There are just a few basic construction styles for kit pens. Various elements are combined in different ways, from a standard repertoire of assembly and connection methods.

The use of stepped tubes is one such element, to allow for more graceful lines in some pen styles. This involves 2- or 3-diameter brass tubes, and usually the supplier also has a matched stepped drill, or set of drills, for that particular style. (See Picture 1) These designs generally have not been all that popular, it seems pen kit builders shy away from laying out extra money for expensive dedicated drill bits. I think this expense is definitely something to dissuade the casual builder who wants to try 1 or 2 of a certain style. But the cost for these dedicated bits is fairly quickly amortized if you build 20 or more.

Picture 1: Stepped tubes and dedicated drill bits, from another kit, not used here

After you've made pens for a few years, you barely need to look at instructions or think about a construction method. Occasionally, a new element is introduced, though. Late last year Berea introduced a new pen that uses a construction method not previously employed in a kit pen, to the best of my knowledge: 2 separate tubes in the same barrel. The kit is the El Grande Streamline, a variation on the El Grande design, which happens to be one of my favorite styles of fountain or rollerball pen because of its light weight.

Like all kits in the US, the manufacturer supplies an instruction sheet. Berea's instructions are a simple sheet that does not give a lot of detail. I don't follow their suggested construction method for this pen. Not to say it does not work – it does, other than my comments below about drill sizes. I made my first pen following their method, but saw no reason to continue that way, once I understood the kit.

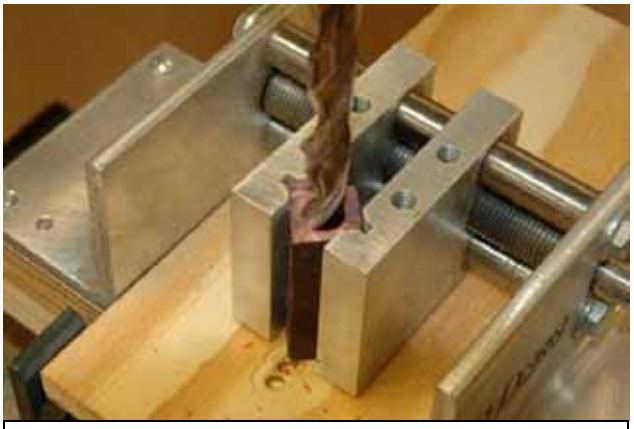
In today's 'normal' kit pen construction, a brass tube is glued into a barrel made from wood or some other material. After the ends are squared, the blank is mounted on a mandrel and bushings and turned to size. As the mandrel nut is tightened, the bushing steps press onto the brass tube, and the face of the barrels. Brass is less compressible than most materials used

for pens, so the stress is absorbed by the brass tube. But in the Streamlined El Grande the brass tube does not sit between bushings, one side is open-ended. If excessive pressure is exerted by the mandrel nut, the pressure is transferred via the bushing to one side of the brass tube, but the other end of that tube is not supported, so if there is any compression in the wood or whatever material is used, it tends to try to push the brass tube in, and the load goes directly into the glue joint. If that glue joint is marginal, or the pressure is too high, the glue can shear and the tube will come loose. I believe this is one of the reasons Berea suggests their construction method, though there is another reason quoted that I will mention later.

In this article I will discuss mainly the method I use, but most of it applies directly to the manufacturer's method also. In fact, if you use the right drill bits, there is very little difference which sequence you use – I just find my method more natural since the basic work sequence is closer to the 'standard' method used in most other pens.

The main body of the pen is completely straightforward. Note that the brass tube used for the streamlined version is the same diameter but slightly longer than the one used in the standard El Grande – don't mix them up! The blank is drilled with a 31/64" drill. The blank I used for this pen is black and red double-dyed boxelder burl. With good drilling technique, an oversize blank is not needed. If you are unsure of your drilling ability, do not have a good drilling jig, or are nervous about ruining an expensive pen blank, either use a cheaper one to practice, or get one of the by now readily available jumbo-sized blanks. The largest diameter of this pen is 0.595", so a standard (around 11/16") blank is definitely usable. The blank used in this article was only 0.640 – 0.670", borderline, but, as evidenced in the final result, big enough! The key to drilling with a large bit (especially up in the ½" neighborhood) is to rough-cut the blank with an extra ¼" in length, drill just shy of breaking through, then cut to final length. My preferred drill bit for pen blanks is a 'bullet bit', more recently sold as 'pilot point bit'. I usually use my drill press' depth stop to just allow the pilot point to break through – it's a visual indication that I have nearly broken through, and when I saw to final length the crosscut will not miss the hole. This technique avoids fracturing of the blank as the bit breaks through, commonly referred to as blow-out.

