The DIY Drum Builders Guide

Compiled by Deejay from the Contributions
Of the Amazing DIY Drum Makers at:

http://www.drumrap.com/

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Chapter 1: How a Drum Works and Shell Section

How a Drum Works

I think that a logical first step in this book would be to understand just how a drum works. This, I think, is important to know as we strive to make a quality finished drum. If you understand the basics of drum sound...you can make better decisions in the building process.

A drum is basically a tensioned membrane over a resonating chamber, in our case, a cylinder. Be it wood, metal, composite, etc. The membrane or drumhead is usually Mylar ... a type of plastic. Drumheads can also be animal skins, Kevlar or poly-spun fibers.

The drum sound is actually a combination of two different sounds. Attack, which is the sound made by the stick or hand striking the drumhead. And resonance or 'body' sound, which is the sound produced inside the drum. The resonance is actually a result of several factors, one being the shell itself vibrating from the attack to the drumhead. This from vibrations imparted to the shell from the head at the bearing edges and from air impacting the walls of the shell. The design and construction of these bearing edges can vary how this vibration is distributed and the resulting sound produced...which we will discuss in detail later. The reflectiveness or how porous the inside of the shell walls are also will affect the sound...again, details later.

Air also impacts the resonant (bottom) head and bounces back to the top head and causes vibration in both. All of these combine to produce the drum's sound. Variations on these would be 'rim-shots' and 'rim-clicks'. The former is a sound in which the attack is a combination of the stick/hand impacting on the counterhoop (rim) and the head simultaneously. The latter is a sound produced by striking the counterhoop with the stick while holding the butt of the stick against the head. Both of these techniques also impart vibrations to the shell.

This may all seem overly technical...but I think that it is important to realize that as a vibrating, resonant chamber and membrane...any contact with the shell or head by anything will somewhat impede its vibration and resonance. In the upcoming chapters we will see how this relates to shell thickness, hardware contact, plastic wraps, lacquers, reinforcement rings and different types of drumheads. In other words...whatever you stick on your drum WILL effect its sound and performance.

Shell Selection

This brings us to shell selection. For the most part, I am going to discuss hard maple, plywood shells. These are the most readily available for the do-it-yourselfer. First, ask yourself...what type of drum kit do I want? What type of music will I be playing? Jazz? Rock? Country? Or do I want just a good all-around, middle of the road, all-purpose drum sound. This will determine shell configuration.

Most do-it-yourselfers are somewhat accomplished drummers...in that they know what type of a kit they want to build. There are, however, a few guidelines to follow. Deep shells or 'power' type emphasize resonance rather than attack. Shallow or 'fast' size shells emphasize attack rather than resonance. Standard sizes offer a middle

ground with a blend of the two. As such...some hard rock types may opt for the deep shells. Some jazzers the shallower.

Also, play (as in stick feel and rebound) is usually a bit slower off deep shells than off shallow shells. Hence the term 'fast' sized.

Because deep shells emphasize resonance...some people think that they produce a lower fundamental tone. I don't know about this. I think that this has more to do with head selection, bearing edge design, tuning and most importantly...shell thickness (which I will discuss in some detail later). I have heard and played some deep, low sounding shallow-type drums. Take Roto-Toms for example or the 'flats' type kits with just a head and rim. They seem to get their low end somewhere.

Shell Construction:

This brings us to shell construction. These drum shells are composed of several thin 'plys' of wood glued together and shaped in a cylindrical mold or form under pressure and sometimes steam or heat.

Thinner shells (generally less plys) vibrate more than thick shells (generally more plys), because they have less mass. The attack and subsequent air movement from a drum stroke can get a thin shell 'moving' easier. Because the shell is vibrating more...more resonance is created. A thicker shell 'moves' less...therefore the heads vibrate more and the shell less. The shell plays a lesser role in the sound development. Consequently, thinner shells with more 'shell' resonance seem to have a lower tone...more of a drum 'body' sound. Thicker shells with less resonance seem to produce slightly higher tones...more of a drum 'head' sound.

So...it would seem that you would want your drum shells thick for small diameter drums and thin for the larger. In a perfect world that would be great...but the simple fact is that larger drums do not hold their shape or roundness well for long with thinner walled shells. This is where reinforcing rings come in. Re-rings are, simply, additional plys of wood applied to the shells at the edges to reinforce or strengthen the shells. The problem with these rings are that they conflict with the vibrations in the smooth-walled shells. Some people think (myself included) that this raises the tone's pitch. This essentially cancels out the advantages of a thin shell's tone. They do add more wood to the bearing edge, which can be designed to control these overtones...but that is another chapter.

To review... the deeper the shell... the more emphasis on resonance. More of a drum 'body' sound. The shallower the shell... the more emphasis on attack. More of a drum 'head' sound.

It is also important to remember that some shells can have thicker plys than others. Generally the plys are approximately 1 mm in thickness. This is not always the case. Some batches of lumber have to be milled differently and this can result in thicker plys. So that one's '6 ply' shell could be thicker than another's '8 ply' shell. It is, however, the overall THICKNESS that affects the tone quality...not the number of plys.

With all of this being said...I think that for the average beginning builder, a good,

safe compromise would be 8 ply shells with no re-rings. These would produce a good, middle of the road sound with easy workability. They would also be strong enough to hold their shape and remain round indefinitely.

Another point to remember is that any added weight to the shells, particularly the bass drum, can cause the shell to sag. This is one reason I believe in leaving the bass drum 'virgin'. This means not mounting any other drums or cymbals to it. I also believe that the bass drum's sound and resonance is much improved this way. That is my opinion any way...as is all of this. I know that my views are subject to objection and encourage points and counterpoints. So lets hear it. Any way...I thought that this would be a good start for our book. What do you think guys?
later,
bubo.

Re: Chapter One: How A Drum Works and Shell Selection:
Can't help in but mentioning that I believe the density/hardness of the chosen wood also has an affect on the drum resonance and pitch. Would you agree?

Nicely Done
bubo,

Well done, Lad!

A point to add about shell depth. All things being equal, a deeper shell seems to produce a lower pitch because of the time necessary for air to reach the bottom head and return, causing a "whoop" kind of thing going, more obvious in an Octoban-type tube drum, even though the air leaves the open ended shell. Shell vibration is minimized and slowed down, hence why floor toms can often sound muddy when you do the same sticking patterns on them. (Did you mention that? maybe you did.)

Thicker wood, higher pitch, all things being equal. Density in almost any sound producing material determines pitch. One can cut two pieces of framing lumber and toss them into the air, striking each with a hammer, and the shorter piece will sound higher, or thinner piece lower, because of the way sound waves move through materials.

Unfortunately, shell making is not perfect. An 8x12 shell, 1/4" thick, might have a lower pitch than a 10x14 with the same configuration because of gluing factors and ply density. That's where bearing edges, head choice, and tensioning come in to level the playing field, as it were.

Hey, bubo, again, great job.

Ray

Sound Characteristics of Shell Types:

What are the basic sound characteristics of the different major shell types? I want to compare a maple ply shell, maple "solid", stave, etc., all in similar thick nesses.

What is the advantage of a "solid" shell (which I assume means a 1-pc, bent shell with a seam) vs. a ply shell? I gather that the resonance will be much better, since there is no

glue/filler/empty space, but what else? You gain in warmth/sustain, but you lose in strength, right?

What about stave shells? These look great, but what is the tonal characteristic of a ply shell in the same thickness? I pick up that they are louder and crisper.

And anyone check out real solid shells, that are carved from a tree (as in Canopus drums...)? There is some interesting info on the Canopusdrums.com site re: this method.

If I were building drums, seems as though a solid/bent shell is great for toms and bass (sustain and warmth), but for a snare, a 10-ply shell or a stave shell would be better...

and what about carbon fiber or acrylic?? What do they sound like?? Carbon fiber is the steel/wood hybrid, right? And acrylic is loud warmth??

Help!

Dominic

Sound Characteristics of Shell Types

Q. What are the basic sound characteristics of the different major shell types? I want to compare a maple ply shell, maple "solid", stave, etc., all in similar thicknesses.

A. More mass means higher pitch. Thus 10 ply shells will be higher in pitch than 8s, likewise 8s are higher than 6s etc. More mass also means louder volume. 10 ply shells are louder than 8s etc.

The physics of solid wood shells are the same as ply shells the only because there is so much more wood than glue you get richer “body”. One of the greatest advantages of solid wood is the fact that there is so much more to choice involved. Drum makers who can do this sort of work have the entire earth’s tree selection to choose from and not just what the mass production industry is pumping out, in today’s case it’s maple. This allows you to explore a little and find a wood with the tonal qualified and sound that you like.

Q. What is the advantage of a "solid" shell (which I assume means a 1-pc, bent shell with a seam) vs. a ply shell? I gather that the resonance will be much better, since there is no glue/filler/empty space, but what else? You gain in warmth/sustain, but you lose in strength, right?

A. Solid wood shells can be 1 ply steam bent, stave or seamless (as in “some” Canopus snare drums. The tonal characteristics of these shells vary as much as the woods do themselves. Personally, I have always been a fan of open grain, softer woods. They produce a warmer more full body and a tone that I would describe as fat and mellow. I have even suggested for guys to try various species of spruce woods if one really wants a resonating drum. Violin, acoustic guitar, cello and many other stringed instruments tops are made of spruce because it is the most open grained wood and it projects sound and even amplifies it more than any other wood. Harder, denser woods are brighter and thinner sounding but yield the ever so desirable “crack” sound. The pitch is higher the denser the wood. Harder woods are denser than lighter woods. The more density the more mass, the more mass the higher the pitch.

Q. What about stave shells? These look great, but what is the tonal characteristic of a ply shell in the same thickness? I pick up that they are louder and crisper.

A. Ahh…now we're singing my tune! Stave shells are (of course this is my humble opinion) superior to any other drum shell construction technique known to man. Why? Simple, first, they are solid wood shells. Some may say that they are not because it's made up of pieces but in the wood working world it is correct to call stave shells "solid". A handcrafted dining table made entirely from solid boards is referred to as "solid wood construction" because it has no veneers, pressboards or plywood of any sort yet it is made of many pieces right? The same is true for stave drums. Now to the practical advantages of stave shell construction. Think of wood as a bundle of drinking straws in you hand. That is the way the molecular structure of wood is. Long, skinny networks of open channels all running in one direction. Which direction do you think sound, which is nothing more than air pressure, will travel the most effectively? Which way would air pressure travel through the bundle of straws? The same way, from end to end not cross ways or perpendicular. Stave shells are made with solid pieces of wood running from end to end or a better way to put it, from bearing edge to bearing edge. They are crisper because the marriage between the top and bottom heads is less interrupted. Also, because the bearing edge is cut on vertical end grain the edge itself it way more durable and because end grain is much harder that cross grain. They are louder because you can build them thicker. But you don't have to have a 1" thick stave shell. I have built some 1/4 " thick shells that really sing. Which brings me to another advantage of a stave shell, options! Stave shells can be made form any wood available and in whatever thickness you want. Ok, now for the last reason why I say staves are superior - structural integrity. One-piece steam bent shells are cool but the problem with one-piece shells is just that, they're one piece. One piece of wood is not going to be as stable once it is bent in a 14" circle. Over time not all but many steam bent shells distort and go out of round. It's a fact of life. There isn't much that can be done to prevent it. Think about it, you are violently and quit abruptly changing the shape of the wood using elements and conditions that aren't natural to it and then freezing it in that position for the rest of it's life. It's only a matter of time before the thing will want to "stretch its legs out" and move on you. Stave shells are cut into smaller pieces then glued together and if the guy who built it really knows his stuff, he will have glued up the pieces in the same order in which it came off the board so that there wont be any internal force inside the wood itself that is slowly pulling your shell out of round. Besides all that, if you are going to go with a solid shell you really don't want to miss out on vertical end grain bearing edges.

Q. And anyone check out real solid shells; that are carved from a tree (as in Canopus drums...)? There is some interesting info on the Canopusdrums.com site re: this method.

A. Yes, I have seen those drums before and they are very impressive. There is a great degree of skill involved I can attest to that. I personally have issues with all the waste involved. I just couldn't see myself with 90% of the wood I bought on the floor in chips and dust. Another concern I would have is the fact that shells built from hollow logs are subject to what is called "checking" which is parallel splits and crack that occur while the wood is seasoning or ageing. I haven't heard any bad things about these drums but I do wonder what has been done to assure that this doesn't happen. I am unaware of a wood that checking doesn't occur in.

