

The Whistle Lady Presents:
Shake, Rattle, and Blow—Making Beautiful Music with Metal Clay

Metal Clay Whistles

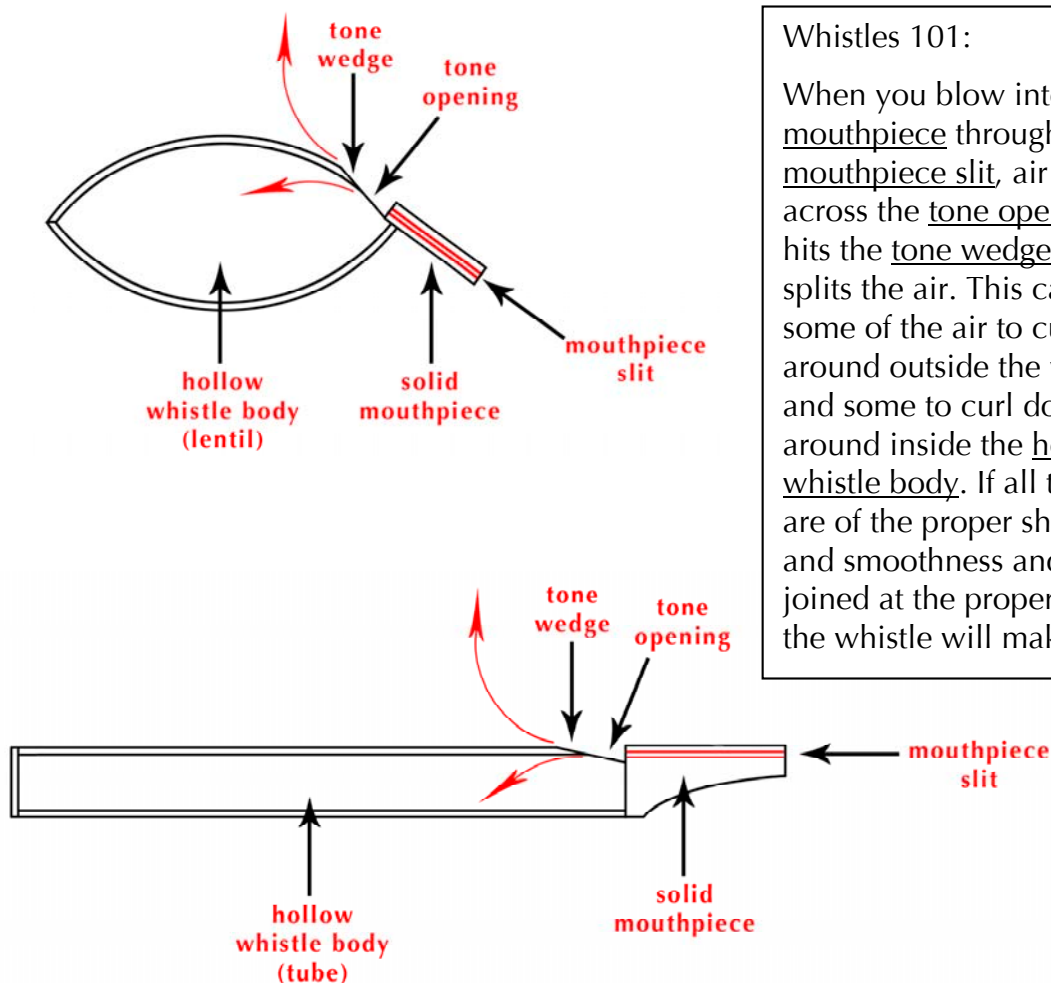
By Donna Penoyer



First of all, I'm an artist, and I absolutely love to make whistles, but I'm not obsessed with the science of aerophone dynamics. I'll tell you what you need to know to make a fun and successful metal clay whistle, and what to check if it's not working properly, but I'm going to leave airflow patterns and musical wave frequencies to the scientists. For a more technical but still very readable explanation of whistle mechanics, I recommend Chapter Six, "Aerophones," in Bart Hopkin's excellent book, *Musical Instrument Design* (See Sharp Press, 1996).

