Fabricating A Woodwind Tenon Blank

By Lars Kirmser

Recently, I had the opportunity to purchase approximately 100 clarinet upper and lower sections that had been damaged slightly in a music store fire in Florida. These were ABS plastic, student model instruments that had been smoke-damaged, with many of the tenons shriveled and deformed from intense heat. Other than this marginal damage, everything else was in quite satisfactory condition.

My shop is already equipped with the tools and equipment required to replace woodwind tenons, however, the prospect of having to purchase pre-made tenon blanks would end up costing me a small fortune. It was at this point that I decided I would have to fabricate the necessary blanks myself, and in an assembly-line fashion.

I was fortunate earlier this year to stumble across about 150 linear feet of 1 ½” delrin rod at a local salvage yard, and as I recall, each 10-foot section cost me about $8.50 each (this is just about what only one linear foot of this material usually costs!). I can still hear my wife (Ada) mumbling “You always come home with the craziest junk that you will never use.” In this case, this particular “junk” was to become the tenon blanks I required for this project.

FABRICATING A B^b CLARINET BELL TENON

The following process is a step-by-step sequence that I used to fabricate the B^b Soprano Clarinet bell tenon blanks. I have selected this particular blank to describe the fabrication sequence in detail since it is one of the more complicated blanks to fabricate. And, with the exception of specific dimensions, all nine blanks specified in this article may be fabricated in similar fashion.

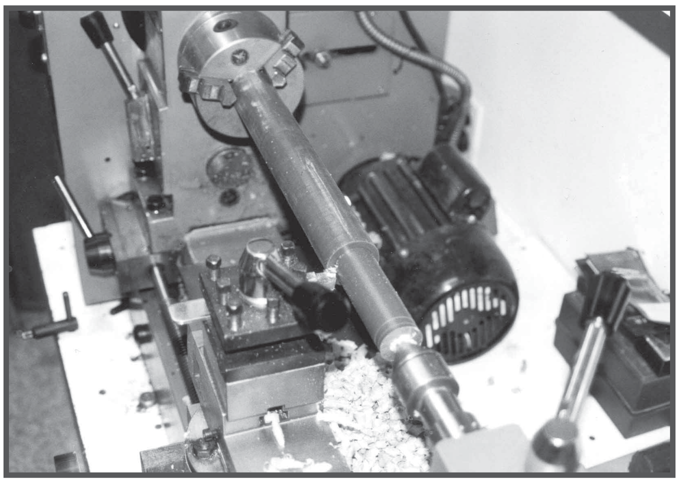
SELECTING THE BLANK MATERIAL

The specific material used to fabricate tenon blanks will depend, in part, upon that which is available to you. However, each situation will usually call for a specific material which is best suited for tenon replacement. One advantage that repair technicians have today is the availability of a variety of useful polymers. For example, Teflon, Nylon, Delrin, Polymide, Polycarbonate, Polyetheretherketone (Peek), Acrylonitrile-Butadiene-Styrene (ABS), Rulon, and Phenolic rod materials are easily available from suppliers. Delrin, however, is my personal preference and is appropriate for replacing the tenons of polymer (plastic-bodied) instruments. It is among the strongest and stiffest thermoplastics, with excellent solvent resistance. It possesses an exceptional fatigue life and dimensional stability. Its machine-ability is equal to or better than free machining brass in normal milling, turning, threading and tapping operations. The only frustration I experience with delrin is the continuous unbroken ribbon of material that is produced when turning. Bit design may reduce this problem by incorporating a “chip breaker” just behind the cutting edge. Otherwise, you will be required to stop the lathe frequently to clear the chip out of the way so that you can see what you are doing. (Note: Don’t attempt to clear the “strings” of material while the lathe is running!)

When replacing the tenons of wood-bodied instruments, one should try to match the wood type, color, and grain pattern of the joint being repaired. (When selecting the wood, always use quarter-sawn lumber.) In the case of bassoons, delrin is usually appropriate for the lined tenon of the wing section of both polymer and wood-bodied instruments. In this particular situation, I prefer to use black delrin vs. hard (vulcanized) rubber for this wing section tenon, as hard rubber is significantly more brittle than delrin. When replacing the bass section tenons of a wood-bodied bassoon, matching wood (i.e. maple or rosewood) is appropriate. Aluminum rod stock is also readily available for the replacement of these tenons, however, it is not my first choice. Its advantages are that it is easily machined and will probably never break once it is installed, however, its excessive weight and its significantly different expansion/contraction coefficient (compared to that of wood and plastic) makes it a less appropriate material for tenon replacement, in my opinion.