Now let's tackle the cap. Since the final length of the cap is 1 7/8", the blank for the cap is cut about 2 1/8" long. According to the instructions, first an 11 mm hole is supposed to be drilled for the smaller diameter tube. But the brass tube measures only 10.5 mm! That is a pretty big gap, I find that it is too loose in an 11 mm hole. Furthermore, according to the instructions, the tube is to be left loose during turning. How are we supposed to keep concentricity when the tube has so much slop? So, I choose a different drill bit. A 27/64" bit makes just the right size hole for me. Of course, hole size depends on drill RPM, feed speed, your drill press, the bit you use, so your mileage may vary!

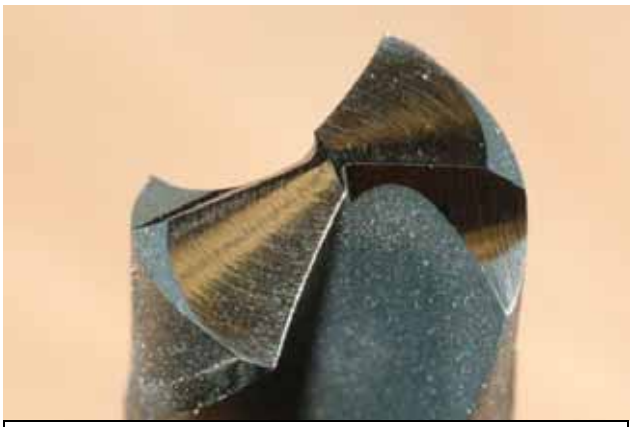


Picture 2: Drilling the cap, step 1

Again, I use a pilot point bit. I generally mark the forward corner of the blank, so I can reinsert it into my fixed drill jig in exactly the same position if I take it out. This is very important – a second hole will be drilled, and it needs to be concentric to the first one. If I drill a batch of blanks, I now cut the blank to length. Of course the drilling jig must not move between the 2 drilling operations. For a single pen, I just leave the blank in the jig and go to the next drill size. Picture 2 shows the first drilling operation.

Next, the instructions call for a 33/64" bit. This is the same bit used on a standard El Grande cap. Unfortunately, for me, and many others that I have talked to about this, the hole drilled by this 33/64" bit, in wood, is too tight, making it impossible to insert the cap tube. On a standard El Grande, it is easy to open up the hole with a round file, because it's the same diameter all the way through. But here, because the hole is stepped, this filing technique does not work. When I got tired of filing standard El Grande barrels, I acquired a 13.3 mm drill bit, and that works very well for me there. This bit can be used here also. However, I found I get a better fit with a 13.25 mm bit that I also have (I bought several bits in that neighborhood when I tried to find the best one). The bits I use are cheap Chinese bits, I would not vouch for their absolute accuracy. Nominally, the difference between a 13.25 and a 13.3 mm bit is only .002". Depending on your drilling technique, equipment and the material, a 13.2 or 13.3 mm bit may

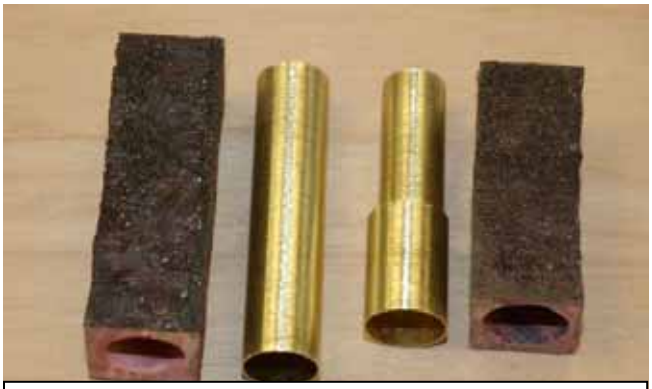
work better for you. Luckily, these import drill bits are inexpensive. I have had very good luck with inexpensive drill bits – but I do sharpen them on a Drill Doctor, to a 135 deg split point. Straight out of the box, these bits may not be very good, and tend to wander in wood, but after a Drill Doctor sharpening they cut with the best of them. This is especially noticeable in the large diameter bits. The split point, of course, does not matter for the particular drill overation #2 here, since only a very narrow ledge is drilled, but the bit does need to be sharp. Picture 3 shows the point of the 13.25 mm bit sharpened with the Drill Doctor.