If I were building drums, seems as though a solid/bent shell is great for toms and bass (sustain and warmth), but for a snare, a 10-ply shell or a stave shell would be better...

Q. What about carbon fiber or acrylic? What do they sound like?? Carbon fiber is the steel/wood hybrid, right? And acrylic is loud warmth??

A. I don't think Carbon fiber shells are steel and wood. I'm pretty sure they are a resin-based shell made with fabric like carbon fibers sort of like fiberglass. In my opinion, and

I'll admit that being the wood guy that I am I know I'm bias but I think acrylic and carbon shells sound like, …well…plastic! If you happen to like 2 ply heads they will sound like beating on Samsonite suitcases or cardboard boxes. All I can say about plastic drums shells is this, "Wood is Good"

Well…there is my long-winded $.02 worth for the night. See yall tomorrow.

-Sean
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SMD Message Board

Re: Sound Characteristics of Shell Types

That was an incredible explanation Sean! I also enjoyed your stave shell evaluation.....excellent.

Hop

Excellent lecture! One thing though:

"I personally have issues with all the waste involved. I just couldn't see myself with 90% of the wood I bought on the floor in chips and dust."

I don't think they waste as much as you picture. If you're just making snares, perhaps, but Spirit Drums in Australia make solid "log" drums by cutting concentric shells out of the log. Cut the middle out of your 20" bass and you have a log for your 18" tom. Cut the middle out of your 18" tom and you have the blank for a 16"... etc.

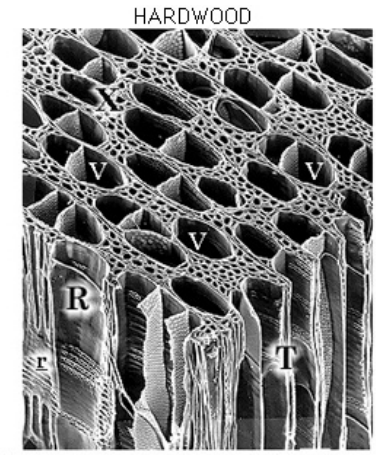
When you get down to 8" you can lathe a couple of nice salad bowls.

.

I find it hard to believe that sound is actually traveling down open 'channels' in the grain. Is just estimation, or do you have some research to back it up?

Re: .

Yes I have plenty of research, years and years of it in fact. But not the type you may be want to hear about; the kind done in labs by dudes in lab coats and slide rules in their pocket protectors. All my research is that of a more practical variety. The kind you get by working in and studying a trade for 15 or 20 years. That type of research is called "experience". However, I didn't say "sound actually travels down open channels" I said you could liken it to that, which you can. Below is a picture of the molecular structure of a typical hardwood. Note the "channels" or vessels I refer too. Now, I'll ask the question again; Which direction do you think sound, which is nothing more than air pressure, will travel the most effectively?



-Sean
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SMD Message Board

Good vibrations

I am the dude in the lab coat with the slide rule and pocket protector. Except without the lab coat and pocket protector. You're right Sean, but a better analogy with your straw example is not sound waves traveling through the straws but pressure. Imagine that stack of straws again. Try to shmush the stack by pressing on the sides of the straws, plenty of travel there. Now try to compress the stack along the longitudinal axis (push down on the ends), no compression at all. So endgrain is less compressible than lateral grain. Lateral grain (grain running perpendicular to the tension of the lugs) will absorb and attenuate the pressure waves from the batter head. Endgrain staves will transmit more vibration to the resonant head. Since pressure waves generally travel faster in denser materials*, the pressure wave in the wood reaches the resonant head before the air pressure wave inside the drum. That produces the effect of both heads being hit at once. Also the "softer" lateral grain will attenuate the heads themselves. Imagine how much a guitar will sustain with a soft rubber bridge rather than a hard surface. The soft bridge will soak up sustain. The endgrain of staves gives firmer, less yielding support to the head at the bearing edges.

*For instance, it is almost impossible to determine the direction of sounds heard underwater. Sound waves travel faster in water than in air. So fast, in fact, that the human brain can't distinguish the difference in time between the sounds's arrival between one ear and the other. Thus it can't calculate direction. Animals that live in the water (seals, dolphins, whales) have brains that are adapted to the speed of sound in water and CAN determine sound direction.

Sound

I hate to burst the bubble but sound is a wave. Does sound travel faster in water or air? You guessed it. Water. Density is the key. If you could make a "hypothetical solid piece of wood (no air)" that was extremely thin say the thickness of a 5 ply Keller shell that would be something. But to say that sound is effected by the "pipes" oriented axially in a drum is what makes the sound I would have to disagree. Why do you think a bell brass snare is amongst the loudest instruments out there? There is very little air in the walls of brass. If the theory that thicker is better then why are the walls of violins, guitars, etc so thin? Because they want the vibration that produces the sound. The vibration is the key. The thinner the shell the lower the frequency of vibration thus lower tone. The thicker the shell the higher the frequency, higher tone.

Drum

"If the theory that thicker is better then why are the walls of violins, guitars, etc so thin?"

Because there isn't enough surface area on a string to produce a powerful enough sound wave to be audible. Demonstration: electric guitar unplugged. Strings only. No sound. The body of the stringed instrument is the resonating surface that moves the air that produces the audible sound.

The body of a stringed instrument is not analogous to the shell of a drum.

The resonating surface of a drum is the head. The shell produces very little sound of its

own. Its contribution the sound of the drum is, mostly, how it supports the head. Harder, less yielding materials let the head keep more of its energy.

Drum

Tessiepot is absolutely correct. The sound of the drum comes from the head primarily. The shell, lugs, and rims color the sound. Drumheads and strings of a guitar produce standing waves. The waves they produce displace air molecules that cause the sound waves that travel through the air. The thing that has the greatest effect on these air molecules are the surfaces that are struck, the heads and the strings. Not so much the shell or the body of the guitar. This is why Roto-Toms are able to produce sound. They do not have a shell and it is still a drum tone. This is why I do not get totally pulled into the maple vs. birch or mahogany thing. What the drum companies do not tell you is how they do their research for the sound characteristics of a shell type. They get a shell with very sensitive audio equipment and strike the shell in a particular way and a chosen spot on the shell. Then these elaborate microphones and meters pick up the sound and a computer gives a read out it. But we as drummers do not hit shells we hit the drumhead. The type of head you use has more of an impact on the tone of the drum than the shell in my opinion. Also how well does the shell let the head vibrate? That is the entire philosophy of the various bearing edge designs. Another less talked about concept is how the individual hits the head. Orchestral players will get a different sound out of the same drum that Tommy Lee will get. This has to do with how fast you remove the stick from the head to let it begin to vibrate. The physics of a drum is fairly complex and has alot variables.
But it does make for some cool discussion. This is why this site is so cool.
I have asked this before but I'll try one more time.
Does anyone know the ratio DW uses to fit the re-ring to the size of the shell?
Thanks
Docholiday

Shell Material

Where bubo stayed with maple, it might be okay to mention the basics of wood composition in shell making. Again, wood density is the determining factor in shell vibration and pitch. Maple is generally harder than birch. Birch harder than Luan-type mahogany. Some exotic woods are much harder than maple and contribute to higher resonant shell pitches.

Sound is really in the ear of the listener. Some say maple has a "warm" sound. I equate warm with soft or mellow for some reason, and I could not say maple sounds soft or mellow. It certainly isn't metallic, and that is where shell composition comes in. Generally speaking brightness and hardness are partners in sound.

My daughter plays violin. Extremely particular about her sound. She has a German violin. She hears differences I do not, but she has played a lot of violins. To me, they sound pretty much the same. I might hear differences in volume. To her - strings, woods, finishes, tuning pegs, blocking, and other factors contribute to a violin's sound. Same with drums. By the time lugs, rims, heads, and mounting come into play, from 20' away, all things get pretty general, even for a Stradivarius.

No one would be disappointed in the sound of a maple drum for toms and bass, where sustain and character are concerned. Snares are different, and would be covered in greater detail in another chapter. Given the nature of the recording and

sound reinforcement industry, a natural drum will sound natural to the one playing it. On record or in the audience, it can be a totally different thing. Another chapter for the book, too.

One might add "Touch" to the table of contents, for the way one strikes a head can determine a drum's sound. Two drummers, playing the same set, can make the instrument sound very different.

Ray

Shell Material

Excellent points guys...this is what we have to get goin'. Lets get these points/counterpoints goin' and then we can edit this down and get our first chapter in the bag.

Anyone want to tackle a little bit on metal, acrylic or fiberglass shells? I agree with Ray...maple is a lot harder than birch, therefore I think that the birch sound is a bit more controlled because the birch shells absorb more of the overtones (being a bit softer and more porous). Also a harder wood vibrates more than a soft. I don't know if deeper shells would be louder than shallow shells...I think that the overtone decay would last a little longer with deep shells.

We could talk about touch and how to coax different tones out of a particular shell...but then I think that we are getting more into drum technique rather than drum building technique. I think that we should let the beginning drum builder know that you can get these tone differences better with some woods than others but without getting into too much detail as to how to get them.

Maybe we could describe some of the differences right down the line with regards to different woods. Maple, birch, beech, mahogany, Luan, poplar and combos of several. Even though Keller and Jasper deal with mostly maple...some builders will no doubt be dealing with restoration of older drums (mahogany/maple, etc.), and may want info on these woods. Something to think about.

Lets keep it goin' guys...I got a good feeling about this now.
Later,
bubo.

Chapter 2 – Hardware: Lugs and Hoops

When I was younger, lugs came down to looks. I never liked Slingerland lugs, or the inverted stick saver rims, though now, I appreciate both, and wish those rims were made available for builders.

I liked the look of Ludwig lugs. Others seemed fairly banal by comparison. When Camco came out, those round lugs were so identifiable from a mile away, as to almost shock the industry. Doug Clifford, of Creedance Clearwater Revival did more for round lugs than Camco could have imagined. Now, DW has them, along with the now defunct Hayman company lugs. A number of custom drum builders use some kind of round lug.

Premier had long lugs, still does on some lines, but everyone knew their chrome plating was absolutely flawless. It had to be seen to be appreciated.

Now, there is even the Lion lug, an actual mold of a lion's face. Very impressive, but VERY expensive.

In the early years heads were tacked in place. Now, the typical lug is there to house the threaded "lug nut" and permit tension rods to tighten drumheads covered by a "hoop" or "rim." Seems simple enough.

"Tube" lugs were standard on drums, especially snare drums, for years. Now they have made a strong come back. Extra care must be taken for alignment or things can get impossible to deal with; stripped threads not the least casualty if things do not line up exactly.

For years it was thought that "long" lugs aided in tensioning, especially on growing deeper tom shells, but now the extra weight and realization that very few drummers tension their toms to such levels, has left long lugs to have a place in but few companies arsenals of hardware. They can still be found on some lines, like Yamaha Recording Customs, Premier or Mapex drums, and for some reason, on lower priced lines.

Cast lugs are generally made of "white metal" which is strong under most conditions. Tube lugs can be cast or machined, or a bit of both, depending on design. Machined lugs can be found in brass, steel, aluminum, or an alloy. They generally have a unique appearance, depending on production capabilities, and are solid metal, not hollow, as cast lugs generally are. Theories battle back and forth as to how different lugs react with drum shell materials. You will never get any common consensus in that arena. One might logically think the less mass of the lug and the fewer contact points, the more possibilities for drum vibration.

One will say a tube lug or long "bridge" lug with two contact points, is better for sound then two lugs making a total of four holes in the shell. So, some make lugs with one hole for mounting screws, and a little "nipple" that indents in a tiny place in the shell so it will not spin. Others create square holes so the lug cannot spin. A lot more work, and adding a lot more dollars to the over all cost of the drum. There is also a long lug that has one hole for mounting it to the shell, yet allows for both top and bottom heads to be tensioned. Some companies use a bottom rim assembly with constructed tubes lugs on it, a la Pearl Free Floating snare drums. Ayotte and others,

employ unique designs in "lug" technology.

The next battlefield is isolation gaskets. Some maintain they keep resonance at a premium by isolating the metal from the wood. Others state it is better to have the metal to the wood, forming a bond between them. Others state the gasket is good for protecting the finish and that's about it. Many drummers will testify lug isolation does not enhance drum sound. Others will say the opposite. Personally, having done both in my building, if there is a difference, my ears can not hear it.

