin is often difficult to cut through, and knives tend to slip very easily on glazed ceramic surfaces. Instead of a knife you can also use a hacksaw blade to "saw" through the skin. A new, sharp blade will have the best cutting action, but may rapidly become dulled by the ceramic surface. If your drum is high-fired, there is little danger of damaging the drum's surface with a knife or saw blade. Once trimmed, you can remove any excess glue with a sponge and warm water. The skin may have a slightly sharp edge. To smooth it, you can wet the edge of the skin with water and press it down, or you can sand it with fine sandpaper. You also can add a decorative band of fabric, ribbon or tape around the drum to cover the edge of the skin.

The finished drum

To hear how a drum like this sounds, listen to track 19 on the CD.

DEMONSTRATION 4 | Side-Blown Flute

Simple as it is to construct, the playing of this flute can be trickier to master than the ocarina or whistle flute. This demonstration provides the basic elements of the side-blown flute's design. You may have to make a few before you have one that plays just the way you like. Experiment with different lengths, hole sizes and shapes. To hear how a flute like this can sound, listen to track 30 on the CD.

Step 1

Our side-blown flute's tubular body is made using a cylinder die attached to an extruder with a capacity of about eight pounds of clay. We've chosen a die that produces a 1-inch diameter tube. You also can use a smaller diameter die, but larger is not recommended for your first flute because the instrument will require too much air to sound.

The key to making hollow extrusions suitable for flute barrels is to use a moist, supple, smooth-bodied clay that has been well wedged so it is free of air bubbles. If you use stiff clay the extrusion will likely split where it passes over the cross brace that supports the center section of the die.

(If you don't have access to an extruder, you can create your flute tube using the slab method shown in the end-blown flute demonstration.)

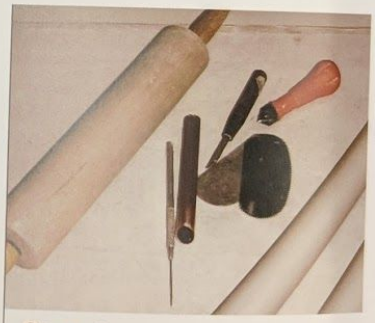
Step 2

Here, the clay has been loaded into the extruder and the first extrusion is underway. The clay is guided with one hand while the handle is pulled downward with the other. If the extruder cannot be easily operated this way, then the clay is probably too stiff.

A full barrel of clay will yield two or three extrusions that are 12 to 18 inches long. Remove each from the extruder using a cutting wire drawn across the base of the extruder's die holder.

Step 3

Since the fresh extrusions are soft, their shape can easily be distorted. Carefully lay each on a large piece of drywall or other flat surface and roll them back and forth to ensure they are straight.



Step 4

The extruder can be cleaned now and the tools needed to finish the flute can be gathered. To the left is a wooden rolling pin. Also shown is a needle tool, a piece of specially-cut copper tubing, a brass hole cutter with a wooden handle, a metal rib with smooth edges and one with a serrated edge. Above them is a countersink. The countersink and copper tubing can be found at a hardware store. The other tools are available from a ceramic supplier. You will also need a small ruler, a small paint brush and a cup of water (not shown). The extrusions can be left uncovered to firm up somewhat, but care should be taken to not allow them to get too hard.

Step 5

Here's a close-up view of the copper tube used to cut the blow hole in the flute. It is approximately ⅜ of an inch in diameter. It has been cut on a 30° angle and the edge has been de-burred.

Step 6

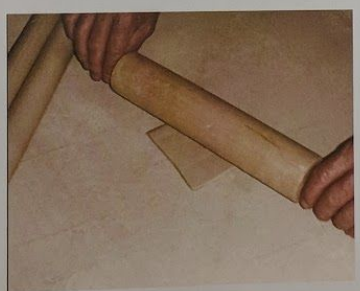
The remaining steps apply to each tube that has been extruded. One end of the tube is capped off with a flat piece of clay. Cut a piece about 2 inches long from the tube using the smooth-edged rib. To minimize distortion, roll the tube back and forth while exerting light pressure with the rib.