Picture 3: An inexpensive 13.25 mm drill bit, reground to a split point

Using the depth stop of my drill press, I drill to ¾" depth. The depth has to be such that the short brass tube can be inserted fully. On a drill press with a rod-style depth control, the brass tube itself can be used to set the depth – no measuring, no math! Simply drill until the corner of the drill bit is even with the top surface, then use the brass tube itself to set the depth as shown in Picture 4. The brass tubes and drilled blanks can be seen in Picture 5. Because the blank was a little marginal in size I do a quick check whether the hole I drilled did the job: I insert the short brass tube, and put the bushing on it. As long as there is a little material left outside of the bushing on all sides, I'm OK – and

Picture 4: Using the large tube to set the depth stop for the second drill operation for the cap



Picture 5: The 3 brass tubes and 2 drilled blanks

Picture 6: Testing the accuracy of the drilling of this marginal blank

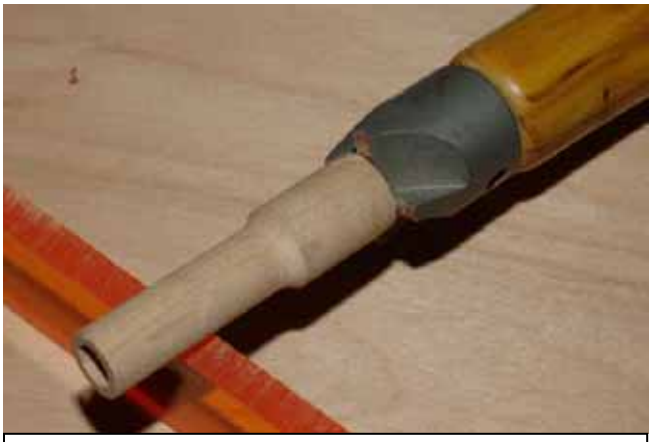
you can see that it was good enough in Picture 6.

The instructions say to not glue the tubes. Leave them loose during turning, and glue them in later, at assembly time. This works, but I have been very successful disregarding this. The instructions claim that pressing in the fittings (in particular the cap brass insert) won't work if the tubes are glued in first. This may be true, if you have a bad glue joint, have glue left inside the tube, a burr on the brass tube, or a combination of these. All these problems are preventable. I use epoxy to glue the tubes, make sure I have good glue coverage, and it has worked perfectly well in over a dozen pens. People who normally use polyurethane glue should think twice: polyurethane glue tends to foam up as it cures, and it is harder to remove any foam with the double-tube. But that can also be done with drill bits that just fit the ID of the brass tubes.

If you decide to follow the instructions and turn with loose tubes, it is especially important to use the proper size drill so that the brass tubes have no slop when pushed into the holes.

After the tubes are glued in, we have to square the ends. Oh-oh… how do you keep a pen mill or sander square to the axis of the stepped tube? Well, you have to make a custom insert that matches the 2 IDs. A good material for this is some sort of plastic or solid surface material,

because it is dimensionally stable, but wood can be used also, of course. The shim can be seen in Picture 7.



Picture 7: A custom shim for squaring the cap ends

Picture 8: The finished pen barrels

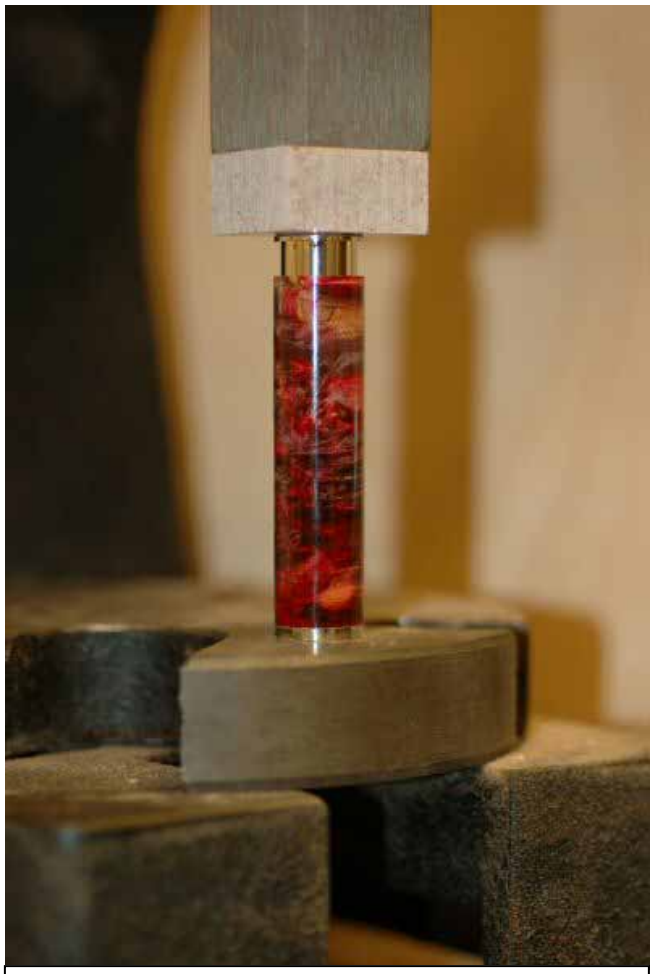
Now we're back on familiar territory – the blanks are mounted on a mandrel and bushings and are turned to size, sanded and polished, and finished (Picture 8). I always (try to remember to) coat the bushings with some wax, because I use cyanoacrylate (CA) glue as my finish. The wax makes it easier to remove the bushings.