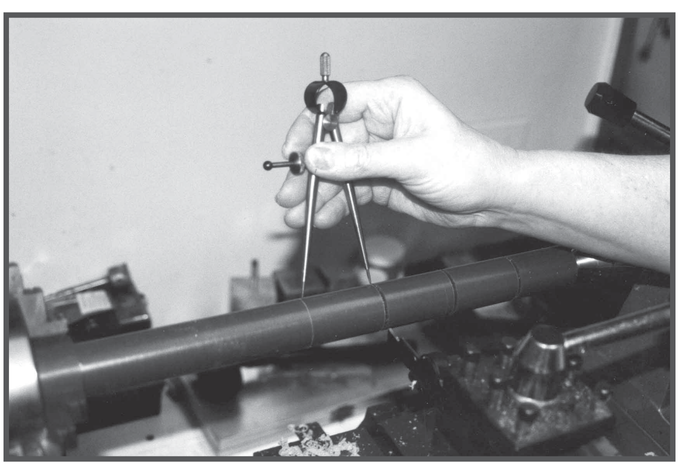
PREPARING THE RAW STOCK

I began by cutting my 10-foot sections up into lengths that fit my lathe bed comfortably. I then center punched one end of these smaller sections and center bored this end of each section so that they may be secured on the lathe with a live center. My first cut was to bring the O.D. of the raw stock down to the major diameter of my blank; in this case 1.125".

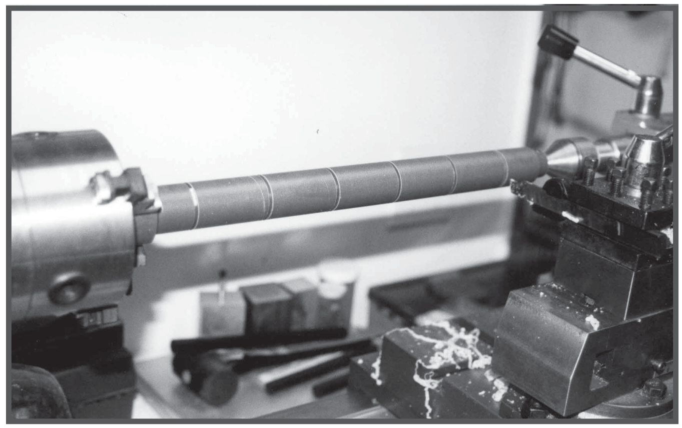


Cutting the raw stock down to an O.D. of 1.125"

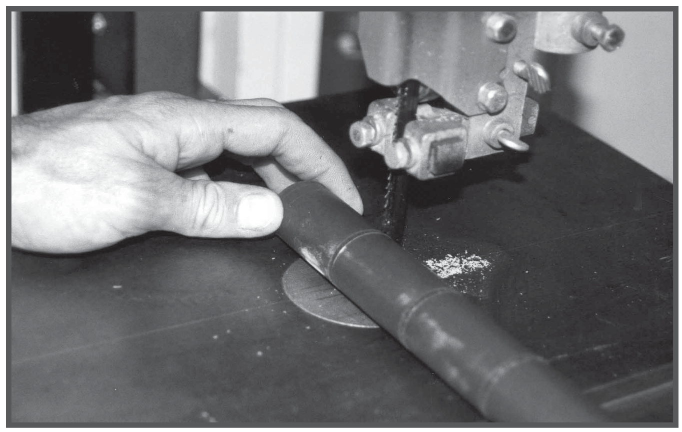
With the long section still secured in the lathe, I marked out a length slightly longer than would be required for the finished blank. Since the finished length of the bell tenon blank is 1.815", I separated the dividers to exactly 2.0" and scribed lines directly to the long section as it rotated (approximately 200 RPM) in the lathe.