Step 7

Slice the short tube open using the smooth rib.

Step 8

Carefully uncurl the clay. Open it slowly to avoid the formation of cracks. When the clay is nearly flat, press it on the table with your fingers.



Step 9

This is the rolling pin's only job. Use it to roll the small piece of clay evenly. There's no need to exert any real pressure. The weight of the roller, alone, should be enough to get the job done.

Step 10

Stand the tube on the clay piece and support it with one hand. Lightly scribe around it using the needle tool, as shown. The circle made on the clay piece will indicate where it should be scored for attachment to the end of the tube.

DEMONSTRATION 4 | Side-Blown Flute

Step 11

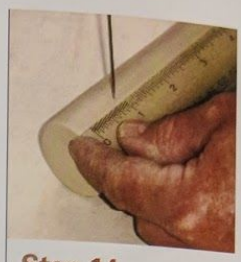
With a needle tool, thoroughly score the clay piece inside the scribed circle. The serrated rib is used to score the end of the tube. Brush both scored surfaces with water to lend additional stickiness to the clay where the pieces are to be joined.

Step 12

After the end cap is in place, trim the excess clay using the smooth rib. Cut the bulk of the flat clay piece away quickly then cut closer to the tube with a series of smaller, "nibbling" cuts until the edge of the end cap is fairly smooth and round. Tip: After cutting away what you can, roll the tube back and forth on the table to further smooth the edge of the end cap.

Step 13

To determine the location of the blow hole, go to the open end of the tube and measure the inner diameter of the tube. This tube's inner diameter is ⅞-inch, so this is the measurement we will use in the next step.



Step 14

Hold the ruler against the tube, as shown, and use the needle tool to make a small hole ⅞-inch from the point where the end cap joins the end of the tube. In other words, don't measure from the outside end of the tube; measure from the end of the air column on the inside of the tube. Note that in the photo the zero mark on the ruler has been moved in from the end of the tube to allow for the thickness of the end cap.

Step 15

Hold the copper tube perpendicular to the flute body and press the edge into the clay at the mark made with the needle tool. Be careful to avoid any side-to-side movement as you twist the copper tube to complete the cut. A small plug of clay should come out when the copper tube is extracted.

Step 16

This close-up view shows everything done so far. The end cap has been rolled smooth, the blow hole has been cut and groomed a little with the fingers, and the small clay plug has been removed from the copper tube. The best sound will result from a well-defined blowing edge, so avoid the temptation to excessively smooth over the blow hole edge for aesthetic reasons.

Step 17

Now for the finger holes. The flute will have a total of six cut into it along the top. Grasp the flute comfortably near its middle with your left hand. Use the needle tool to mark where the pads of your first three fingers rest on the flute.

You might also choose to make a four-hole pentatonic flute that plays a five-note scale. For this style, mark your first and third fingers.

Step 18

Use the hole cutter to make a hole at each spot where you made a needle mark. As with the blow hole, hold the cutter straight up and avoid wobbling side to side. Repeat the process to make three more holes for your right hand.

About precision tuning

For your first flute, you may want to cut the finger holes without too much measuring or fuss, and just enjoy whatever scale results. If you want to tune your flute to play a standard scale, the process involves cutting and tuning one hole at a time, starting from the distal (bottom) end of the flute and working your way up. For a standard six-hole flute tuning, the spacing of the holes along the body should be close to the measurements given in the diagram. The holes should be approximately ⅜-inch in diameter, but it's recommended to start smaller and fine-tune each hole by gradually enlarging it until you achieve the tuning you want, then move on to the next hole. Each successive hole slightly changes the tuning of the previous hole, so this process requires a lot of backtracking and adjusting if you want a high level of precision.