I have often wished drum companies offered a greater distinction in lug design. At one time you could easily see the difference between a Mustang, Corvette, Impala, Barracuda, VW, Cadillac, Thunderbird and other cars. Now, driving down the road might lead one to believe there is only one car company in existence. Lugs have that same issue. Ludwig is still Ludwig. DW is obvious. One might pick out a Yamaha piccolo lug, or Premier Genista. Ayottes are certainly noticeable. But overall, from a distance, you might be hard pressed to know a drum company by its lug design.

Lugs can also come in various coatings beside chrome, such as brass or gold. Some can be baked with an anodized powder coating in any color imaginable. Black is readily available for builders.

When all is said and done, a lug is a simple device, but without it, we are back to tacking heads. That's nice for museum pieces.

Ray

Number of Lugs

Anyway, a common reason is Money. Less lugs in the production line costs less to manufacture a lot of drums, especially in beginner's line drums.

At the same time, the tensioning ease of ten lugs, less stress over all, and the over all feel of the playing surface is changed quite a bit. There are less "hollow" spots in the head between lugs. Some piccolo drums have 12 lugs to really aid in cranking the heads for as much "pop" as possible. Many parade drums have 12 lugs for that reason as well.

Some drummers like 8 lugs because they don't crank their heads, and it also allows for easier positioning on a snare stand. Everyone has had the annoyance of trying to position those three stand arms so they don't collide with the lugs on the drum, and still be able to have the strainer mechanism in a comfortable place to get at while playing. Some like the way it works out with 8 lugs, some 10.

The same logic would apply to bass drums, especially as the shell size increases. Production costs, tensioning ease, head feel, and where spurs are placed on the shell all comes into play.

Ray

Tension Rod Formula

What is the formula for getting the correct tension rod size? I've seen it before, but forgot to bookmark it. I wise there was a way for the message board to have a search thing. Thanks alot.

Tension rod formula

I am also interested in this formula. I didn't think you needed one. Is it ok to measure from the hoop to the lug and add a little extra? If not what is this magical formula. Thanks

Re: tension rod formula

From the inside of the head measure to the bottom of the flesh hoop and then subtract the thickness of the flesh hoop from that number. Now measure from the top of the lug insert to the bearing edge. Subtract the first answer from that. Now add the thickness of the batter hoop and 1/4" to that number.

Example:

.625 Deep - .375 Flesh Hoop Thickness = .250
2.0 from Edge to Lug Insert - .250 = 1.75
1.75 + .100 (2.3mm Batter Hoop Thickness) + .250 Untensioned Rod Engagement = 2.100
Get the next closest size rod 2.0 or 2 1/4" (52mm/56mm)

JDW

Die-cast hoop Vs triple flanged hoop?

Die-cast is heaver for a more focused tone, more attack, crisp rim shots, more durable, darker.

Triple flanged are thinner, so more open tone, more high-end ring, less focused, more overtones, brighter.

Die Cast are much heavier

Flanged are thinner

Chapter 3 – Drum Heads: A Broad Field of Sound

Heads

The easiest way to determine head selection for a set is to understand the basic construction of a drumhead and its purpose.

Mylar is a plastic that has stretching properties, and can take stress.

It replaced calfskin heads, which was the doom of many purists who like calf's mellow tone. Stick attack changed as well. But, maintenance completely changed too, because the plastic was not subject to atmospheric changes, as calf was.

You have a round (unless you are Trixon) drum shell/cylinder. The head tightens over it to create a sound from vibration when struck. Common sense. Then comes the wide array of sound from the simple premise of thickness.

The thinner the head, the more sensitive to vibration and transfers of vibration and air between two heads and throughout the drum shell. The thinner the head, the more likely it can stretch beyond use under constant pressure of playing (especially with larger sticks), or it can just snap and rip through from a strike.

The basic layout is simple enough; and any head manufacturers catalog basically tells you what you need to know:

Clear heads offer the most natural and open sound.

Coated heads offer a slight dampening of that sound, but help brush playing stand out with the "sandy" surface. Some coatings are better than others for durability.

Heads with fiber coatings or integral fiber design, etc., designed to recreate calfskin heads, dampen even more.

2 ply heads offer lower tone, as vibration is lessened. Coated 2 ply even more dampened.

Heads with glued twin ply, or a touch of oil between the layers takes the sustain down another notch and again, lowers tone.

Snare side heads are the thinnest and will not stand up to stick playing. Their purpose is to help snare wires vibrate evenly and with as much sensitivity as possible.

7-8 mil. thick heads - Diplomats, etc., are generally for sensitive, light playing, or for resonant side heads.

10-12 mil. clear - Ambassadors, etc., are general all-purpose heads.

Heads with "dots" or attached Mylar rings around the circumference are designed to take away harsh overtones: something that often accompanies poorly tensioned/tuned heads, or drum shells with less than optimum sound characteristics.

Twin ply, 7 mil., or combination of thicknesses, offer more durability and take away overtones many players do not like.

Generally speaking the most wide-open sound a drum will get for average playing is a 10mil. batter and 7 mil. resonant. But that may sound thin for some tastes, so they will put another 10 mil. head on the resonant side.

Such a combination might not hold up to the force others play with, not only ripping through the batter head but supplying enough force to pop the resonant head as well. They might choose a twin ply batter and 10 mil resonant. Very few will use 2 - twin ply heads, unless a studio requires very muffled drums.

Muffling is the slight of hand art of putting something on a drumhead to take away "just the right amount" of ringing, overtones, boing, etc. It can be done with any type of tape, any type of Mylar rings or pieces thereof, any type of sticking substance like "moon gel" or self-sticking foam weather seal, mounted felt drum muffles, or combination of these things.

Bass drums are the most filtered drum in a set. They can range from wide open single ply, to the heaviest of double ply technically modified heads (felt strips or rings, Mylar rings, holes in resonant side, etc.) to everything in between: stuffed with blankets, pillows, packing peanuts or shredded newspaper to gain that "perfect" combination of low end, attack and sustain. One man's fruit is definitely another man's candy when it comes to bass drum sound. Experiment as much as you and your wallet can stand.

Ray

Chapter 4 – Drum Finishing: Prep to Final Coat

Keeping The Dye off Bearing Edges

Make sure you are all masked off so dye doesn't go where it's not supposed to and get a sponge brush and dip lightly (1/4" to 1/2") in the dye. Work around the shell from the bottom up (so if dye runs it will run on already dyed area and this will lessen your chances of an uneven color)...work at a fairly rapid pace to get the whole shell covered evenly. When the whole shell is covered go around the shell again but with a less saturated sponge brush (don't dip as much this time) kind of rubbing the brush in a tight circular motion to get the dye into the grain as good as possible. Let dry. Check the shell for any more raised wood fibers and take care of them and the bit of a blotchy appearance with a light rubbing with steel wool.
If you feel your color is not what you want, adjust accordingly, remember though, it will look a little blotchy until you get your top coat on!!...if you like your color move on to your sealing and top coat process.

Take masking tape and wrap it around the outside edge going around the drum, then fold the tape inward to cover the inner edge.
This is especially easy with 90 degree edges (45 on both sides), but with 45/rounded might be more tricky. If your edges are 45 on the inside only, I wouldn't even worry about it. If a bit of dye gets on them you can take it off with the power sander pretty easily. You can do this with the outside rounded edges as well if you feel confident with your power sanding abilities!

As far as dying, I wouldn't double the amount of dye. It's harder to undo. I would just do several coats. Each subsequent coat will be darker and you can then see the gradations and stop at your taste. Once I went really dark on a shell and it turned out bad and I had to sand it off, and if you sand a shell too many times it starts to warp and you start taking off the ply... yuck.

6 cans should do it, but it depends on how many coats you are applying. My preference is to do as few coats as possible to prevent choking the shell by hardening the outside too much. To hell with mirror finishes if the shell can't sing!

To keep dye off your bearing edges, take some tung oil on a q-tip and run it along the edge, then tape them off. Same goes for the holes, take a q-tip and run it inside the holes, then tape them off, that way nothing will run inside your drum around the holes. Be careful whatever the tung oil touches dye will not take to.

Stains

Yes, oil goes over stains nicely, IF you wait for the stain to dry well (I have found 2-3 days should be the least amount of time) otherwise the oil can lift some pigment. It's amazing how long stain can stay moist enough to lift. I haven't worked with dyes, so I couldn't say how oils work with those.

Ray

Finishing

010 Verify scratches in drum shell. If there are scratches then I remove them inside and out. 220-320 grit paper will suffice to use.
Use and incandescent light to see scratches. Block sand only to keep uniformity throughout shell.

020 Oil inside drum and edges. Watco Danish Oil, any Tung Oil with a dull finish. Too shinny on inside produces a tinny, ringy sound. 2-4 coats usually does the job.

030 Mount drum in fixture. This is the drawing I sent you. Cheap to make, priceless when holding drum for all operations.

040 Verify that there are no scratches on the surface of the shell. Remove as required.

050 Dye/stain shell. Let dry overnight.

060 Lightly sand shell with 320-400 grit sandpaper to remove any raised grain caused by the stain or dye. Be careful not to sand hard or you will remove the color.

Synthetic steel wool in the finest grade or 0000 steel wool will do the job. Clean off with a "tack cloth" to remove any dust or debris before moving on.

070 Seal the dye/stain into the shell using a lacquer sanding sealer only. I have used spray and brush on. I like spray the best. It gives a better surface to work with and doesn't need as much sanding because of that. Be sure it's a lacquer seal if your going to top coat with lacquer. If you use any other type then you will end up with a crinkle finish when the chemical reaction takes place. Give one coat of sealer and let dry. Usually sanding sealer will dry in about an hour. Read
the directions on the can for set up time. Sanding sealer dries quickly and can be block sanded to remove unevenness. Sands very easy. This sealer is going to do two things for you. It will lock the color in and also fill in the small pores of the wood to end up with a nice smooth finish. Do at least 2 coats of sealer. After 2nd coat, follow the same directions as above with the first coat. Tack cloth the shell before moving on to the next step. Need to remove dust and debris. BIG ENEMY!!

080 After the shell is smooth and clean it's time to start top coating. Spray light coats of lacquer over the drum. You are able to spin this shell in the fixture slowly while spraying the coats of lacquer. I usually can get 4-7 coats before stopping for the day. The light coats as your spraying look kind of dry. When you reach the look of wet. STOP Now you have what's called a wet coat and it usually comes in 4-7 light coats. You don't want runs that you just have to take out later. You will probably have what is called "orange peel" in your finish but don't worry about it. It's normal. Orange peel looks just like it sounds. It looks like an orange peel texture. Let your drum dry overnight.

090 The next day check out the drum and you will see it's time to do some light sanding to scuff the finish, get rid of and bugs, dust or any other perfection's in the clearcoat. You must use water when doing this. Use a grit of about 400-600 wet emory only. Using the sanding block again. Always use the sanding block when doing any sanding on the shell. Keeps it flat. Take some kind of container and put a few drops of dishwashing liquid in it and fill with water. Needs to be big enough to get

your hand into and out easily. Place the emory in the soap and water mixture the night before. Works better that way. Start rubbing down the drum without putting heavy pressure on it. Keep the block moving in the direction of the grain. Start with the seam of the drum for a gage point. You'll lose track of where you're at without some kind of reference point. Keep dipping the Emory into the mixture to keep it clean. You do NOT want to let the Emory load up with lacquer. It will scratch the finish and you've got more work now to remove the scratch. After doing this a while you can hear when your Emory loads up if your working in a quiet environment. Go around this shell a couple of times and then dry the drum off so you can see if you have removed the flaws. Again this is where a light comes in handy. I use on in a regular table lamp. Easy to sit out in front of you while your working. If you have not removed most of the flaws then you'll need to do a bit more wet sanding. Do not worry about removing everything. Just get the worst out.

When coating again you will cover some imperfections that are very minor but not hair. Hair, dust, bugs and those sort of things must be out. They will stick out like a pimple on your butt when you're done. Once flaws are under control. Use tack cloth again. Remember, dust is your enemy along with humidity with lacquer. Must be lower than 68% or you will get what is called "blushing" on your finish. That is when moisture gets trapped behind the lacquer and then gives a white appearance like cloudy. If that happens, you've got troubles. There is a product to remove blushing and it's called just that (blush remover) and it just sprays on but why use it if you don't need it. Watch the humidity.... Oh, wear a mask of some sort or respirator when spraying anything. Don't need this stuff in your lungs. Not good. Dust, lacquer, sealer and the like. Now it's time to coat some more.