Marking off the individual blanks with a sharp divider

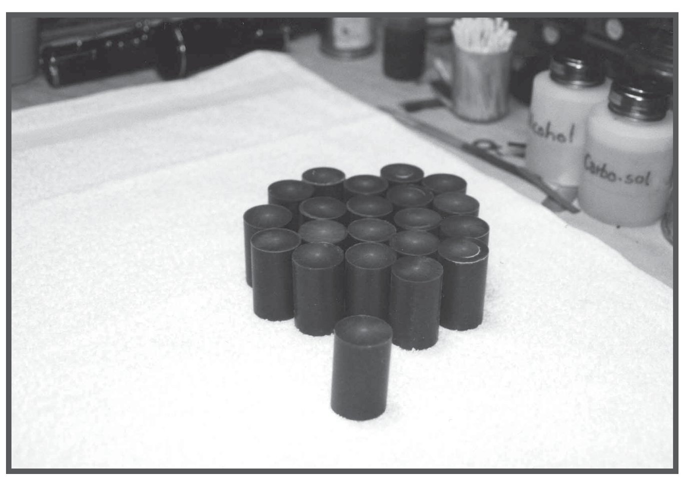


Partially separating each section with a cut-off bit

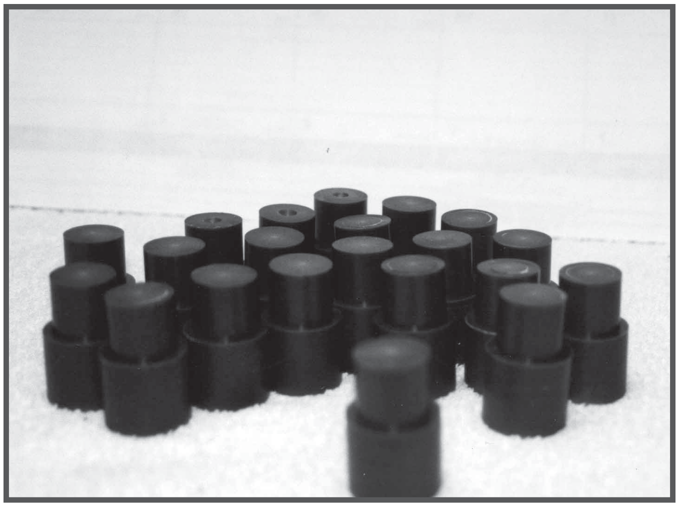


Separating the rough blanks with the band saw

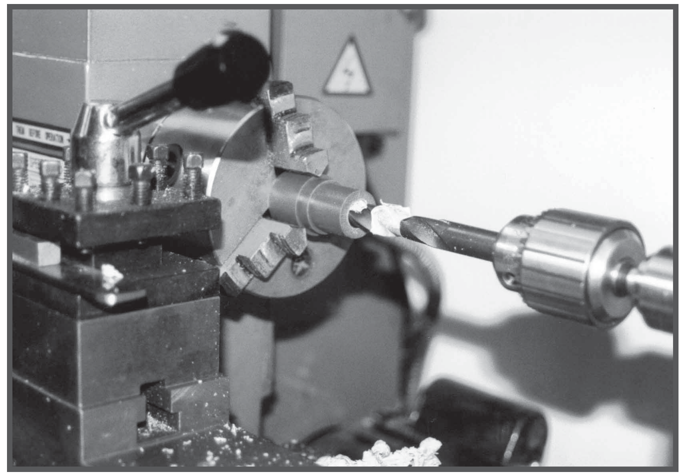
After I have separated the rough blanks, I faced one side of each blank. After all the blanks had been faced on one side, I carefully reset the tail stock position for the second facing cut for each blank. I did this so that each blank would be precisely the same overall length (in this case, 1.815").



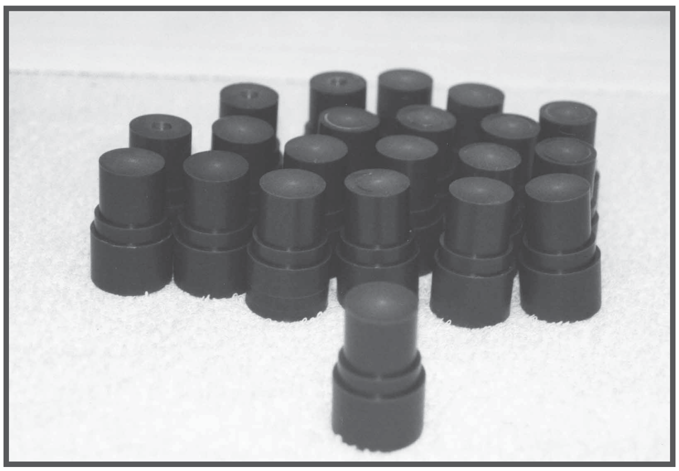
Face each side of the rough blank to your precise length



The blank after making the first O.D. cut of 1.0” for exactly 1.0”