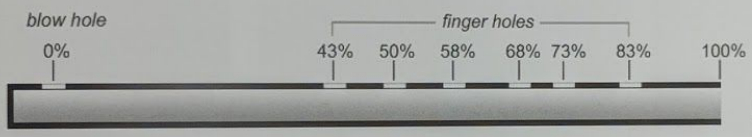
Here are the two most important rules for tuning:

A hole placed closer to the mouth hole gives a higher pitch. When placed farther away, it gives a lower pitch.

A smaller hole gives a lower pitch. If made larger, it gives a higher pitch.

These rules indicate two ways to raise a pitch produced from a tone hole: either enlarge the hole, or place the hole closer to the blow hole. To lower a pitch, use a smaller hole or place the hole farther from the blow hole.

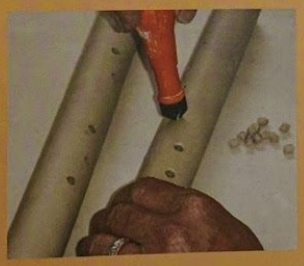
Precision tuning a flute in this way can be quite time-consuming, but the results are rewarding. If you get more deeply involved in making flutes, there are additional factors that come in to play that you will want to understand in order to better control the tuning, including wall thickness, tone hole undercutting and factors that impact intonation of the second octave. Several sources for more detailed information (and links to software for calculating hole size and placement) are listed in the "Resources" section and at this book's website, www.FromMudToMusic.com.



Measurements from "Simple Flutes" by Mark Shepard.

Final Steps

It isn't absolutely necessary, but chamfering the edge of each finger hole with the countersink may make it easier to seat your fingers over the holes. You might try one flute with countersunk holes and another without them to see which works the best for you.



The three flutes that were made simultaneously are finished and ready for drying.

When completely dry, the flutes were bisque-fired to cone 04. They were decorated with a white crackle glaze and fired again in a raku kiln.

DEMONSTRATION 5 | Whistle Flute

The whistle flute in this demonstration is an end-blown ducted flute similar to a recorder or Irish penny-whistle, which has an airduct assembly at one end and a series of finger holes. This flute is challenging to make but easy to play. Successfully make one or two of the four-hole ocarinas and you're ready to give this instrument a try. For variety, experiment with different tube lengths to develop different pitches and try bending the tube into different shapes. As with the previous projects, most any type of clay can be used. What's important is to begin with fresh, well-wedged clay.

Step 1

Our collection of familiar tools now includes a drum stick and a carpenter's square. The drum stick is about 14 inches long and ½-inch in diameter. A wooden dowel rod is a suitable alternative. It is important to have two of the sharpened Popsicle sticks (like those used in the ocarina demo). This project starts with a ⅛-inch-thick slab of clay that measures about 12 inches wide and 18 inches long. A slab roller is recommended to create this, but a rolling pin can be used if care is taken to ensure a slab of even thickness. A 2-foot-square sheet of drywall makes an ideal working surface.

Step 2

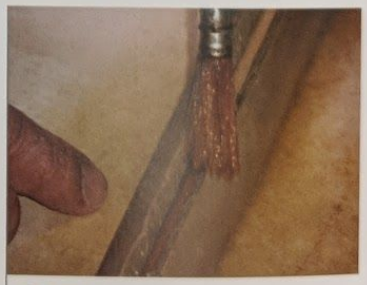
After gathering the tools and rolling out the slab of clay, the next step is to cut the clay into a manageable shape. Use the needle tool with the carpenter's square to make a straight cut along one side of the slab. Lay the edge of the dowel or drumstick on the clay with its side about an inch and a half from the edge of the slab. Make another cut in the slab about an inch and a half below the other side of the dowel.

Step 3

Using the needle tool, make squared cuts at each end of this strip of clay. Cutting the strip slightly shorter than the dowel makes it easier to remove the dowel later.

