Knowing your Classical Guitar

By Christopher Peppler

Dr Peppler Classical Guitars

What do you want to know about a Classical Guitar? From a player's perspective you will want to know three things: How does it sound? How does it play? How does it look and feel?

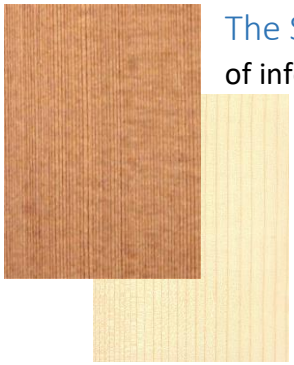
I started playing classical guitar at the age of 30 but after a few years I packed my instrument away and only returned to it at age 67. Since picking it up again I have bought a new guitar, built my own under the watchful eye of a master craftsman, repaired a couple, and played almost every day. During this time, I have read a lot and experimented quite a bit, and so can now give reasonable answers to the three key questions. I hope you find this article useful.

How does it look and feel? I am starting with this because it is the first thing we notice about a guitar. A classical guitar should be attractive. Yes, I know it's an instrument, but for most enthusiasts like me it is so much more. Besides, how it looks will have an effect on how it sounds. The guitar needs to be well built, in the correct proportions, and be finished well. If it meets these three basic visual criteria, then it will most likely sound good when you play it.

How does it sound? Both the base and trebles must sound clean and resonant. When you run down the keyboard on any string, from the open position to the 12th fret, the notes should retain their clarity and sweetness. When you play a fretted note, the sound should sustain for a couple of seconds. Obviously, there should not be any buzzes when you play any string at any fret position. If there are, then this can usually be eliminated but it will require tweaking. Some guitars are heavier than others and you should be comfortable with the feel of the instrument on your knee as you sit with it in the correct position. I prefer lighter guitars because they are built with thinner woods and finishes and this positively affects the sound. A lighter instrument can also be less tiring to play. But this is very general rule of thumb; Smallman's guitars are very heavy but sell for a fortune.

How does it play? The factors that most influence ease of play are the height of the strings from the keyboard, the width of the keyboard, the length of the strings from nut to saddle, the string tension, and the height and shape of the frets.

The various components and parts of a classical guitar all combine to produce looks, sound and playability, so it is probably easier to consider each of the major elements of the instrument separately.

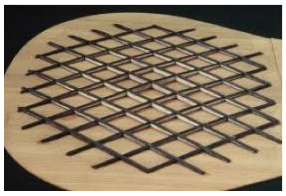


The Soundboard/top: Only very cheap guitars will have a **3-ply top** made of inferior woods glued together to a veneer of some sort. The tonal quality of these tops is not very good. Some classical guitars have Mahogany or Maple tops, but almost all good quality instruments have **solid Spruce or Cedar tops**. Both of these woods are strong, light, and flexible and thus provide excellent projection of sound. The tone wood used and the actual construction of the top constitute the biggest influences on how the guitar sounds. Both Spruce and Cedar are attractive, evenly grained tone woods. Spruce is said to produce a crisper and brighter sound than Cedar, which is believed to produce rounder and more mellow sounds. This is not always true because the tone of a guitar is also the product of several other factors such as the thickness of the top wood, the finish, the strings used, and so on.

The **quality of the Spruce or Cedar soundboards** are indicated by the suppliers of the wood and the convention is that 'A' grade is good mainly for low-end guitars, while 'AA' grade and up is suitable for higher end guitars. The difference between the grades is usually noticeable in that the higher the grade the more evenly spaced the grain and the fewer the blemishes and irregularities. Tone wood should always be produced from quarter-sawn mature wood, and swirls and patterns, while sometimes strikingly attractive, are clear signs that the board is not quarter-sawn and is thus unlikely to be a suitable top wood for a good guitar. 'AAA' grade constitutes about 5% of all top woods produced and is almost always used for good classical guitars. 'AAAA', or Master Grade tone wood, is a rare exception and found only on fine concert guitars.

Some instruments, particularly luthier built guitars, have a slightly **domed (arched) top** with a curvature of between 3 and 5 millimetres which is not obvious to the eye at first glance. The reason for this domed effect is that it makes the wood a little stiffer without adding to the thickness and weight of the top. A stiffer and lighter top usually vibrates more freely and acts as a better energy transmitter and thus sound generator. A domed top can also adjust better to changes in relative humidity and is less likely to crack or warp. Older or more traditional classical guitars will probably have flat tops, and certainly lower-end instruments will have flat tops because it is easier and cheaper to construct them this way. However, the quality of the wood is the important factor and the dome is a fairly minor improvement.

The other big influence on how a top functions is **the bracing structure** beneath it. The bracing supports the top and integrates it into the body of the guitar.



However, it also plays a role in volume and tone production. The traditional way of bracing a top is some sort of fanlike arrangement that both strengthens the top at key points and channels the sound in both the base and treble registers. There are several different designs for fan bracing but they all function in much the same way. The other main, and more

recent, way of bracing a top is lattice bracing, and this consists of a wooden grid that is uniform over the inner surface of the top. Some experts say that lattice bracing produces a brighter and louder sound but this is somewhat subjective and depends on several other factors of instrument construction.