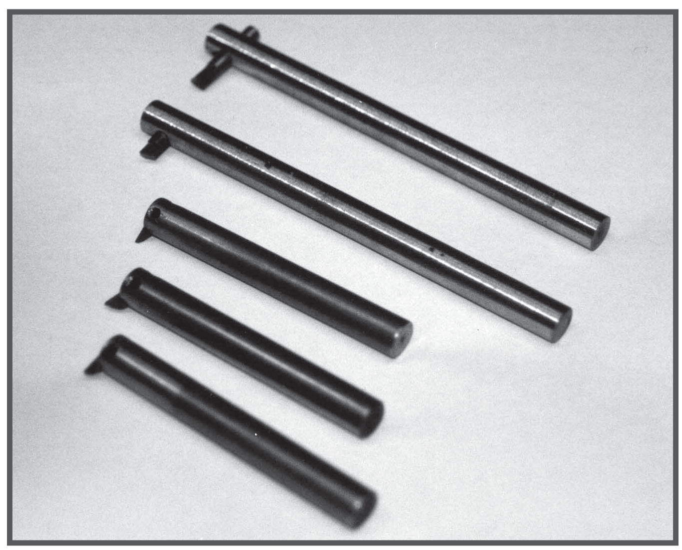
Drill out each blank with a sharp ½” drill bit



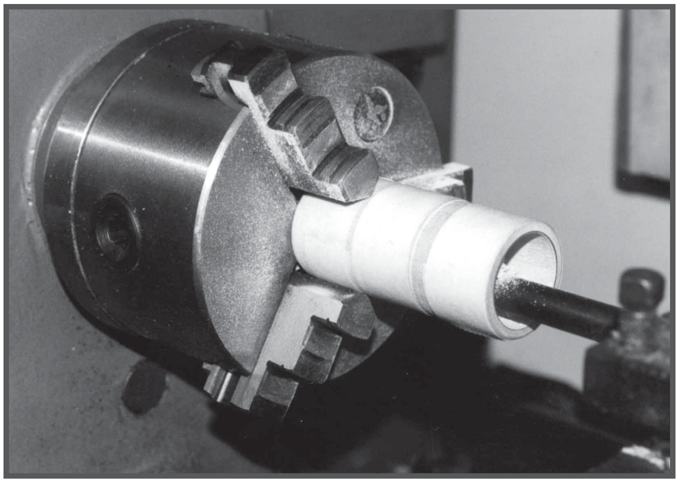
The blank after making the second O.D. cut of .875”
for exactly .750”

Center bore the small end of each blank

I use a ½″ drill bit to make this cut because this is the largest drill my Jacobs chuck will accept. After boring out all my blanks to this dimension I employ a standard boring bar setup to cut the required .540″ for this specific blank. The 1st photo on the next page is of this operation as it was applied to the making of a bassoon bell tenon.