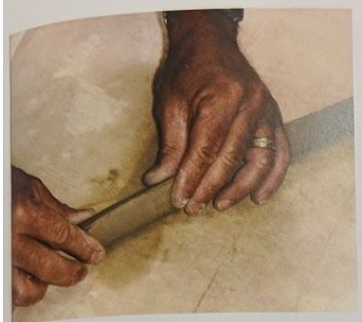
Step 4

This is where the suppleness of the clay is critical. If the clay has been allowed to get too firm it will crack as it is formed around the dowel. The trick is to move slowly along the length of the dowel. If some cracks develop, lightly moisten the outside surface of the clay. If the strip is too wide, reopen the clay and trim the excess. Don't seal the seam shut yet.



Step 5

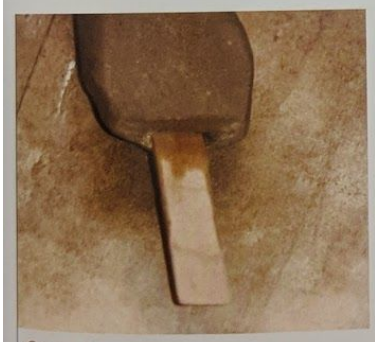
Once you have the clay trimmed just right, thoroughly score the edges of the slab using the needle tool or a serrated rib. Then, apply a light coating of water along the full length of the strip. There's no need to drown the clay in water. In fact, too much water will make it more difficult to remove the dowel.



Step 6
Now the seam can be sealed. Pinch the edges together along the full length of the dowel. Every few inches, stop to give the dowel a slight twist to keep it moving freely as the tube is being formed. Making a strong seam now will prevent splitting later.

Step 7
Once it is completely closed, roll the tube back and forth to smooth out the seam. Leave the dowel in the tube while you do this, to keep from crushing the tube. As soon as the seam has been smoothed, twist the dowel and draw it out of the tube. It must be removed at this point, because the clay shrinks as it dries, and will tighten up around the dowel.

Step 8
To construct the airway, insert a Popsicle stick into the tube and press the clay down around it with your thumbs, as shown. Press the clay from the end of the tube down about an inch. Leave the stick in place for the moment.



Step 9
Trim some of the excess clay from the sides of the mouthpiece. This is a top view of the tube after the mouthpiece has been trimmed.

Step 10
Trim the opposite end of the tube. A large serrated rib (as shown in the image) works well, but a variety of tools can be used for this purpose.

Step 11
With one Popsicle stick in the airway, the other is used to cut the sound hole. The sound hole should be located just below the point where the clay begins to taper toward the mouth hole. Make the cuts into the clay until they reach the inner stick. Use the sharpened edge of the stick to cut a shallow bevel in the back of the sound hole.

Step 12

This is the finished sound hole. The tube is now a simple, one-note flute. Give it a try. Although the clay is wet, the flute can be blown enough to determine the quality of the basic sound. No sound? Reinsert the stick in the airway and adjust the beveled edge so that it splits the airway passage. Be sure the beveled edge is sharp and smooth. If it's a little ragged, use the Popsicle stick to smooth the surfaces. The ocarina's mouthpiece was made in the same way.

Step 13

The flute is nearly ready for drying and firing. Use the hole cutter, as shown here, or a ¼-inch drill bit, to cut four evenly spaced finger holes along the top of the flute. You can now play the flute to see how it sounds. If you're not happy with any of the finger holes, you can enlarge them to raise their pitch, or fill them in with clay and re-cut them in another spot on the tube to get a different pitch. For information on hole placement and precision tuning, see the "side-blown flute" demonstration in this chapter.

Step 14

The countersink is twisted over each hole to give a nicely smoothed edge. Before letting the flute dry completely, check the inside of the flute to be sure it is smooth and free of obstructions. The dowel won't fit in it any more, so use the needle tool, a chopstick or other small stick to clear out the flute's interior if necessary.

The Finished Flute

This instrument was raku-fired to blacken the clay inside and out.