

## Testing the Density or Specific Gravity of Bassoon Cane

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**O**f all the possible variables in reed making, the variability of the cane is the primary one, and the one that players long have assumed they could not control. Therefore, reed makers have strived for a high degree of consistency in all other aspects of the process of constructing the reed in an attempt to overcome or at least minimize the effect of this primary variable. However, recently it has been found that the density of the cane can be tested before the reed making process begins, and that if cane of consistent density is used, the reeds which result will exhibit more nearly similar playing characteristics.

There are several qualities that may contribute to the vibratory characteristics of a piece of reed cane, and most but not all of them can be measured and quantified. These include: (1) hardness (resistance to force), (2) stiffness (resistance to bending under pressure), (3) resilience (ability to return to the original configuration after having been flexed), and (4) density or specific gravity (the weight of material in a specific volume, expressed as a relationship to the density of water). Additionally, some bassoonists have devised other less readily quantified ways of evaluating cane, including a flexibility test, in which the cane is simply flexed and the degree of resistance to this flexing intuitively assessed, and a dynamic test, in which the cane is dropped from a given distance onto a hard surface, and the sound or pitch produced is evaluated as an indicator of its vibratory characteristics. While the question of correlation between the results of these various methods has not been extensively tested, the current experimentation has shown a strong correlation between the hardness test (number 1 above) and the density test (number 4). The density test has the additional advantage that it can be simply, quickly and inexpensively performed.

The procedure recommended here is called a "flotation test." The equipment needed for conducting it consists of: a small jar or other container, approximately 6" tall by 1½" in diameter, with straight sides, such as an empty olive jar; a ruler marked in millimeters, like the one used in reed making; a pencil with a thin, sharp lead; and a small hand-held calculator.

The test is conducted on gouged-only cane that has been allowed to dry thoroughly. For the most consistent results, the cane should have been symmetrically gouged, having as nearly equal dimensions as possible on both ends. The steps are as follows:

1. Fill the jar exactly to the top with water.
2. Take the piece of cane to be tested, and quickly and briefly immerse it completely in the water, in order to break the surface tension. You will notice that there are small air bubbles adhering to the surface of the cane. Withdraw the cane from the water and wipe the surface with your fingers, removing any bubbles, as otherwise they may affect the outcome of the test. Then, once again quickly and briefly immerse the cane completely.
3. Release the cane, letting it rise out of the water as much as it will so that it will seek its own level, making sure that the sides of the container are not artificially holding up the cane. With a pencil, carefully mark the inside of the cane at the water line. Conduct the test as quickly as you can, consistent with careful work, so that the cane will not absorb enough water to affect the outcome. After completing the test, unless you are immediately beginning the soaking period, thoroughly wipe any water from the surface of the cane.
3. Measure in millimeters the total length of the cane and the length of the amount which was submerged when the cane was floating freely in the water.
4. Using the calculator, divide the amount of cane, in millimeters, which was under the water by the total length of the cane. The result is a percentage, showing the proportion of the cane that sank under the water. This value may be marked on the cane or entered into a "reed log."
5. You may wish to wait several minutes in order to make sure that the cane is thor-

oughly dry, and then test it again, this time immersing the end opposite the one tested in the previous steps. This can be a good check of your technique in performing this test, as the two ends of most pieces of cane will produce results within one or two percentage points of each other.

The heaviest, most dense pieces of cane have been observed to sink about 90%-92% under the water, while the lightest ones typically will float with 68%-70% or less of the total length submerged. After having tested several hundred pieces of cane, it has become apparent that both the mean and the median measurements are almost exactly 80%.

There are several factors that can skew the results of the flotation test. (1) The thickness of the cane should be uniform throughout its length. If there has been inconsistency in the gouging process and one end is thicker, that end may test considerably softer. (2) Asymmetry in the width of the cane tends to produce differing results in tests of the two ends of the cane. (3) Cane which exhibits a thicker gouge, or a concentric configuration as opposed to an eccentric one, will tend to show a greater degree of buoyancy. (4) If the cane is not thoroughly dry, the results will not be accurate. To a degree, any inconsistency in the density test caused by numbers 1, 2 or 3 above will also be reflected in the characteristics of a reed made from that piece of cane.

This writer has found that with cane that has a density measurement ranging from about 78% to 82%, nearly all reeds work, that they

have relatively similar playing characteristics, and that a much greater degree of consistency in reed making can be achieved. About one-third of the pieces of cane tested fall within this range. Thus, the process enables us to avoid using the densest third and the least dense third of our cane. Eventually, you may discover that you prefer cane that is a little harder or a little softer. One other person who employs this procedure has reported that he prefers cane with a specific gravity rating of about 75%. This could vary to a degree depending on the altitude and the ambient humidity level at which the reed will be played.

An additional advantage of expressing the density as a percentage is that the results are comparable no matter what the dimensions of the cane, or what type of gouge is used. Further, by using this measurement, all bassoonists can compare their results.

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