The whistles I make have two main components: a hollow whistle body, based either on a tube or a lentil model (which I interpret widely), and a mouthpiece. These components need to be crafted with a few essential parts in order for the whistle to work:

- what I call the "mouthpiece slit," which focuses and directs the air blown into the whistle
- what I call the "tone wedge," a part of the whistle body wall that has been sharpened at an angle into a knife-edged slope, which splits the air directed at it through the mouthpiece slit and causes the whistle to make a note
- what I call the "tone opening," a hole in the whistle body, between the mouthpiece slit and the tone wedge, that allows some of the air to leave the whistle and some to enter the whistle body as the air is split by the tone wedge



Whistles 101:
 When you blow into the solid mouthpiece through the mouthpiece slit, air travels across the tone opening and hits the tone wedge, which splits the air. This causes some of the air to curl up and around outside the whistle and some to curl down and around inside the hollow whistle body. If all the parts are of the proper shape, size, and smoothness and are joined at the proper angles, the whistle will make a note!

Q: Donna, are your whistles suitable for personal protection (i.e., are they “rape whistles”)?

A: Some of my whistles are shriller than others, but most make sweet notes or, in the case of my larger whistles, more plaintive sounds like mourning dove cries. I do not intend people to wear my whistles for personal protection. In fact, my motto is, “They’re for pleasure, not for panic.”

Q: Why do you make whistles?

A: I’m an odd duck. I look mild-mannered, but I’ve got a secret wild side, as anyone who has seen me perform on stilts will attest. (Entertaining at corporate events and festivals as a roving “hostess with the mostest” on stilts is my “day job.”) I like things that “do stuff,” that have secret lives, that have the power to surprise and transform, and that encourage playfulness and spontaneity. Homemade instruments, especially whistles, are a particular interest of mine, ever since my husband and I exchanged gumball-machine whistle rings in our wedding.

Q: Don’t you have to have a pea inside a whistle in order for it to work?

A: No, you don’t. A pea-sized cork will simply make the whistle more shrill, as it makes the whistle note fluctuate rapidly between tones. Our ear hears the discord, as when two side-by-side piano keys are struck at once, and our brains and bodies go on the alert. There are some challenges with including a “pea” in a metal clay whistle. It has to be light enough to float around when the whistle is blown, so firing a ball of metal clay inside the whistle may not work (but I haven’t tried it—so go ahead and experiment!). And, of course, the traditional cork ball will burn up in the kiln.

Q: I’ve seen ceramic whistles made in one piece, with the mouthpiece slit, tone opening, and tone wedge made all at once by shoving a flat wooden slat through the clay. Will that work for metal clay whistles?

A: I have tried this method several times and have had no luck with it, but that doesn’t mean it’s not possible. My students and I always make the mouthpiece separately from the main body of the whistle, which allows us to make a precise tone wedge and tone opening, then to place the mouthpiece at exactly the right location and angle to make a good note.

Q: Can you make a metal clay whistle that plays more than one note?

A: Absolutely! Tiny, jewelry-sized tube whistles aren’t long enough for very many multiple notes—I’ve managed to get one extra hole to play well—but ocarinas and other globular or lentil-shaped whistles can easily be made with extra holes for more notes. See my comments, toward the end of this handout, called “Metal Clay Whistles: A Few ‘Notes’ about Holes.”

If you're having trouble getting a good sound from your metal clay whistle, keep these items in mind:

- The mouthpiece must have a rectangular slit, not a round hole.