100 Start spraying like you did with the first coats. Light coats up to the wet coat. Same as before, 4-7 coats. You may not want to but I usually end up with 15-20 coats overall. Nice and deep looking when finished. Also you do remove some when rubbing out.

110 Follow the directions as in operation 090 and wet sand but this time you will use a bit finer grit if you can. You may not have dust, debris, orange peel and the like so start with 600-800 if possible. Again you have a reference point to keep track of the times you make it around the drum. My personal preference is 5 times to each grade. 800-1000-1200-1500-1800-2000-2400-3200-5000-8000-12000. Sounds like a lot and it is but the you time spend here will make it worth it if your looking for a million dollar finish. Keep the grit clean, very important or you'll mess up all the work you put in so far. Always be careful at the outer edges of the drum when you're sanding. For some reason lacquer is thinner in these areas and you end up removing the finish down through the color. This is why I cut my edges last. You may not have a problem but I am just trying to stress the point that it can happen. Sometimes I try to build up more lacquer on edges when I am spraying. You live and you learn. After all rubbing out has bee completed you should have a very smooth drum and a decent shine on it. NOT DONE YET!!!!!

120 Let drum set for a week to let the lacquer cure a bit. Now it's time to buff. Drum is still on the fixture and you have a car polisher. Can buy them for less the $40 over here. Worth the investment. After you building this drum and see and hear how beautiful it sounds and looks, your HOOKED. You be building them for a long time. So get some extra fine polishing compound and start buffing the shell. Speed should be around 1200-1500 RPM and do not let sit in one place too long nor let the buffer start outside rubbing into an edge. Always buff outward. If this shell is in the fixture

then the buffer will make it spin and will help keep you from standing in one place too long. Need heat but NOT TOO MUCH. The best compound I have found is Stewart McDonald's "swirl remover". Can't get it anywhere except from those guys but all it is, is a guitar luthiers compound so you should be able to find it there somewhere. It will be the last grade they use when buffing their guitars.

Now you may have a finish after the 12,000 grit Emory that is suitable for you. Don't really know. But I know if you want a shine like no other shine then you need these extra steps of swirl remover. After using this, hold the drum up to sunlight or any light and you will see your face in the finish. Remember, lacquer and it's high shine is not forgiving when it comes to blemishes. If you don't get them out in the beginning then you're stuck with them. With an oil finish or something that is not so shinny, it's more forgiving as far as flaws because it does not shine and cast shadows.

130 Now it's time to layout and drill. Different process.

Tung Oil Finishing

I have used just about all the available finishes out there: poly finish, both regular and water base, lacquers, both brush and spray, and oils. Oils I like the best because they are "workable." The Homer Formby high gloss is what I like best. You can't really make mistakes because of quick "set up" time. Most finishes tack up fast (save for regular polyurethane). Oil stays workable. It takes longer to dry between coats, but time lessens with each coat.

Prep your shell with good fine sanding if necessary. Tack cloth well.

I usually apply two coats at once to get started.

If it's too workable and you are afraid of dripping, here's a tip that works for me.

I use sponge brushes to apply oil. Some sponge brushes are not as good as others. The easiest way to tell is by color. A typical Wal-Mart brush will be black, and it looks to have a more porous texture. Brushes I have found in better hardware stores, etc., have a denser foam, like a sound reducing foam, and look grey. They have a much denser look to them. They work much better. Of course, you can hand wipe Tung oil too, rubbing it in. That works better for satin finishes. Gloss seems to look better when you brush it on. You don't need much on your brush. It is surprising how much material gets put into one dip of the brush, just the first 3/8". Don't load the whole brush! You'll have a loose faucet on your hands.

Basically, just glide along with the grain, watching for spots that seem heavier than others. They probably are, and will begin to run on you as you go on to the rest of the shell.

Just about any applicator leaves bubbles. With oil, they are not the hassle of other fast drying finishes. After applying your coat, hand spin the shell to make certain everything congeals evenly.

Then, when things look nice under your work light, put a hair dryer to the shell for a

couple of minutes, on low setting, at arms length. Some bubbles will settle because of the air flow. Others will hang in there, but once the oil tacks slightly, you can go over the shell "dry brushing" (you don't need another dry sponge brush, the one you're using will do, just make sure it isn't filled with oil; just damp). 99% of the remaining bubbles will be taken out and the finish sets up nicely, remaining bubbles generally shrinking out. Dry brushing takes some practice. A gentle touch is always best.

The first coat of oil is an 8 hour wait, but subsequent coats dry much faster, especially if the hair dryer is used to tack it up.

Like any finish, the more coats, the more gloss. You won't notice a distinctive reflection of your face in the shell till about 5 or 6 coats. I'm usually satisfied with 8-12, depending on the wood. And I do sand between coats, using finer grits as I go along. While some finishers wet sand using very fine grits, I hang in there with 220, 320, and then 400. You can certainly go finer if you like. Once I can make out the wrinkles in my face, I call it a job. But you can get a "mirror" finish just like lacquers.

Oils have a "liquid" sort of look, which I like, while leaving wood to actually look like wood (because of the way oil settles into the grain), rather than the look of wood coated with a second glass-like substance. If you use a satin finish, it's even easier to get a professional appearance.

Ray

Tips – High Gloss Tung Oil Finishing

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Ray

Satin Finish

I like the satin/hand-rubbed oil finishes. Lacquer looks and feels too plastic for my taste. I used a water-based stain and finished with Tried and True Danish Oil. Most folks use Tung oil, but I found this non-toxic Danish oil that is used for turned wooden bowls, wooden spoons, and baby cribs. I was able to control the gloss by buffing and paste/wax applications. Maybe I'll get around to posting some pictures. Be careful as to how "natural" you want your finish to look. Some oils have some pigment that may change the color/tint of the shell upon application. I suggest looking at some the finished drums in the photo section. DO LOTS OF RESEARCH!!

Natural Finish

I would NOT use Minwax Tung oil unless you want to change the color of the shell. You will not get the shell to look like natural wood. Its tends to "orange" the color. It's cool but far from a natural look. You cannot put poly over Tung oil either. You can put Minwax poly over Minwax Tung, but don't mix the brands. If you like satin and not gloss I wouldn't go with a poly finish, that will be really shiny. Use Formby's Tung oil. That's what everyone uses and I've heard no complaints. You can control how shiny the finish is by the number of coats you put on.

Dave

Danish Oil

I just used natural Danish oil (it comes in wood tones also) on a birch shell and got a nice satiny, almost wax-like smooth finish from it. I did this by sanding it in with 400grit cami (use 600P). I want to let it dry and do this a few more times but I'm getting a very natural, shiny but not glossy, smooth finish that is pretty much exactly what I was going for. I think I may just rub a furniture paste wax on to finish it.

Tung Oil

Any Tung oil will have an ambering effect to the wood, regardless of the manufacturer.

I recently used two coats of MinWax Red Oak stain, followed by six coats of McClosky Tung oil. After sanding with #0000 steel wool, I switched to a terry cloth towel, that I would spin the shell on while I watched TV. I finished with a couple of coats of liquid Carnuba wax, then more spinning on the towel. This gave a nice shiny, but not glossy finish, and it is actually smoother than that baby's a**

Logiztix, help us out here, show those comparison shells from www.acousticdrums.com/ they're in the DIY Olympics under "Gloss Comparison..."

Natural

Check out my post in the pictures section called Natural with Ego's. That finish is Formby's high gloss tung oil.

Tung

That drum has about 10 coats. With new shells, I start with 320 and go up to 800. That might seem like a lot, but I want the shell super smooth before I start the finish.

The top one is wet sanded through 600 grit and then given one final slobbery coat of Formby's that is left to run off the shell into awaiting cotton rags below. It drags when you wipe your finger along it, but it looks like glass.

I'm considering waxing the top one so see if I can get it to look like glass, yet feel like silk.

The middle one is 8 coats of Formby's, wet sanded through 1000 grit, polished with #0000 polishing wool and finished off with 3 coats of Carnuba paste wax. It's smooth as silk, but not very glossy.

The bottom one is the standard water-based satin finish found on all Oregon Drum Myrtle wood Series snare drums.

The bottom shell is actually a water-based satin poly with much sanding in-between coats. There is no stain applied to the shell. It's a solid piece of Myrtle wood, so the same technique on Maple won't produce the same result. I suppose you could get a brown dye on a Maple shell with some nice grain patterns and come close.

Logiztix

Chapter 5 – Bearing Edges 101 / Snare Beds

Edges / Tone

Lug spacing is generally 1.5" - 2.25" from the edge. Maybe 2.5 in some cases, but that is rare. For a bass drum it's around 2.5 -3" depending on the tension rods you use and how much thread you want in the lug nuts. You should have at least 1/4" of rod going into the lug nut.

Bearing edges. I'll start it off, but others will say other things. Generally speaking, the farther you move your cut to the outside edge, the more sustain a drum head should display. BUT, on some shells, that kind of edge will not work well with sitting the heads from some head companies. The shell and the apex of the head will not align correctly, messing up tunability.

On an 8 ply drum, some will put double 45 degree edges in different combinations - outside plies/inside plies: 1/7, 2/6, 3/5, 4/4. If you go 5/4, etc., you'll lose sustain and get more attack.

DW does a 3/16" round over outside, 45 inside. I've done that. It was okay. Some companies did round-overs both sides, which seems to make a drum very mellow in tone. I have gone to using 4/4 because anything less and the drum sounds somewhat "thin" or "hollow" in tone to me; not enough depth or range of tones, high to low; and the heads sit perfect.

But, if you get thin shells with reinforcement rings, that changes. Even a 1 ply outside cut with whatever inside, will sound good with thin shells and the rings, if the head sits right on the drum.

Some companies do a double 45, but they round over the two center plies. Mellow. Vintage.

Most of us don't have the money to experiment like companies do. I learned by doing over 11 years.

The rule of thumb is, the more wood touching the head at the bearing edge, the less sustain the head will give. And those are generally small differences too. I mean, if you were doing a test with scientific instruments, measuring duration of sustain, you would see the numbers. But, when you are playing the whole set, the differences are more initial "taste" of sound than actual duration of sustain. For those who play with big quarter note fills, I guess they might notice.

Sound is in the listener's ear. Shell material comes into play, head choices, drum depth, etc. You could have perfect edges for sustain, and kill them with thicker heads, and just get a lot of punch and staccato sound.

So . . . . .

Good luck,
Ray

DrumMaker.com bearing edges -

Bearing edges are all about how much wood is left touching the head after the final edge is cut. Angles don't seem to matter that much - 45, 35, 60 degree... that is not "throwing" the air column in any different movement to change the sound.

After trying the various edges possible, we have chosen a single 45-degree bevel, cut to the inside only. This edge extends out to the outer 1.5 ply. We then finish over the outer edge lightly by hand. This leaves only the slight 1 and 1 half of a ply left for the drumhead to rest on. We have found this edge to be the best for general-purpose use. Not TOO ringy not TOO boxy, JUST RIGHT! Easy to tune and similar to a Gretsch or Sonor edge. We get complimented on this all the time.

The other common edges that we CAN do on special request, but have not chosen as our standard are:

45 degree bevel cut to the inside, plus another 45 degree bevel cut to the outside, commonly called a dual or double 45. This edge has been made popular by modern drum co's like Spaun. This edge leaves the least amount of wood touching the head. We have found this type of cut to allow the head to almost float TOO much, resulting in a LOT of high, ringy overtones - too much for MOST tastes. This is why we advise against this type of edge.

45-degree bevel cut to the inside, plus a round over to the outside. This is similar to what you would find on a vintage drum that started out with a nice sharp edge, but has worn down and rounded over the years. This edge leave more wood touching the head. We found this edge to give a fatter, darker, more "boxy" sound. Not our favorite for a nice modern drum tone. This is why we advise against this type of edge.

Bearing Edge Ratio To Sound

Have any of you guys ever done a bearing edge all the way back towards the inside ply? Normally on an 8-ply shell I will do 4/4, or 3/5 45-degree edges. I've done 3/16" half rounds, and also 1/7 or 2/6, which always sounded too thin to me.