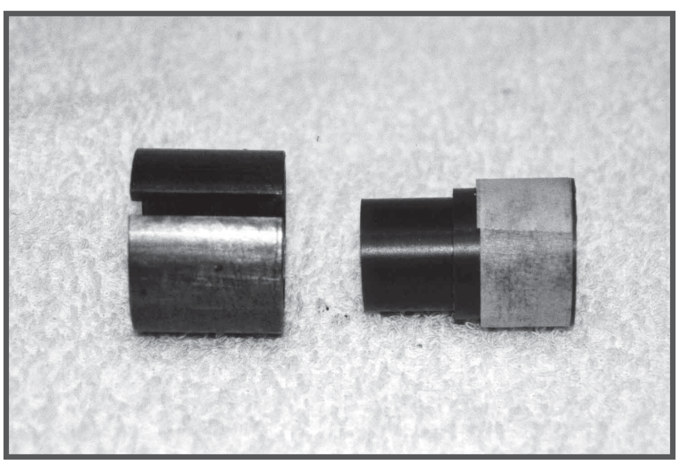


Boring Bars

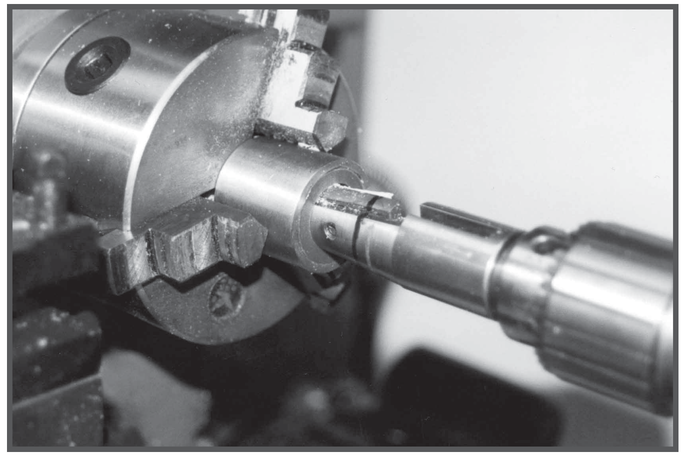


Cutting the I.D. of a Bassoon tenon blank with a boring bar

The clarinet bell tenon blank after being bored to .540”

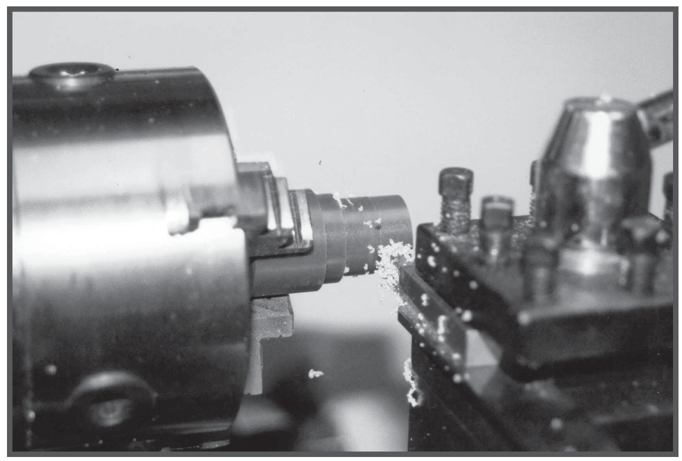


Ferree’s G66 Lower Tenon Plug Holder secures the blank in the lathe chuck



Cutting the compound taper into the blank using Ferree’s G106 Bell Tenon Reamer

The next step is to precision-fit the blank to the counter bore in the body of the broken section. It is important that the blank fits easily into the counter bore. It should not be overly snug, nor should it be so loose that you experience “wobble”. Keep all the cuts sharp and clean.

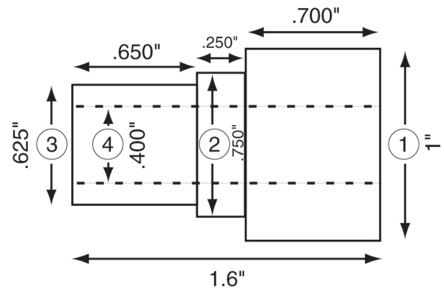


Precision fitting the blank to the counter bore in the clarinet section

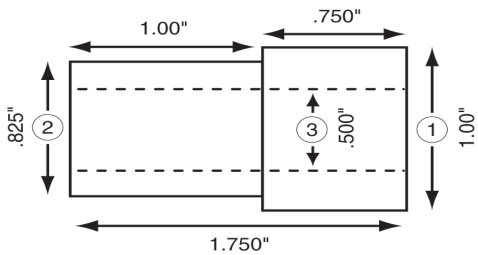
The finished tenon; prior to drilling-out the low F tone hole and cutting the cork slot.

For a complete description of specific tenon replacement applications refer to other issues of the WWQ.