- The mouthpiece must be solid, so that a long channel is formed (the mouthpiece slit). The mouthpiece slit, being long, narrow, and flat, focuses the airstream in an essential way upon the tone wedge.
- The mouthpiece slit must be smooth. Fold a thin strip of 400-grit sandpaper crisply lengthwise, and run it through the mouthpiece slit to clear out any stray clay that might block the airway. Be careful not to change the shape of the mouthpiece slit or to sand too much, which may affect the sound of the whistle and may make the walls of the mouthpiece thin and fragile.
- The inside of the whistle body must be relatively smooth—no major bumps or scraggly parts.
- The mouthpiece must be aimed directly at the tone wedge. Try moving it up or down, left or right, or change the angle.
- The tone opening and wedge must be the same width as the mouthpiece slit.

- The tone opening must be the proper size and shape. I get the best results when the width and length are the same. See below:



Problem: Tone opening is too long.

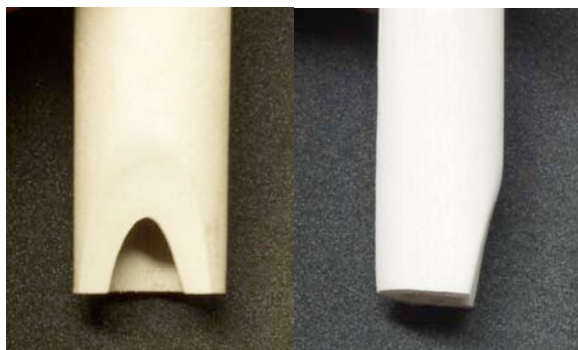
Solution: File end of tube with emory board until tone opening is about as long as it is wide.



Problem: Tone opening is too wide.

Cause: Angle wasn't cut steep enough.

Solution: Slice off this end of the tube and try again, holding the slicing blade more vertically and cutting away less of the tube. Or try again with a new tube. Or build in the sides of the tone opening with metal clay paste, and sand smooth.



Yeah, baby! This tone opening is just right!
Note the steepness of the cutaway portion, as seen from the side.

Make the Hollow Tube Body

1. On a laminated cutting guide, roll about 10g metal clay to 3 cards thick. With a slicing blade, cut a rectangle about 1 1/2" x 7/8".
2. Leave the clay on the cutting mat, and taper both of the long edges by pressing down with the side of your thumb, 1/8" of the way in, all along each edge.
3. Lightly oil the straw. Remove the clay rectangle from the cutting guide, and hold one of the tapered edges so that it falls lengthwise on the straw. Wrap the rectangle around the straw to form a tube, overlapping the ends lightly.
4. If the overlap is too small, wad up your clay and cut it a bit wider than 7/8" this time. If the clay overlaps too much, roll the top layer back onto the work surface, trim the long side with a slicing blade, and re-taper that edge.
5. Roll back the top layer and spread thick slip all along the inside of that edge, then wrap the clay around the straw again to form an even overlap. Hold your finger gently on the seam for a few seconds to create a good bond between the layers.
6. Use a fine-tipped brush to run water along the seam, then switch to a silicone-tipped shaper tool to blend and smooth the seam gently until it is almost invisible. It will help to dip the shaper tool occasionally in water. Finally, use a wet finger to smooth the entire tube.
7. Dry, under heat, for about 10-15 minutes. When firm enough, remove straw and put tube back under heat to dry completely.
8. Fill in any major gaps, cracks, or low spots with metal clay syringe or slip. Smooth the surface with a wet fingertip, let the tube dry completely, and refine with 400-grit sandpaper. Repeat filling, drying, and sanding as necessary, then smooth the piece even more with 600-grit sandpaper.
9. Sand the ends of the tube flat with an emory board.
10. Close one end of the tube: Roll a small amount of metal clay to 3 playing cards thick. Apply thick slip to the edge of the tube on one end, then stand the tube, slip-side-down, onto the rolled-out clay. With a needle tool, cut the clay in a circle around the tube, allowing approximately 1/16" extra clay all the way around. Alternatively, use a brass cutter to make a circle that is slightly wider than the tube (to allow for shrinkage as the clay dries), and apply to the end of the tube with thick paste. Run water along the seam.
11. Dry the tube completely, then sand the end circle flush with the sides of the tube. Refine the sides and closed end of the tube further by filling any flaws with slip or syringe, drying, and sanding with 400- and 600-grit sandpaper.