I always wondered what would happen if you make the edge 6/2 or 7/1. Would it brighten and sharpen the sound? Deaden the sound? Flatten the sound?

Any thoughts?

Ray

Are you referring to an inverted single 45? I have done this edge on toms before. If gets the seat closer to the flat part of the drumhead. It looks funny but makes for good tuning features.

SeansSMD

Yes, I guess that's what it would be, if you brought the 45 back to the 1st or second

ply.

I began going in at least 4/4 because I too noticed how well the heads then sit on the shell. The farther back you put the edge towards the outside, the worse the head sits. That's one of the reasons Premier made shells slightly smaller than other companies.

Tommy Campbell, on a Zildjian Day video, is playing these Pearls with undersized shells. Man, the drums sounded really beautiful! They dropped that line of drums. But the concept of giving heads room to sit just right is worthy of getting it right.

Ray

This is the concept that Spaun drums uses. He does a double 45 with the peak of the edge landing in the center of the shell plies as said earlier a 4/4 bearing edge. Personally I agree with this concept. It lets the head sit better and vibrate more naturally. The "node" for the head to vibrate is more consistent because it lands in the flat area of the head, not the curved or sloped portion of the head. I think and again this is only my opinion, that this is also slightly more forgiving of bearing edge inconsistencies, so the head will still vibrate better, make a better tone and sound. If the peak of the edge lands in the curved slope portion you will have an altered tone, and generally people put the head under higher tension to pull the flat portion of the head to the peak of the bearing edge. Now the head will vibrate better but you have changed the pitch of the sound to get this.

Can anyone shed some light on this?

Hope for some feedback.

Thanks
Docholiday

Double 45's

Hey Shelby,
As far as the tone produced by a double 45...it depends on where the "peak" or actual edge sits. On say an 8 ply shell, for example, there could be an inside 45 that covers 5 plys with an outside 45 that covers the other 3. Or the "peak could be right in the middle (4and4). When a drum head is tensioned over a bearing edge it usually makes contact with the shell for the entire outside 45 slope. The more shell touching the head...the more controlled the sound. Some say more 'mellow' or 'centered'. What it does is muffle the head somewhat.

The less contact the more resonant the tone. More attack...longer sustain, BUT not necessarily a higher pitch. When you muffle a drumhead you kill overtones which can "fool" the ears into thinking it's is a lower pitch. You can have a lot of resonance AND low fundamental tone, (think of tympani, which have smaller edges.)

Anyway...if you want a mellower, more controlled sound with few over tones go with more head contact with the shell. If you want a more resonant, wide-open sound with emphasis on attack (and a bit longer sustain), then go with a small contact edge. A 45-degree angle works well because it is easy to install and gives the head

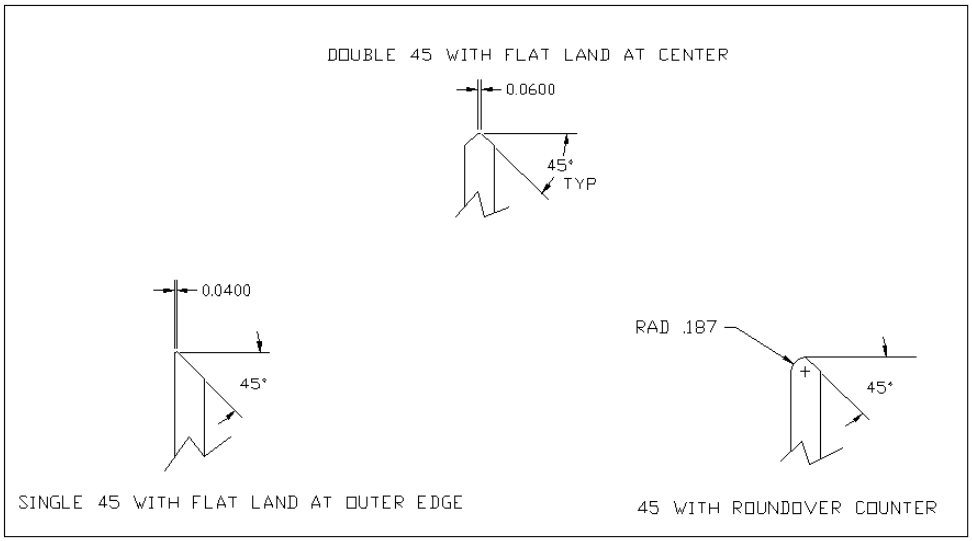
plenty of room to vibrate unimpeded. As far as rounding over the edge for a mellow tone...I found that you can stay with the 45 but just make sure the peak is more towards the center of the plys...this way the head can contact more of the edge surface. Trying to round over an edge by hand, evenly around a drum is time consuming and difficult. The head contacts the shell the same with a straight 45 counter-cut. It's the number of plys the head contacts that counts. That "vintage" sound that you hear on old drums is usually caused by a lot of head/shell contact because the edges have seen a lot of wear and are usually rounded over quite a bit. It is all a matter of taste...but the main thing to remember is...how much of the shell touches the drumhead. The angle of the cut is really secondary.

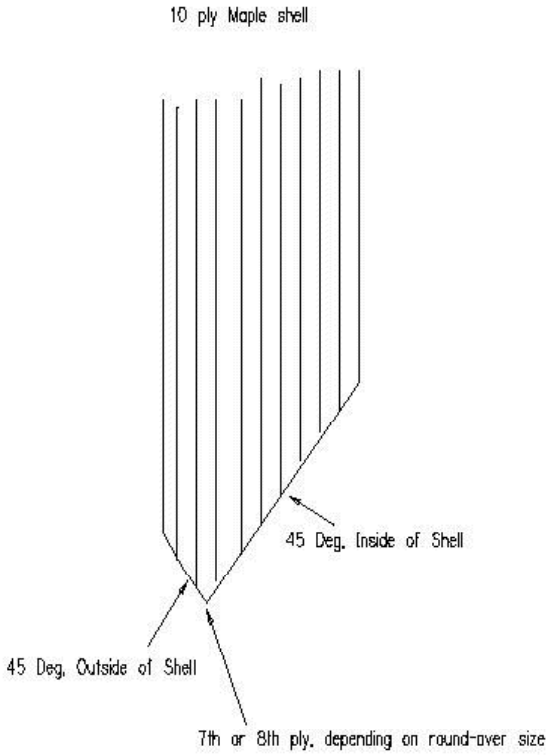
Later, *bubo.*

CCB:
It's a matter of preference. The more area you have touching the head, the less of a presence there will be of upper harmonics the result of which is a perceived "lower" or darker drum tone. Some will say to leave at least a ply's width when working with ply shells. I tend to cut 'em sharp on the snare drums: heavy on the inside with shorter back cut (outside).

Good luck

cl





Snare Beds

What are some of the ways you all cut your snare beds?

Snare Beds

I cut mine about 3/16ths of an inch deep and about 3.5 inches wide with 1 in ramps. I also use a Dremel tool with a sanding drum on it. Any more questions email me at drummer10501@hotmail.com

ditto

I do the exact same thing only with 1.5" ramps. I draw the line for my ramps from bed to bearing edge so they are even.

Re: Snare Beds

I think I've read posts about using a Dremel to cut snare beds, but I think I need to see what the finished bed looks like to understand it. I just raise the bit on the router about 3/16" and cut about a 3" bed, then smooth it out a bit w/sandpaper. Is using a Dremel producing the same type of edge?

Re: Snare Beds

I make my snare beds about 6" wide total, with about a 4" in the center than 1" ramps on either side. I use a vibrating sander, busts them out in a few minutes, perfect every time.

Dave

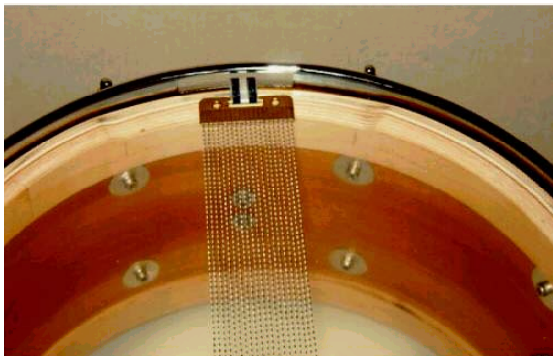
Re: Snare Beds

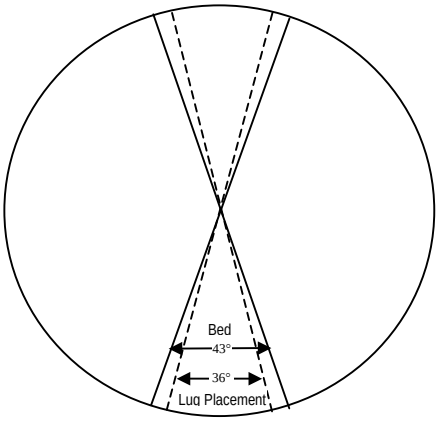
I have just recently used Dave's method.....well sorta..... I used 220 grit on a sanding block after I've drawn and measure all my lines. I let the block make the ramps somewhat naturally. It took like 1 hour per side but I was very happy with the end result. I'm not quite confident enough yet to use the electric sander. I'm sure it would save some time though. My depth and with are the same as Dave's as well. Seems to be the magic numbers for me. Thanks Dave....

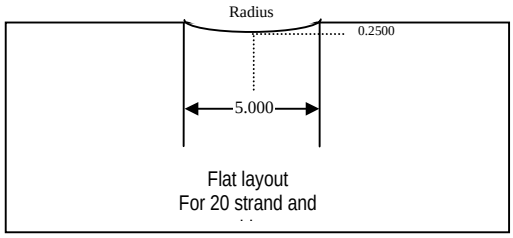
Mike

snare beds

I use a flat hand file to make my beds. The width of the flat portion of the bed is about one inch wider than the width of the actual snares than I use 1.25 inches for each ramp. The extra 1/4 inch makes the ramp slightly more gradual to my eye and it makes me think the head will seat a little better. It probably does not make a difference but this is what I have found to work. The depth depends; I start shallow and progress if I need to. I have done beds that were only an eighth inch deep and sounded fine with very little buzzing. If there is buzzing I will make the beds deeper. Also I tell the individual to take the drum and use it. If they need to have the bed deeper I can do it then. Some individuals don't mind the buzz because it has a responsive sound that they like. Other want less buzz, so I make the bed deeper.
That's my two cents
Doc




Bed
43°
36°
Lug Placement


Radius
0.2500
5.000
Flat layout
For 20 strand and

Chapter 6 – About Plys Diameter and Staves

I found out that the most plys Keller makes shells with is 10...but I need/want 20. So I have the challenge of adding 10 more well my dad is a woodworker so I have the materials and all but any tips about doing this??? Especially since they have to be added to in inside or else the rims won't fit...THANKS!!!

Plies and Shells - Dimensions and Tolerances

1) Number of Plies and Shell Thicknesses:
You can see below that Keller uses plies that are thinner than almost all major manufacturers. Also, the shell thickness of the generally-accepted 6-ply tom is thinner than just about anything out there. Sorry if I left your favorite drums out, I had a hard time finding out these dimensions for many of the drums listed here.
I edited this post to add the numbers for Yamaha maple custom absolutes and DW shells. Feel free to add to the list if you are so inclined:

plies/ shell mm/ shell inches/ ply inches
Keller Maple
5 ply / 3.5 mm / .138 / .028/ply
6 ply / 4.2 mm / .166 / .028/ply
8 ply / 5.6 mm / .220 / .028/ply
10 ply / 7.0 mm / .276 / .028/ply

Pearl Masterworks or Artisan
4 ply / 5.0 mm / .197 / .049/ply
6 ply / 7.5 mm / .295 / .049/ply
8 ply / 10 mm / .394 / .049/ply
10 ply / 12.5 mm / .492 / .049/ply

Pearl Session
6 ply / 7.5 mm / .295 / .049/ply

Mapex Orion Classic
? ply / 5.1 mm / .201 / ?/ply

Mapex Saturn
6 ply / 5.1 mm / .201 / .033/ply

Mapex Pro M
7 ply / 5.1 mm / .201 / .029/ply

Tama Star Classic Maple
6 ply / 5.0 mm toms / .197 / .033/ply
7 ply / 7.0 mm bass / .276 / .039/ply

Yamaha Oak Custom
6 ply / 6.6 mm toms / .260 / .043/ply
7 ply / 7.7 mm bass / .303 / .043/ply

Yamaha maple custom absolutes (a little thinner than maple customs):
6 ply / 6 mm toms / .236 / .039/ply
7 ply / 7 mm bass / .276 / .039/ply

Ludwig drums (super classic maple)
9 ply/ 6.0 mm.