My finishing regiment consists of odorless thin CA applied with 400 grit sand paper. If I want to use a really high gloss, I apply 2 more layers of thin CA. I first re-sand the wood with 400 grit sand paper to make is smooth. The CA is allowed to cure from the bottom up: I spray with accelerator first, then, with the lathe running very slowly, run the nozzle of the CA along the pen tub, flowing CA onto the barrel. My left index fingers wrapped in a plastic bag follows right behind, smoothing the layer. With a bit of practice you can get a really even layer that way. If you move too slowly, the CA starts curing while your plastic-protected finger is still there, which generates heat. The plastic melts… it's not pleasant! And if you move too fast, you get a spiral instead of a uniform layer. It does take some practice!

I smooth the built-up CA with a skew (an oval skew I don't like to use as a skew), laid flat on its side. Perfect for this! If necessary, I use 400 paper again, then proceed to polish with micro-

mesh. I use grits 1500, 1800, 2400, 3200 and 4000. After that, I buff on a soft cotton wheel, using white diamond compound, to get the kind of finish I like.

Picture 9: Lining the nib up with the sunny side of the body



Picture 10: Pressing in the nib holder using a drilled block

To assemble the pen, I first press the receiver holder into the main barrel. Next I decide on the 'sunny side' of the blank – the most visually appealing side. This is the side I want to line the nib up with. I screw the nib all the way into the nib holder, line the nib up with the most attractive side of the barrel, and hand-press the assembly in, just enough to hold it in place (Picture 9). Now I carefully unscrew the nib, without loosing the position. I protect the delrin threads using a small block with a 31/64 hole drilled, so the assembly press applies the force directly onto the metal sleeve (Picture 10). The receiver tube and nib assembly are screwed in, and that finishes the main pen.

The cap also goes together very simply: Press the brass insert into the small tube. This is where the instructions say it doesn't work – but I have not had a problem. I do make sure there are no glue remnants inside the tube, and I chamfer the edge of the brass tube using an inexpensive deburring tool. The tool generates a little slope inside the tube which makes it easy to get fittings started. You can see the tool in Picture 11.

Picture 11: A deburring tool is used to put a little slope on the end of the brass tube

I roughen up the delrin part of the center ring a little using coarse sand paper. I then screw the part onto the nib holder, seating it well. Because of the possibility of some stray glue I remove the nib for this step. I apply a little epoxy to the inside of the large brass tube in the cap, and a very small amount to the plastic, and press the cap onto the center ring, lining up the grain. Lining up the grain doesn't buy all that much with most screw-cap pens, because the cap threads have 3 (or sometimes 4) entry points, so the grain will be aligned only 1/3 of the time. Still, I do it, at least to display the pen. With a burl, it matters even less, of course. Then I unscrew the cap, grabbing the plastic only. If necessary, I complete the insertion on the arbor press, but as long as the brass was deburred, that's usually not necessary. It is a good idea to look inside the cap for any glue squeeze-out that may interfere with the nib later, and use a Q-tip to remove it. Just add the clip and finial and the pen is done!

That's it! A wonderful pen, isn't it? It has the light weight of the original El Grande, with a nicely shaped cap, and an appealing clip. The complete fountain pen weighs about 33 g which is pretty light weight for a pen that size. A rollerball pen also exists, construction is the same, only because of the symmetry you do not have to pay attention to lining up the sunny side of the main barrel.