Another more recent innovation is **the double-top** which consists of a ply of two very thin quality wood sound boards with an artificial material, called Nomex, sandwiched between them. The two boards can be a combination of Cedar and Spruce or the same wood for both upper and lower boards. The idea here is that a double top provides rigidity, flexibility, and strength without the need for a bracing system.

A third major influencer of the performance of a guitar top is **the way it is finished**. Thick varnish will muffle the sound but an unfinished top will be susceptible to damage and humidity issues. The three common finishes are French polish, which is hand-applied lacquer, thin Polyurethane varnish, or Nitrocellulose. Most Luthiers place a premium on French Polished finish for the top, but several thin coats of Poly. or Nitro. are very acceptable. Varnish is the most durable and affords the best protection for the instrument. The reflective quality of the finish can be either matt, satin, or high gloss but this is purely a matter of individual preference. Some Luthiers finish their guitars with oil instead of lacquer or varnish to achieve a natural matt look and feel.

The sound hole in the centre of the top is to let the sound out and is usually round, but could also be oval. Sometimes there is no one sound hole, but rather a cluster of small holes arranged in a pattern either in the centre of the top or higher up nearer the fretboard. The ornate arrangement of rings and pattern around the sound hole is known as the Rosette and in any quality guitar is made of various woods and other natural substances inlaid flush with the guitar's surface.

Another recent innovation is an **armrest** attached to or built into the guitar where the musician's forearm rests on the top. This serves two purposes; it protects the finish from the acid content of human skin which can discolour the surface, and it prevents the forearm from dampening the volume of the guitar top.

One last item of interest is whether the top of the guitar has some form of **cutaway** in its lower part near where it joins the fretboard. These cutaways are to provide easier access to the frets above the 12th but the trade-off is that they slightly reduce the volume of air inside the sound box and thus make the instrument potentially softer. To compensate for this, a modern innovation is the bowl-cutaway that only affect half of the depth of the affected portion of the box.

Back and Sides: The sound box of an average classical guitar is about 100 to 110 millimetres deep and its sides made with either laminated or solid wood. **Laminated wood**, in these cases, is differentiated from plywood in that it consists of just two layers of wood. Either the inner layer is a less expensive type of wood or an inferior quality of the outer wood type. The advantage of laminated sides is that they provide a stronger and stiffer support for the whole guitar. Side woods are usually made from Rosewood, Maple, Mahogany, Walnut or some more exotic wood such a Ziricote or Ebony. Sides and backs can be finished with French Polish, Varnish, or Nitrocellulose and it is quite common to find a guitar with a French Polished top but varnished sides and back.

A modern innovation is to cut a **sound port** into the upper side of the guitar to enable the player to get a better idea of how the instrument sounds to an audience. Some contend that a port reduces the overall volume of a guitar but most are satisfied that any reduction in volume will be undiscernible.

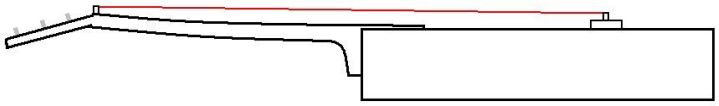
Some guitars are constructed with **laminated backs** because this provides a stiffer sound reflector and obviates the need for any form of bracing on the inside of the back. Internally, the main purpose of the back is to reflect sound back up and out through the sound hole. Once again, a back can be solid, or laminated. Guitar backs that are laminated using the same wood species are sometimes referred to as double-laminated.

Whereas some guitars are built with slightly domed tops, many instruments have more pronounced **domed backs**. This is increases the internal air volume of the box and provides greater overall strength.

Whereas tops need to be quarter-sawn, backs and sides can be cross cut, which results in some very attractive figures and patterns. Some Luthiers claim that the strength of the back and sides can be compromised if they are not quarter-sawn, but other craftsmen do not think so. Back and sides made from either solid or laminated Rosewood, Maple, Ziricote, Ebony or some other exotic wood can be very attractive whether figured or even-grained.

Neck: The most common woods used for the neck of a classical guitar are Mahogany, Rosewood, Cedar, Maple or Cypress. Due to scarcity of good Mahogany, some guitars have necks made of Nato wood, a slightly inferior Mahogany substitute. The key factor in wood selection is an even grain running the length of the neck and a relatively high density. The neck supports the strings at full tension, provides stability to the whole instrument, and plays a part in increasing the sustain of the notes played. Of major importance to the player is the thickness and shape of the underside of the neck; it must be comfortable and suitable to individual hand size.

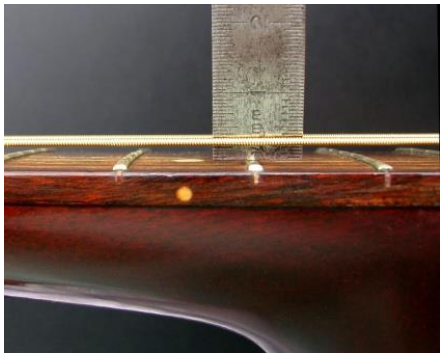
Neck relief is a crucial factor. If the neck is not angled slightly away from the plane of the sound board then the strings will lie flat against the fretboard and be virtually unplayable at worst and buzzing at best. This angle away from the plane of the top board is known as Neck Relief. Most classical guitars do not have **truss rods** but some manufacturers and Luthiers insert them into the neck so that the relief angle can be adjusted where necessary.