Yamaha Maple Custom
7 ply / 7 mm toms / .276 / .039/ply
10 ply / 10 mm bass / .394 / .039/ply

Yamaha Maple Custom Absolute (advertised as thinner than maple custom)
6 ply / 6 mm toms / .236 / .039/ply
7 ply / 7 mm bass / .276 / .039/ply

DW Maple
5 ply 3.5 mm small toms .139 shell .0278/ply
6 ply 4.2 mm med toms .167 shell .0278/ply
8 ply 5.6 mm large toms .222 shell .0278/ply
Solid Craviotto .375 shell

DW website regarding re-rings:
small toms (8" to 13", 5 ply): 1" wide (3 ply)
medium toms (14 to 18, 6 ply) 1.25" wide (3ply)
large shells (20-28, 8 ply): 1.5" wide (3 ply)."
A 10" (up to 13") shell is considered small and is 5-ply.

Vintage Hayman drums:
Birch, 4 Ply (6mm) with 4 ply (6mm) 1.25" wide re-rings.

Keller Shells
8 x 10 - 8 ply - nominal .220 thick
edges flat to within .003
edges parallel to within .016
round to within .030
thickness .208 average
9 x 12 - 8 ply - nominal .220 thick
edges flat to within .007
edges parallel to within .010
round to within .045
thickness .206 average
11 x 14 - 8 ply - nominal .220 thick
edges flat to within .004
edges parallel to within .005
round to within .108
thickness .208 average
13 x 16 - 8 ply - nominal .220 thick
edges flat to within .004
edges parallel to within .014
round to within .100
thickness .210 average
15 x 22 - 10 ply - nominal .276 thick

edges flat to within .001 (unbelievable! both ends!)
edges parallel to within .005 (again, unbelievable)
round - too big for the height gage
thickness .275 average
1.5 x 22 Hoops - 12 ply
edges flat to within .006
thickness .300 average

So Keller makes pretty darn good shells - nothing measured looks like it will be a problem, and the bass is perfect. They are all 1/16" to 1/8" undersize on the diameter. The snare shell I bought first was like this and it turned out to not be a problem. Hope the toms sound as good! I can't wait to retire that 8 x 12 I have now!

These numbers are exactly the same as Keller's! This makes DW shells the thinnest of all major manufacturers that I've looked at. Their web page is listed below, and their catalog says that they do use reinforcing hoops in all their Collector's Series drums. The catalog states "the addition of reinforcing rings is an essential element in increasing the strength of the shell at the point of greatest tension, and raising the pitch of the shell to increase its articulation and projection. DW reinforcing hoops are 'graduated', meaning that their depth increases as the shell diameter increases." Also "Bass drums and tomtom shells are thin to bring out their low end, with smaller toms slightly thinner than larger ones."

2) Construction and Tolerances:
Keller Maple shell construction and tolerances.

Type of ply joints - butt or scarf? Butt on shells, Scarf on reinforcing/sound rings
Difference between interior and exterior ply material? Ext.- Solid rotary cut, Inner-flat sliced and joined

Grain direction of alternate plies? Long Grain/ Cross Grain, varies w/ number of total Plies

Allowable knots or voids in interior or exterior plies? Core gaps up to 1/16"
Shell thickness tolerance? +/- .040
Shell diameter tolerance? Approx. 1/8" undersize
Shell height tolerance? +/- .031
Shell roundness tolerance? Varies with thickness and diameter, usually 1/4" on sm. dia's, 3/4" on over 30" Dia's.

3) Dimensions of Purchased Snare Shell:
I was horrified to think that the shell I had on order was going to come in out of round by a quarter of an inch. I was also concerned that the shell height tolerance might imply that the bearing edges I was getting would not lie in a plane by a thirty-second of an inch.

So when I received the shell, I decided to measure it. I have access to a granite table and a height gage at work. One of the guys in our QC department helped me measure the shell during our lunch hour. Here are the measurements of a 6.5" x 14", 10 ply Keller maple snare shell in its free state:

Bearing edge, batter side - flat/planer within .003 inch (amazingly good)
Bearing edge, resonant side - flat/planer within .005 inch (exceptionally good)
Parallelism, bearing edges - within .008 inch (also exceptionally good)
Snare bed depth 1 - .071 (~2" wide w/o ramps, ~5" wide with ramps)

Snare bed depth 2 - .078 (~2" wide w/o ramps, ~5" wide with ramps)
Shell thickness - average .258 (.018 under nominal, but within tolerance)
Shell height - average 6.488 (.012 under nominal, well within tolerance)
Shell diameter - average 13.853 (.1475 undersize, smaller than I'd hoped)
Shell roundness - from 13.834 to 13.870 (.036 variation, again exceptionally good)
Inner ply gap - around .045 (kind of big, poorly filled, not good looking)
Outer ply gap - essentially 0 (looks very good)
Interior ply gaps - around .045 (all filled, none look too bad)

4) Conclusions:
Overall, I was very pleased with my first Keller maple shell. The bearing edges are a double 45, with 3 plies outside, the bearing edge on the 4th ply, and 6 plies inside. The bearing edges are very nicely finished and they continue smoothly through the snare beds.

Based on some of the snare bed discussions I've seen, this is a fairly shallow bed. It seems to be wide enough for my 24 strand Grovers, and the ramps are very smooth and gradual. I think it will be easy to tune, but I wonder if it is wide/deep enough to avoid buzzing/rattling. It is sure smaller than the ones Vaughn has been cutting! I figure I'll put it together and try it out – if I don't like the snare response, I'll try deepening and/or widening the beds.

I don't like the looks of the crappy fill on the inner ply gap, and I'm afraid it will look bad on the finished drum. However, I know I have some options to improve this.
One of my main concerns is the undersize of the drum O.D. At an average of 13.853" (more than 1/8" undersize) a 14" head slops around a great deal. I wonder what your experiences are? Will the head tend to center itself okay? I don't plan to use a wrap, but a natural tung oil finish - I suppose I may need thicker gaskets under the lugs than I had originally thought.

How To Add Plys

20, 30 Multi-Ply, 2 to 1 shells, Shell Stuffing, OCDP Style Vented Shells

The basic process is simple in theory. You take one shell and cut it down to fit snug inside another and then glue them together. There's a very scientific formula that uses Pi to find the exact measurements. Don't bother!

Use a tape measure; the kind used by a seamstress. Simply measure the outer diameter of what will be the inner shell, and the inner diameter of what will be the outer shell. The difference between the two is what you will cut out off of the inner shell. It's usually very little so don't be fooled if it seems like it is not enough. MEASURE TWICE, CUT ONCE. You can always cut more if it doesn't sit right. Cutting too much will ruin the project.

Many have commented about what kind of joint to use when cutting the shells. I usually use a butt joint with 45-degree edges at the seams. Some folks recommend a scarf joint. I was told by the guy at Anderson International Trading that OCDP and Pork Pie use a butt joint. I called OCDP and asked about it and the gentleman said, "We just stuff them inside each other, Dude."

Once they're cut and fit snug inside one another you are ready for the glue. I used Gorrila Glue; some say Titebond, other say Elmer's. It's up to you. Glue the inside of the outer shell and the outside of the inner shell. Then slide them inside one another. Wipe any glue that squeezes out. It's very handy to keep two square pieces of plywood around at this point. You can use the wood to sandwich the shells by the bearing edge to make sure they sit flush. Remove the plywood before the glue dries. Use as many clamps as you can to press the shells together while the glue sets up. I have yet to discover another practical way of doing this part.

Once it's dry, sand off any glue residue. Cut your edges and make your beds. Here are some pics of a 5.5x12 18-ply shell I made from 3 6-ply shells using the above method:

Quick Questions

Hey when you say to cut the difference...will the number you divide by two come out to a # that is for example 1" so you cut a 1" section out of the inner shell??? And also, how do you cut that section out?? I hope you understand what I'm saying...but your reply helped out ALOT!!! thank you very much zilpex!!!

The way I do it is just measure 1" from that inside seam and cut that piece out on a table saw.

Diameters

When a drum is 12" or 13" in diameter, are we talking Inside, Outside, or the Center of the ply? This is my first time making drums...

The inches refer to the outer diameter of the drum. As far as that aircraft supply store, I wouldn't recommend building a drum that thin, or building it out of plywood. I'm building a drumset now out of six-ply maple shells (about 1/4" thick).

13" is NOT the outside diameter of the shell. Usually it is the diameter of the hoop. Shells typically have an undersized outside diameter by about 1/8 to 1/4 inch.

TJ

Is a 14" snare shell EXACTLY 14"?

Will somebody please measure their 14" snare drum shell (outside edge to outside edge) to see if it is, in fact, exactly 14"?

My brother works in a plastics fabrication shop, in Fresno. He's willing to build me a clear acrylic shell, but I need to tell him EXACTLY how big in diameter it needs to be.

I've already sent him pics, and a drawing describing how to cut the snare beds.

I just don't want him to go through all that trouble, only to find out that I can't fit standard heads or hoops onto it!

Re: Is a 14" snare shell EXACTLY 14"?

---

14 inches is the inside of the head hoop. The shell is usually about an 1/8 inch under (13 7/8 inches).
Lou.

shell sizes

Most shells are undersized 1/8". So a 14" is actually 13 7/8". Some make their drums even 3/16 - 1/4" smaller so the heads really sit easily, off the curve in their shape. You just need to add some spacing material under the lugs so the rods hit the lug nuts correctly.

Ray

Re: Ray F

Ray F, you mentioned some companies' shells are Undersized. Could you Name the companies AND give the sizes, if you know them. (Please).
I read that Premier and DW are slightly undersized.

Rob (UK).

Re: Ray F

Premier has a line of shells that are 1/4" undersized. DW makes theirs about the same as Keller and in some instances use Keller's. Their shells are 1/8" undersized. Jasper shells are 1/16" undersized. The inside of a flesh hoop is most generally right on size within a tolerance range. I'm not sure exactly what the range is but I have noticed a difference in head fit from one drumhead manufacturer to another on the same drum. I have yet to find a head that is exactly round. I guess I should say at least within .010. I have seen them as far out as .032. An example of this is an Attack coated on a snare and a Remo coated on the same snare shell. The Remo had more clearance than did the Attack. Neither were exactly round. I have never seen wooden shell exactly round either. Not sure why I got off on this other stuff but so be it.

JDW

Shells

Kirk;
FYI-
The brass shells form Andy here at DSH are exactly 14" in diameter. I don't know if that

applies to other metal shells.
TL

Undersized shells

Sonor shells are 1/4" undersized and I think Dunnett too. Great drums anyway.
\www.dunnett.com">www.dunnett.com
Mic

Plys? Wood?

But I'm confused, you suggest not using plywood, but isn't that the material used to layer to get your 6-ply maple shells? Did you build the shells yourself, or buy them?

I figured using thinner stock and layering it to reach the 1/4" thickness. 1/16" ply is much easier to bend than 1/8"...and I'm planning to use quality birch ply.

Look forward to your answer.

I use a birch ply that is made to bend, it's 1/8 thick and I do two plys, granted I'm only making shells for Electronic drums, Im not concerned with the sound of the shell. If I was to make acoustics, I think the birch would be great, as would your ply wood, once you glue it you get A nice sturdy shell, besides look at the crapo the big guys use for their entry-level sets, it looks like old chopped up school rulers and pencils.. Keller uses a maple ply and layers it to get the right thickness, if it's too thick the wood will snap when you bend it. Just do layers and use a good glue, try one at first and go from there.
Good-luck!
-Zacker-

You will be making a plywood shell. When you glue thin plys of wood together regardless of the type of wood, it then becomes plywood. Birch plys should make a great shell providing you can bend and glue everything together. That's the hard part from what I understand.

I've heard you can train wood fibers by bending them for some time (even with some steam). Doing this before the glue up should help with maintaining the shape.

As far as true diameter, I guess I'll have to head down to the drum shop with my measuring tape.