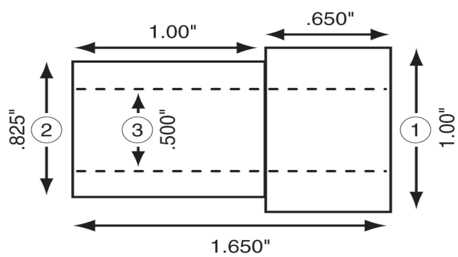
WOODWIND TENON BLANK DIMENSIONS



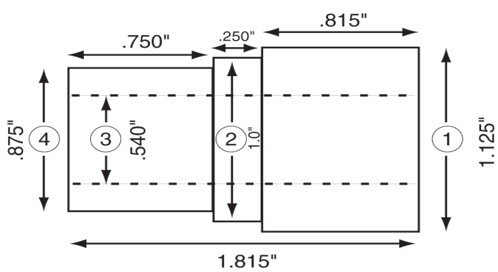
E^{b} Soprano Clarinet Bell Tenon



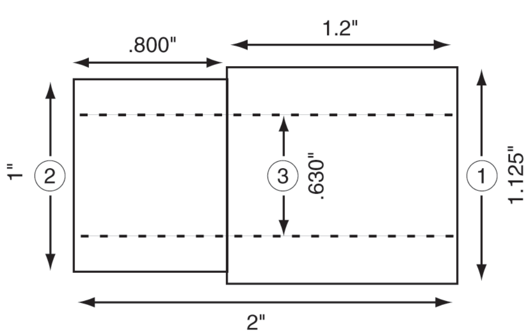
B^{b}/A Soprano Clarinet Barrel Tenon



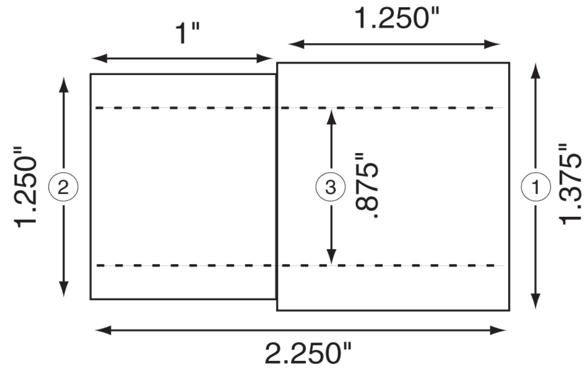
B^{b}/A Soprano Clarinet Center Tenon



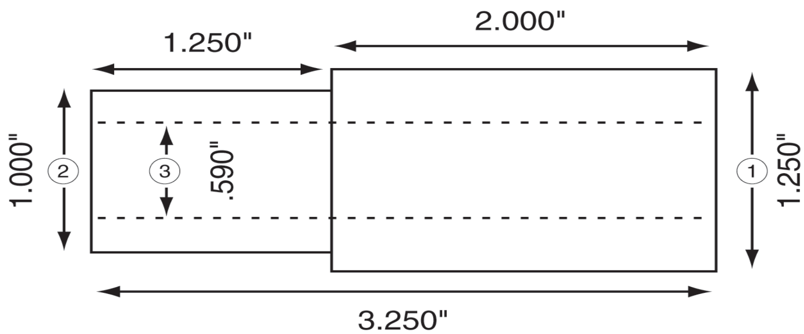
B^{b}/A Soprano Clarinet Bell Tenon



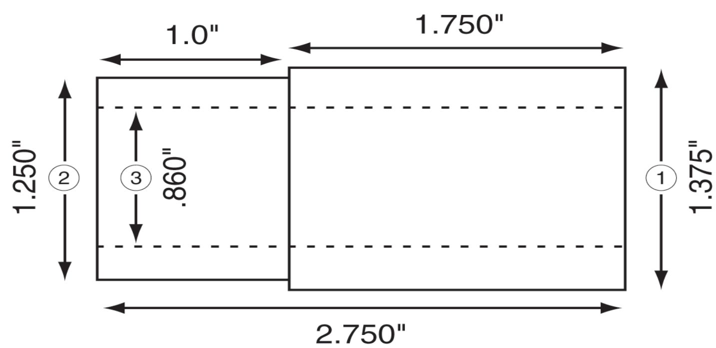
E^{b} Alto Clarinet Center Tenon



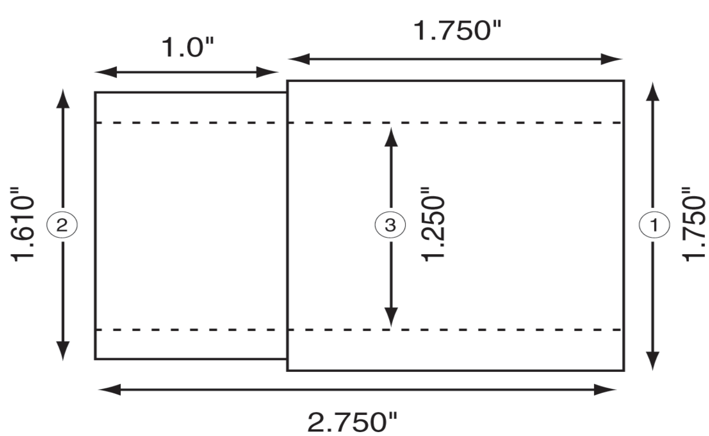
B^{b} Bass Clarinet Center Tenon



Bassoon Wing Joint Tenon



Bassoon Bass Section Center Tenon



Bassoon Bell Tenon