Fretboard: The main criteria for the choice of a fretboard wood is that it must be hard. Ebony is the usual choice for high end guitars, but Rosewood also serves well. The frets must, of course be properly inserted into the wood at the required intervals and should not be too narrow or too high. The height of the fret will affect the potential for string buzz and both the height and width of the fret will affect the comfort and accuracy of playing.

Keyboard width is another factor. Most classical guitars have a fretboard, and therefore neck, that is 52 millimetres wide. This width allows the strings to be spaced far enough apart so that the player can produce clean notes without interference from adjoining strings. Some classical guitar makers produce a 50 mm Neck width to accommodate children and adults with small hands, and some even make a 48 mm width to appeal to players making the transition from electric or steel string acoustic guitars.

Nut and Saddle: For best energy transfer both nut and saddle should be made of bone, although ivory, tusk and modern artificial hard plastic can be used. The nut is in the position of the 0 fret and forms the top-end start of the string length. The saddle sits in the bridge on the sound board and forms the bottom-end point of contact between strings and sound board. Apart from the guitar top, the nut, bridge, and strings constitute the major influencers of tone, but they also affect playability. If the string slots in the nut are cut too shallow, then the strings will lie higher off the fretboard along its full length; if the saddle is too high then the strings will get increasingly further off the fretboard down towards the 12th fret. The distance between the bottom of the 6th, bottom E, string and the top of the 12th fret is known as **the Action** and should ideally be between 3.5 and 4.0 mm. To adjust the action, assuming the nut has been correctly cut, it is usually only necessary to lower the saddle by sanding some material off its lower edge.



Strings: The volume, tone, and playability of a classical guitar is considerably affected by the quality and tension of the strings. Classical guitar strings are usually nylon with the three base strings wound with thin metal wire. Some trebles are made of carbon fibre and some bases are coated to provide longer playing life. Top quality strings cost more than student quality versions but are well worth the extra price.

The length of the string from nut to saddle is known as the **scale length**, and this too plays a role in volume, tone, and playability. The norm today is a scale length of 650 mm, but older guitars often have a length of 660 mm or more. Modern guitars are sometimes built with shorter scale lengths usually varying from 630 to 645. The longer the scale length the greater the potential volume, but the higher the string tension and playability difficulty. Short scale length, all other factors being equal, usually results in greater ease of playing because it is easier to press the string down behind the fret. However, **the tension rating** of the strings themselves has an even greater influence on playability. High tension strings are harder to press, louder, and less likely to cause string buzz. Medium tension represents the happy-place for most guitarists.

Intonation is a word describing the string's ability to remain perfectly on pitch as it is played down the fretboard. In a well-made guitar the average player can't tell if it has intonation problems unless he or she uses a digital tuner. It is possible to correct intonation on each string by filing away small portions of the saddle; material taken off the leading edge will push the point of contact back just a little, increase the string length slightly and thus effect the intonation. However, if the strings are changed to a different brand or tension then the intonation can go off again. The G string (3rd) is the most prone to intonation problems and so it is sometimes necessary to compensate for this at the saddle.

Tuning Machines are located on the guitar stock/head where the strings are wound to bring them up to tension. The gear ratio of these machines is normally either 1:12, 1:14, 1:16 or 1:18. The higher the ratio the more sensitive to tuning differences but the longer it takes to bring the strings up to pitch.

Other factors that influence string performance are the angle of the strings from saddle to where they are tied to the bridge, and the angle between the nut and the tuning posts. In very high quality concert guitars, this may be a factor, but in most guitars the main consideration is that each string moves freely between the saddle tie and were it goes over the saddle and between the tuning machine posts and the nut.

Relative humidity: The most carefully crafted guitar made from the finest materials can be ruined if unduly exposed to extreme humidity or temperature conditions. A very low relative humidity will dry out the wood and cause it to shrink or crack, the frets to protrude at the edges, and the top and bottom of the guitar to become slightly concave. High Relative humidity has the opposite effect and will cause the wood to swell resulting in a soggy sound. Both these conditions affect the playability of the instrument and can result in permanent damage. Wood is able to adjust to its surrounding conditions if given enough time, but rapid

changes in relative humidity can be disastrous. Extreme heat can melt the glue and cause the guitar to literally fall apart within a very short period of time. It is important to keep the guitar at a relative humidity of between 30% as an absolute minimum and 70% maximum. Guitars that are constructed in high humidity areas are known as wet guitars and can tolerate higher relative humidity levels, but will react badly to levels of below 40%. The converse obviously applies to instruments built in much dryer climates.

I do hope this has been helpful. I am sure that I left out some stuff but what I have written about seems to me to be the most essential information I have gleaned over the last few years.