Shell Jig

You need something in the center of the shell to bend the wood around, I use a PVC coupling machined down to the right od, then I glue and clamp my shells and let them

dry for a few hours. This works great! I use a good glue and strong clamping helps. A strap clamp is probably the best for this, although I have used radiator hose clamps linked together for size and they work good too. Home depot sells 6" hose clamps so you'll need a few to get the right size though.
-Zacker-

Re Shell size: About 1/8 under the stated size as the OD of the shell will get you there. Every one said it a bit different, but every one who replied knows what they are talking about and said about the same thing. 1/8 under is what Keller does on theirs.
Lou.

Jig

Lou, if your doing the shell your making 12" I got the jig, if you need it holler back and you can use it. I'm not ready for it yet and its gonna be some time before I am. Also if you want one of your own, I got an extra piece you just have to get it turned down at a machine shop. Probably cost you a case of brewskies though, unless someone here can help you out? E-mail me and let me know,
C-ya bro!
-Zacker-

ANY Info

Yeah Zacker, post your pics, I'd love to see 'em. If any one's got more info on making shells please post it. Specifically types of timbers to use (or not). I'm in Australia so ideally I'd like to use local hard woods, does any one know about the suitability of our timbers?. Thanks, Johan.

Re: ANY Info

Hi Johan:
For using your local hard wood you may want to do searches on Stave Drums, and consider that as an approach. I know you have been around this board enough to have seen a bunch of examples.
The wood you use will depend a lot on the sound you want. You are not actually limited to hardwood either (note Ray F's Pine snare). Do some checking on what wood was used by the Native population in drums as a place to start.

Using Zackers technique you will need something bendable. Zacker uses 2 pieces of Bending Birch plywood, the stuff bends very nicely.

Lou

Re: Woods

Johan - It would be a blast if you had access to a bowl lathe and made some one-piece log shells from your indigenous hardwoods. Cost a fortune though unless you own a woodlot. Ed <><

Re: Woods

Ed, do you know about Spirit Drum Co.? They are based in
Far North Queensland, (about 3000 km north from me, I'm in Melbourne) and they turn

entire kits from 1 log of 'Iron-bark', have a look at their website, the drums look sensational and apparently sound awesome too.
www.spiritdrums.com/snare/beat.html

Lou, I've seen Ray's snares and was impressed, you're all absolutely correct - the man's a craftsman all right. I might look further into stave drums but I'm really interested in forming my own ply shells - for a unique instrument. I came across a guy in the UK called 'Jalapeno Drums' (cool name huh?) who makes his shells from scratch using Finnish Birch, but he wasn't willing to share too much info with me, said he had to protect his livelihood, fair enough I suppose. He makes some damn nice drums too - worth a look.
www.jalapenodrums.co.uk

Re: Woods

They do look nice at that.
Ya should swap info with Zacker. He has worked hard at the from plys aspect of shell building.
Lou.

Re: Spirit

I'm familiar with Spirit, the key word there was "close". Zacker is Da Man on bending plies.

Re: Spirit

Close as in indigenous?? You've lost me a bit there.

Yo.

Re JDW

Thanks JDW. Rob (UK).

Stave data sheet

This data sheet assumes that 3 of the variables involved will be constant and unchanged, which is what I have found to occur naturally in stave shell construction anyway.

1) The outer surface machined depth really should be kept to the absolute minimum, which is set at 0.120" (just under 1/8th")

2) The number of staves isn't up for negotiation. That number is, or should be, predetermined by the number of lugs. I have drawn 2 stave details for shell sizes that typically can go more than 1 common lug configuration i.e. 14" shells can have either 8 or 10 lugs therefore you can either make 20 or 16 staves. Yes, you can make 40 or 32 or even 10 or 8 but that way of building staves is very unorthodox and doesn't utilize your material wisely so in essence there is only 2 logical ways to go.

3) The outer diameter must accommodate commonly available drum hardware components. Making the shell slightly larger or smaller than the industry standard will cause you problems later. The industry standard seems to be 1/8" under actual size i.e. a 14" shell is actually 13.875" or 13 7/8" in diameter.

Because the vast majority of builders will be using .750” stock, the drawing shoots for an approximate shell wall thickness of between .375” and .500”, which is obtainable for .750” stock. However, the wall thickness can be adjusted thinner or even thicker as per the discretion of the builder. Note: If an extremely thicker wall is desired, one may use the same stave width dimensions. Since the figures are “long point to long point” dimensions, the inner width of the stave is irrelevant.

Remember, it’s the outer diameter that must be achieved in order make the shell compatible with commonly available hardware components. The inner diameter can be adjusted as per desired effect.

Stave Specs Quick Reference Sheet			
Shell Size	Number of lugs	Width of stave	Bevel Angle
14”	10	2.2356”	9°
14”	8	2.8076”	11.25°
13”	8	2.6087”	11.25°
13”	6	3.5142”	15°
12”	8	2.3812”	11.25°
12”	6	3.2462”	15°
10”	6	2.7103”	15°

Chapter 7 – Drilling Your Shell

Drilling

Tape sheets of paper around the drum shell so you have a good surface to write on and don't have to worry about getting the marks back off when you're done. Obviously, you want the paper to be tight and firm against the shell. If there are any "landmarks" where you want the snare strainer, snare butt, badge, or which side you want on the top or bottom, note it either inside the shell or mark the paper as soon as you can.

Pick an origin.

Take a tailor's tape measure and measure the circumference of the drum.

Divide by the number of lugs.

Measure them out and mark their locations - write lightly with a sharp pencil, you'll be making multiple adjustments.

You now have a rough idea where the lugs go.

Take a square and get the vertical lines for the lugs going.

With the tape measure adjacent lines from one edge of the drum/lug-line to the other, making virtual X's around the drum shell. Your goal is to get "cross" of the "X" equal to every other one (all 20 on a 10 lug drum). This will ensure that your lines are equidistant, parallel to each other and perpendicular to the shell.

Work around and around, adjusting until they are as close as you want them to be. I

doubt you'll ever get them perfectly even, but within a half a millimeter is fairly easily achievable (with time and patience) and pretty darn close.

This is the hardest part.

If you have a snare strainer and butt, similar marking will get them in place (and they are more "forgiving").

Mark where your vents are going while you're at it.

If you're marking out a snare bed, you might as well mark it now.

You'll be making similar X's around the drum to mark your positions where the holes for the lugs go vertically on the lines you've drawn out. Always double and triple check your work.

Are the crosses of the X's equal length?

Are you centered on the drum vertically?

Is the distance what you expected it to be between the holes for the lug?

Are you sure that the lugs are even with each other?

Eyeball things with the hoop, if you can.

The actual drilling is almost anti-climatic - in a good way.

A little masking tape behind where the drill will go through the shell will help prevent splintering on the inside of the shell.

Support the shell with a 2x4.

Use a drill press.

Use a brad-point bit.

With the drill not spinning, bring the bit to the position marked out, press the point in where you want it, hold it there and engage the drill. Go slowly through to avoid splintering the inside of the shell.

Good luck.

KO

Quick and Easy Lug Layout:

Probably one of the most intimidating and confusing steps in the drum building process, (other than spraying a finish), for a new drum builder is lug and hardware layout for drilling.

I would like to share with you a method that I have used that makes this process relatively quick and painless.

A lot of builders set up the layout as one of the last steps...after the shell's finish is completed. With my method, layout is one of, if not, the very first steps.

Some builders make and use drilling templates out of Mylar or Plexiglas, and these work great. But I believe that they are geared more towards someone making a lot of the same type drum...such as snare drums. They are also practical for the builder making a lot of kits.

My method seems, at least to me, to be more practical for the new builder wishing to build a single kit for him/herself for now.

Some may ask...how can you properly finish a shell that is already laid out for drilling? You can't stain or spray over holes or pencil marks, as they would by covered by the stain or dye. This will be explained later.

The first step is to figure where on the shell the lugs will go. Regardless of how many lugs you use...they have to be spaced equa-distant from each other around the shell. The best, and in my opinion, the most accurate method is to figure out a shell's circumference and divide by the number of lugs. You can do this with a flexible tape or by multiplying the EXACT diameter by 3.14. When I say...exact diameter, I mean take the time and measure it exactly. Just because you ordered a 12" shell does not mean that it is exactly 12" across. Most drum shells (the good ones anyway) are made undersized. This to allow the drumhead to 'float' on the edge. As such...a 12" shell is probably more like 11 7/8 or 11 3/4 or something. By multiplying this exact number by 3.14 you will come up with the circumference. I personally, use a top of the line Taylor’s measuring tape. These can be found at fabric and sewing stores.

Now, divide the number of lugs that you plan to use on this shell into the shell's circumference. This will give you the proper spacing around the shell for each lug. Measure and mark the shell as carefully and precisely as you can...modern counter hoops allow for some play in lug placement, but this can be unsightly and affect tuning.

Once the lug increments are figured out and marked on the shell...you need to scribe a straight line at these marks that run the entire length of the shell. To do this, you will need a long "T" square. At least as long as or longer than the shell itself. Place the shell at the edge of a table so that the drum over hangs the edge. Rest the "T" squarely and level at the top edge of the shell so that the straight edge is lined up with the lug marks. Now with a sharp pencil, scribe a line at each mark the entire length of the shell...from edge to edge. Now, you should have a shell with 6, 8 or whatever lines up and down, from edge to edge all the way around the shell.

Now... take a small strip of masking tape and mark two lines on it that are the exact distance of your lug's mounting holes...center to center. Place this piece of tape along the edge of the "T" square with the top mark the exact distance from the "T" that you want the top hole of the lug to be from the top edge of the shell. Place the "T" back on the top edge of your shell...make sure that it is level and flush against the shell's edge. Line the straight edge up with your lug lines and where the marks on the tape meet the line on the shell...make a small intersecting line. This is where you will drill the mount holes for the lugs. The "T" square, in effect, becomes your

template. Do this all the way around the shell at every line.. Then flip the shell over and do the same from the other edge.

After the shell is marked all the way around, top and bottom...pick two lug lines and measure the distance between them. Divide this in half and scribe another full-length line down the shell as before. Your vent will be placed along this line at some point. I like to place vents in line or at the same 'node' as the lugs. This way...you can hide the vent with an Iso-Mount bracket. Some drums have them in the middle of the shell...it will be up to you. Actually, the vent can be anywhere on the shell, but they look better symmetrically spaced between two lug lines...regardless of how far up on the shell you want it. Incidentally, vents can be hidden by snare strainers, Iso-mounts or even on the bottom of bass drums...I personally do not mind the look of a nice vent grommet (keyword-"nice").

As for tom mounts...you could do the same thing. Divide the space between two lugs but most builders opt for some type of Iso-mount system these days (R.I.M.S., Opti, Starcast, etc). They save the trouble of drilling the shell and the acoustic improvements are well worth it.

As for bass drum spurs...it depends on the type you want to use (length, etc). A good guideline would be to locate them about 1/3 the distance back from the front head as the drum sits on the ground in its playing position. And, depending on length of the spur, about 1/3 up from the ground.. or just below the halfway point of the shell. Most of these come with gaskets that you can use for marking the holes.

Once all of the spots are marked for the hardware you are ready for the next step.

You will need an awl; a drill and a small bit...about 1/3 or 1/4 the size that the final drilling bit will be. Drilling holes for lugs in drum shells should be done with a drill press...it is very important that holes be drilled as straight as possible. However, for this step a hand held drill will work fine.
At each marked intersection or "X"...carefully make a small indentation by pushing in the awl, this will help start and guide the drill bit. Drill a small, SHALLOW "dimple". Only go through about one or two plys of wood. These dimples are simply marks and must be shallow for reasons that I will explain later. After you drill a 'dimple at each "X"...go ahead and erase the pencil lines. Now sand the shell to its final smoothness and then go on to the coloring stages...with dye or stain. The reason you want the dimples shallow is so that stain/dye will not pool up in them and run out as you rotate the shell. The reason we don't just stop with the awl marks is that the sanding process can deteriorate them.

After staining...apply your final finish coats. Spray on your lacquer, poly, whatever. Or use a nice hand rubbed oil (my favorite). After everything sets up and is dry...go ahead and drill at each dimple WITH A DRILL PRESS. You do not want any slop or play in the lug mounting as this can affect tuning and resonance. Bit size is also important. Practice on scrap wood until you get the bit that gives the tightest fit on the lug's mounting nipple (can I use the word "nipple" on this site...I guess so). It is even better to go a little smaller if you have to and finish off with a rat-tail file. You want a very snug fit.