Create the Tone Opening and Tone Wedge

12. Stand the tube on its open end on a cutting mat. Position a sharp slicing blade approximately 3/8" up from the bottom, on the side of the tube opposite the seam. Be careful to handle the blade only from the top, via its dull side. Slice downward at a slight angle, about 15 degrees from vertical, to remove a wedge from the tube. This results in an upside-down, "U"-shaped opening that has a sharp edge. This wedge-shaped edge is a crucial component to making the whistle work, so make sure you cut cleanly and evenly.
13. The opening should be about as long as it is wide. If it is too long, sand off the end of the tube with an emory board. If it is too short, shave off a bit more at the opening by making another angled slice, close to the first one but a bit further up the side.

Sand the Inside of the Tube

14. Clean up the seam area that now shows inside the "U" by repairing flaws with slip or syringe, drying, and sanding. Roll a small piece of 400-grit sandpaper into a cylinder, grit side out, to sand the inside of the metal clay tube. It is important to remove any major bumps or rough spots that would interfere with the airflow inside the whistle, but there's no need to fine sand, except in the area that is visible through the "U." Be sure not to damage the sharp edge of the "U." If you do, hone it with an emory board or some folded sandpaper.

Make the Mouthpiece

15. Using an X-Acto blade, cut a strip from an old credit card about 1/8" wide.
16. Shape some metal clay into a thick log about 3/8" wide and about 5/8" long. Stand the log on end. Oil the plastic strip well and push it vertically into the log, orienting it closer to the top as you look at the log end from above. Be careful to hold the plastic strip straight up and down as you push, and support the log's sides with the fingers of your other hand as necessary. Push the strip all the way through to the other side, and leave the strip in place.
17. Turn the log on its side, plastic strip running horizontally and oriented toward the top. Using a 3/4" round clay cutter, cut away a portion of the bottom part of the log, toward one side, being careful not to cut too close to the plastic strip. This will create a curve in the mouthpiece that will be comfortable for the bottom lip when the whistle is blown. Continue to trim and shape the mouthpiece until it is roughly the shape you want it to end up, but don't distort the mouthpiece slit in the process. The shape will be further refined later with sandpaper after the mouthpiece has dried.
18. With the plastic strip still in place, allow the mouthpiece to dry under heat for 15 minutes. Pull out the credit card strip, and return the mouthpiece to the heat source to dry completely.
19. Sand the mouthpiece with needle files and/or sandpaper to achieve a pleasing shape, being careful not to sand away too much and cause the walls of the slit to become too thin. For now, leave the end that will be attached to the tube a little wider around than the tube, as extra insurance for proper placement when the two pieces are joined. Sand that end flat with an emory board.

20. It is important that the slit be smooth inside to allow the airstream to flow properly and create a clear whistle note. Fold a thin strip of black sandpaper crisply lengthwise and run it through the slit in the mouthpiece to clear out any stray clay that might block the airway. Be careful not to change the shape of the airway or to sand too much, which may affect the sound of the whistle and may make the walls of the mouthpiece thin and fragile.