Don't forget to wax the insides of all the drilled holes you made. This for moisture protection and to set the lugs nicely into the shell. DO NOT tighten down the lug mounting screws too tightly...as this can damage the shell and inhibit vibration. A

good snug tension is all that is needed. The tight fit in the hole coupled with the drum tension will help to secure them.

Well...there you have it. I hope this will help to get some of the new builders past this seemingly difficult step in the building process.

Always remember...safety first. Give yourself plenty of time and space...and as always, GOOD LUCK.
bubo.

Lug Layout

This is the less than mathematical procedure I have used, but it has worked for me. It can be done before or after finishing. If you have a good "eye" for layout, it's pretty simple and works well.

Just take a head and hoop and lay it on the shell, paying attention to where the "ears" of the hoop are lining up with your back seam, and grain patterns. It allows you to put lugs in the best possible places (covering flaws, or utilizing best grain patterns.

Once you have determined where you want your lugs, take some masking tape and tape the rim to the shell just so it doesn't move around.

Next just get a very thin plastic ruler. Put the drum at eye level. Premark your ruler with a general center of lug placement. Take the ruler and place it against the shell and slide it up under the head making sure its edge is flat against the head (nice and vertical). Eyeball the edge of the ruler with the center of your hole on the hoop. Place a tiny mark where the lug will go on a vertical plane. Once you have done that, remove the head and hoop and flip the shell. Repeat alignment process. If you aren't very good at "eyeballing" you can take a piece of masking tape and affix it to the ruler so a "branch" comes off the ruler, giving you exact center of hole placement when you match things up. Foolproof.

Next you need to make the placement for the actual lug stem holes. I use a Carpenter's Square. For those who don't have one, it looks like a pistol. It has a steel ruler with a channel to allow it to slide through a fixture that looks like a handle on a gun. It has a bubble level in it.

I use a piece of masking tape on the ruler (both sides of the shell if it's already finished). I take the lug and put it against the ruler, marking exactly where the center of the holes are on the lug. Then, once I determine where to put the lugs, I just slide the ruler where I need it, place it on the shell, square on the bearing edge, find my vertical alignment mark and make the marks for the lug holes.

I do use a drill (I don't have a press) for making holes. I get a piece of closet pole and hold it behind the drilling mark, so when the bit comes through, no shattering takes place on the inside ply. I use Bradpoint bits, too.

As far as snugness of fit. I have my own experience on that one. I attempt to make

things snug, but in the past, because lugs have had very tight snugness, I have broken lug stems from the stresses of playing (and I don't play very hard). It may be do to casting deficiencies in the lugs, but I have done it more than once. So, if the lugs fit very tight, I will open them up a touch with a rat-tail file. I want the lugs to slip in, not have to be forced in. I'd rather they breathe than be squeezed.

That's it. I use my same plastic ruler, or seamstress tape, to find center between lugs for strainer layout on snare drums. I place some masking tape where the holes will be, press the strainer into the tape and the hole impressions are left behind. Then I just mark hole centers with an awl, making sure the holes are level with the bearing edge, and drill. The same process works for bass drum spurs, which can fall in different spots below or above lugs depending on bass size and how far you want your bass to be able to tilt toward you.

My memory is shot. Was this already mentioned? I take the bass shell and lay it on the floor, up against a wall or door. Then I take a spur and see where it can fit to touch the wall or door and leave a good 2-3" inches of space between the shell and the wall/door. If a collision with lug placement takes place, I have to compromise. But generally you'll end up on top of that lug somewhere with today's manufactured spurs on a 22" or 24" bass.

As I mentioned elsewhere, I don't use vents, but if I did, I would place them behind a mounting plate, as was mentioned, or in the back of the drum towards the bottom, so as much air compression as possible reaches the resonant head before escaping the shell.

Once, I burned into the shell a maple leaf pattern. Then I drilled tiny holes at the tip of each point in the leaf, so the equivalent venting of a 3/8" - 1/2" hole was approximated. You get the venting and something nice to look at the same time. If you are a wood burner, almost any pattern could be utilized for the same purpose.

I am not a nametag type person. I don't like logos on cymbals either. But if you are going to use nameplates and vent holes, get the vent grommets that screw together. Hammering over the inside edge of the typical vent grommet is touchy business.

Ray

By the way the tube lugs along with most of the lugs from Drummaker are metric M4 size with 0.70 pitch thread. Metric threads measurements are the measure in millimeters between threads. M4 0.7 pitch

More Lug Layout

Well-explained Ray. As I have mentioned before on this forum I use Mylar templates for everything. Even if it's for one single drum that would have a lug that I haven't used before. I would agree with both you and Bubo that making the 1st drum for a newbie may not want to go to the trouble of making Mylars. Especially if he's not going to do another drum. I have the benefit of working on a CAD system and access to an engineering plotter and the initial layout has been on file for many years so to add a new one is just the matter of changing the lug pilot centers and maybe a strainer layout. That may only take 3-5 minutes so it's a real breeze. I think you both have an excellent way of doing yours and I really like the way Bubo dimples his

layouts on the drum. I like that tip you have Ray of using a wall or door for laying out spurs. Why didn't I think of either of these? haha. I have often thought of contacting Andy and seeing if he would be interested in making copies of the Mylars I have on just plain paper and enclose them in an order if requested by a customer for his cost for paper and time. Not sure if that would work as accurate as Mylars because of heat and humidity but it may be worth a try. Gee if it were off .010-.020 I don't think that's too much. I can add that you two gents certainly are pros at this drum building. Hats off to you both!!!

Just my pennies worth guys..

Jerry

Drilling For Lugs

Another option would be:

calculate the distance between lugs (already described)
(dia. * Pi) / #lugs

Get a vernier. (I think this is what it is called) It looks like a compass with 2 points on the end.

Set the vernier span = distance, then "walk" it around the drum. Adjust the span accordingly, until you end at the exact same point as the start point. Mark and drill accordingly.

You will need to ensure that you maintain a horizontal straight line as you walk the verneir around the shell, or this could cause errors.

Finish Then Drill the Vent Holes

Finish the drum THEN cut your vents. If not, all the finishing products will run inside the shell. Trust me, I know from experience.

Wax?

Bubo, you said that after drilling the lugholes one should put wax in for sound reasons, right? Well what kind of wax do you recommend? Thanks!
Chris

More Wax?

Jesus Rocks,
It's mostly for moisture protection reasons...but it also allows the mounting nub (nipple) of the lugs to install easily and 'seat' properly. Min-Wax has a finishing paste-wax that I use. It is a fine furniture grade wax and applies nicely. Use a Q-tip to get it in the hole. Then run a cotton shoelace through the hole and, with both hands, rub back and forth briskly. This will heat the wax and actually 'burnish' it to the surface of the inside of the cut (drilled) hole. This same wax is great for waxing bearing edges also.
bubo.

Chapter 8 – Tuning Techniques

The Way I Tune My Drums

Hi, here is one easy way to tune your drums, I've been using this method for a while now and find I get great sounding drums from it, in not a whole lot of time. You first start by taking the old head off (if you are putting new heads on, if you are just tuning the drums, you can loosen the tension rods until you don't need a key to turn them, instead) and placing the new head on. Put the hoop on then one by one I put a tension rod in and tighten it with my fingers until I need a tuning key to tighten it further. Then I go to the rod across from it, do the same, and so on in a clockwise direction (not that it makes much of a difference). Then I go around with my key and do 1/4 turns one by one clockwise. Usually end up doing about 1-1 1/2 whole turns to where I get a good sound, but it does depend on the drum. I am sure this is much less intricate than some guys, but it is what works for me. Hope this helps.
Drew

Little Different

I kinda do the same thing, sometimes because of the seating of the head it is better to go in a star pattern; but I hate that so I made a compromise :o) I go in a clockwise pattern starting with the first lug skipping one then going to the next one always ending on the one just before the one I started on and repeating.
Just thought I would put in my $.oooooo2 in ;)

Finding a Drums Pitch

Support the shell on a couple fingers in the approximate center of the shell, hit it lightly with a closed fist on the side of the shell. The shell will resonate. You'll hear the tone of the shell. Match this with ..say a piano note. A, G, F etc.
this gives you the fundamental note of the shell. This will be high or low. Once you build the drum this will play a factor, like Saturn said.
To me, it is not possible to have a high-pitched drum if you have a shell with a low fundamental note. You can play with the sound with different heads and tensions, but it will in essence still be high or low due to shell size, thickness, depth, and construction.
Patrick

Chapter 9 – Finishing Your Drum

Sheet Veneers

I will let users of regular "flitch" veneers explain their process from start to finish. I have used sheet veneers; from Oakwood veneer company, with great success. Sheet veneers are generally 4x8, 5x10, even 12' long. They come in a wide range of wood types. The fancier, the more expensive; Red Oak going for $1.89 a square foot, up to almost $16 for Tamo Ash (the veneer covering Terry Bozzio's drums). Seam lines are extremely tight, and on some grains, unnoticeable.

Oakwood offers a bubble free veneer, which is guaranteed not to bubble on you, as long as it is applied correctly. Any common sheet material glue should work well for you, Contact Cement being the most common. Fumes can be rough, so I have used the water-based cement.

First I figure out the necessary square inches on each shell by determining circumference: shell diameter x3.141592, which is known as "Pi." Then multiplying shell depth by circumference. An 8x12 shell would have a circumference of 37.699" x 8= 301.592.

Find out the square inches for each drum. Then add it all up. A 4x8 sheet has 4,608 sq." You now know if you are in the ballpark. But, you have to take into consideration the exact path each cut of veneer will take from the sheet, so get some quadrant paper at the drug store and lay out the equivalent of a 4x8 sheet on your pad and begin laying out each piece for each drum.

Now you need to decide if you want the grains wrapping around your shell lengthwise, as most drums do, OR up and down the way a tree grows, which is my preferred way, mainly because the wood wants to bend that way very naturally. I also like the look. If you want the grains running lengthwise, mark it out that way on your pad. Start with the largest pieces, obviously, and see where smaller pieces can then fit in.

you can cut sheet veneer with scissors quite easily. Draw lines with any metal yardstick, and even place a slight scoring line in the veneer with any very sharp utility knife. Just be careful with those razor sharp edges.

Once you have cut out your pieces of veneer, scribe a line on your shell as a starting place. Do not assume the shell seam is perfectly square. It may not be. You can then put your glue on both the shell and the veneer. Wait the recommended length of time for tacking up, or, like in my case where I want some room for movement of the veneer once it's on the shell, apply it just before it fully tacks up. You can use dowels between the two surfaces to keep them apart as you go along. You can hang your shell off an arm of some kind, or use the boom on a cymbal stand, or place the shell on a flat surface and line up your piece against the drum that way.

Go slowly, making sure you start square. Generally speaking, once the two surfaces touch they bond. That's why I like things just a bit wet.

You can expect the glue to take up just enough room on the shell, believe it or not, to leave a gap when you come around to the end, so leave extra in your cut, and make a final cut at the end of the application.

You can do this a couple of ways. One is to place the lap over the other surface (protecting the lower with wax paper), and slice it with your Exacto knife. Pull the two

pieces away and they should seam nicely.

The other way is to mark where the lower piece lies on your lap, draw a line and just cut with scissors. This is if you do not want a lap, but you could; for all intents and purposes; just leave an inch lap, like many do apply regular drum laps. With grains running up and down on the shell, they become almost invisible.

If you choose to wrap the veneer lengthwise around the shell, clamping may be necessary on smaller drums where you are asking the material to make a tighter turn around the shell.

When the veneer is on, use a "J" roller to "marry" the two surfaces. If you get a hold of a vacuum press, or other such tool, that makes it the easier. Generally, the hobbies will not have such expensive tools, so the roller will suffice. Get out any air bubbles. You'll hear the pooping as you go along.

Should you have a bubble that will not press out, because of improper placement on the shell, you can do a couple of things. You might put a pinhole in the veneer and let any air out and press again. Or, in a more drastic case, as I have encountered, you may make a razor cut along a grain line, taking out a tiny slice of the veneer, and repress. If the wood is a "forgiving" bolder grain, such cuts can be almost invisible. On a less bold, or tighter grain, great care must be exercised in that cut. Be careful when sanding it. Veneers can be extremely thin. You could sand through one before you know it.

Working with regular flitch veneers is an art in itself, because of the very delicate nature of the wood flitches, the necessity to seam wider drums you, and the sometimes necessity to have a backing material applied first, lest bubbling, or seepage of glue to the surface takes place.

Ray