Attach the Mouthpiece

21. Before attaching the mouthpiece, you need to determine its best angle and location relative to the main body of the whistle. Hold the mouthpiece in place against the open end of the tube, with the slit aimed directly toward the curved part of the "U." The "U" will be facing up, and the mouthpiece will be oriented with the curve for the bottom lip facing down. It may help to peer through the slit and adjust the mouthpiece until you can see the far edge of the "U" aligned properly within your "sites."
22. Holding the mouthpiece in position, try blowing the whistle to see if it makes a clean-sounding note. (Make sure your lips are dry, to avoid rewetting the metal clay and transferring it to your mouth.) If you have trouble getting a good note, try changing the angle of the mouthpiece, or move it a tiny bit up, down, or to the side.
23. You may find that the side of the mouthpiece that joins with the tube needs to be sanded at a slightly different angle in order for the slit to be aimed properly. If so, use an emory board to make these adjustments, and re-test the mouthpiece.
24. When you have determined the proper angle and location of the mouthpiece and, in that spot, the mouthpiece and tube fit well against each other, you may wish to make some registration marks with a pencil. Separate the parts and, with a fine-tipped brush, apply thick slip to the end of the tube. Press the mouthpiece in place, and keep holding the two parts together. Carefully blow the whistle to make sure you have hit the right spot. Slide the mouthpiece around, if necessary, until you can make a good note. With a dry brush, wipe off any slip that has oozed out of the joint. Apply water to the joint, and hold the mouthpiece gently in place for a few moments until the slip sets up and a good bond has been achieved.
25. Allow the whistle to dry completely.
26. Reinforce the join between mouthpiece and tube with paste and/or syringe, and dry again. Sand with sandpapers and/or tiny files to clean up the join.

Finish, Fire, and Polish

27. Add decorations and/or a bail, if you like.
28. Fire, supporting the piece in vermiculite.
29. If you tumble-polish your piece, remember to plug up the hole with a pipe cleaner, or your whistle will fill with steel shot.

Congratulations! You've made a whistle!

Make the Hollow Lentil Body

1. Roll about 10g metal clay 4 cards thick plain, then 3 cards thick on a texture sheet. Oil the clay before rolling it on the texture!
2. Cut out a circle. (For example, 1 3/8" wide.)
3. Apply to oiled armature (light bulb, measuring spoon, marble, plastic egg, ping-pong ball, etc.) (For example: 1 teaspoon measure.)
4. Roll gently with finger from middle out to remove air bubbles and get metal clay to conform to dome shape.
5. Repeat above steps to make and dome another circle.
6. Dry, on armatures, under heat, for 5-10 minutes. When domes are firm enough, remove them from armatures and put them back under heat, upside down, to let back side dry.
7. When pieces are fully dry (about 15-20 minutes total), sand concave-side-down.
8. On one of the circles, run paste along flat lip created in Step 7, or apply water first and use syringe. Either way, apply water on top of paste or syringe afterward.
9. Join two domes together. Use dry brush to clean away any paste that squeezes out.
10. Wet fingertip and rub water lightly around entire circumference to smooth.
11. Dry under heat.
12. Sand edges with emory board and then progressively finer grits of sandpaper. After 400-grit sandpaper, check for gouges and scratches that may need filling with paste, and do cosmetic repairs at this stage. Dry under heat, then sand with 600-grit sandpaper.

Make the Mouthpiece

13. With X-Acto blade, cut a strip from a credit card about 1/8" wide.
14. Roll a small amount of metal clay 3 cards thick. Cut a square about 5/8" x 5/8".
15. Oil the credit card strip and lay it across the center of the square. Fold one edge of square over top of credit card strip so that edge of clay meets the far edge of the strip.
16. Apply plenty of metal clay paste to the part of the square that hasn't been folded over yet. Fold over and smooth the seam.
17. Dry under heat, remove the credit card strip, and dry some more.

18. Sand ends and sides with progressively finer grits of sandpaper. Fold a thin strip of 400-grit sandpaper crisply lengthwise and run it through the slit in the mouthpiece to clear out any stray clay that might block the airway. Be careful not to change the shape of the airway or to sand too much, which may affect the sound of the whistle and may make the walls of the mouthpiece thin and fragile.

Make the Tone Opening

19. With small, flat file, sand a flat area at the edge of the lentil at about a 45-degree angle to the seam.
20. With an X-Acto knife, cut a small square hole approximately 1/8" x 1/8" in this flat area, right near the edge of the lentil. This should reveal a ramp or wedge that leads down into the hole. This is the tone wedge, the spot toward which the mouthpiece should be aimed in order to split the airstream and make the whistle sing.

Attach the Mouthpiece

21. Hold the mouthpiece in place against the lentil, aimed directly at the tone wedge. Make sure your lips are dry (to avoid transferring metal clay to your lips), and try blowing to make a note. Wipe your lips! Adjust the angle of the mouthpiece until you get it right. You may need to use an X-Acto to carve a seat in the lentil wall to get a good fit between the mouthpiece and lentil.
22. When you have observed the right angle, paste the mouthpiece to the lentil, making sure not to block the airway with stray paste. Hold the mouthpiece in place until the paste sets up a bit, then carefully do another test blow to make sure your whistle is making a good note.
23. Dry completely. (When I make a delicate or crucial join like this, I let the piece air-dry for several minutes before putting it under heat. This waiting period gives the moisture time to mingle and make a good join.)
24. Reinforce the join between mouthpiece and lentil with paste and/or syringe, and dry again. Sand with sandpapers and/or tiny files to clean up the join.

Finish, Fire, and Polish

25. Add decorations and/or a bail, if you like.
26. Fire, supporting the piece in vermiculite.
27. If you tumble-polish your piece, remember to plug up the hole with a pipe cleaner, or your whistle will fill with steel shot.

Congratulations! You've made a whistle!

Metal Clay Whistles: A Few “Notes” about Holes

Copyright 2008 by Donna Penoyer

--If you're going to add finger holes for extra notes, drill them with small drill bits, by hand, after the clay has fully dried.

--Start off with very tiny holes and enlarge them as needed to tune the notes.

--If I were going to put finger holes in a whistle/flute, I would make the clay without texture or with very fine texture around the holes, so that my fingers would close up the holes properly. A deep texture can interfere with that good finger seal, resulting in poor sound.

--A small, jewelry-sized tube whistle may be long enough to have one extra hole, inches from the mouthpiece, but probably not more than that! Experiment.

--For globular flutes/whistles (ocarinas, lentil whistles, etc.), hole placement is unimportant. Even a tiny ocarina can have several holes, placed wherever it's comfortable for you to cover the holes with your fingers.

Bart Hopkin, from Making Simple Musical Instruments:

--“The essential factor in controlling pitch is the size of the holes, or, to be precise, the cumulative size of all open holes at a given moment.”

--“The rule for tuning is simple: the larger the hole, the higher the resulting pitch.”

From Dwight Bartholomew, “How to Make a Clay Whistle”:

--“If you put more than 1 hole in the whistle, you may want to consider making the holes different sizes. This will maximize the number of tones it will produce. For example, if you make 2 similar holes, you will have 3 tones. From low to high, these tones are ‘both holes closed,’ ‘one hole open,’ and ‘both holes open.’ However, if you make the holes different sizes, then you will have 4 tones: ‘both holes closed,’ ‘small hole open,’ ‘large hole open,’ and ‘both holes open.’”

Whistle Resources

Hopkin, Bart. [Making Simple Musical Instruments](#) (Lark, 1995).

Hopkin, Bart. [Musical Instrument Design](#) (See Sharp, 1996).

Waring, Dennis. [Great Folk Instruments to Make & Play](#) (Sterling, 1999).

Chris Henley, how to make pinch-pot clay whistles:
http://hominid.net/whistle_making_sequence.htm

Willow twig whistle directions:
<http://www.schizoffective.org/whistle/whistle2.htm>

Whittled wooden whistle directions:
http://e-scoutcraft.com/wood_carving/whistle.html

Straw whistle directions for kids:
<http://www.e-scoutcraft.com/misc/whistle.html>