Fritz Wilhelm, LLC

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Tentbuilding - Selecting Materials

Introduction

To build a tent you need a number of materials. This will be a discussion of these materials, what to look for, and where to get it. First off, just let me say, **Get good materials**.

You are going to spend somewhere between 40 and 100 hours building your tent. This is a lot less than building a house,but it's still a major project. Even if you paid yourself minimum wage the labor is going to be the majority of the cost. This doesn't mean you need to get the absolute be-all and end-all, gold plated, super best stuff you can find and cost be damned. It does mean that this is not the place to get cheap. Buy good materials and your tent will keep you warm and dry for years.

Canvas

Don't skimp on your canvas. I don't know how many times I've talked to someone who built their own tent out of some stuff they got at Wal-mart, (or Jo Ann's or whereever) for only $2 a yard or something like that. I ask them, "So how did that work for you?". "Oh, it's great", they reply. "You know, it mists inside if it rains hard, but that's to be expected.".

This appalls me. If stuff inside my tent is getting wet, the guy next door better be done building his ark because I'm packing up and hitching a ride. I don't like beds that go squish and I won't carry poly-tarps to cover everything inside my beautiful period pavilion when it rains. Suffice it to say, good canvas may cost a bit more, but a dry bed is priceless.

To be fair, I have seen, or rather felt, very light misting, with good 10 oz cotton duck, when it was raining so hard that I had to yell to be heard by the person standing next to me in the tent. Even then, however, the misting was so light that is was felt more as a humidity in the air and nothing was actually getting wet.

So, what do you want? Linen and Hemp are prohibitively expensive ($25+/yard), Cotton is probably not as authentic for Western Europe (perfect for Turkey, India & parts of Central Asia), but has a reasonably accurate look and feel, and a reasonable price. Synthetics like Nylon or Polyester are very strong, but look like plastic, are expensive, and are not naturally water-resistant (they require a coating because the fibers don't swell when wet). For truly authentic gers and beduin tents, wool felt is the way to go, but it's very pricey and in our rainy climates (compared to where these tents come from) probably not that great.

Waterproof?

Waterproof materials, such as vinyl or rubberized canvas, might seem like the perfect choice for a tent; they are not.. This is because they don't breath. Sweat and water vapor in your breath will make the interior of a waterproof tent terrifically humid, and can even condense on the inside of the roof and walls and make it rain inside the tent.

What you want is **water-resistant** material. Cotton canvas is naturally water-resistant, even before adding any additional treatments.

Cotton canvas makes a nice compromise, so let's go for that. For strength and water resistance we want a nice tight weave. For example, the 10.10 oz double fill duck I use is 54x42, meaning there are 54 warp threads per inch and 42 weft threads per inch. The tighness of the weave is more important for

water resistance than the finished weight of the fabric. Most resellers don't actually specify threadcount, so you'll have to guess, based on appearance (or ask for a sample).

In looking for fabric you may run into the terms Double-fill and Single-fill. In double-fill canvas, each thread is made from two yarns twisted together. This gives the thread a sort of screw-like shape. It's a complicated bit of 3-D geometry, but when you lay two screws together at a right angle (warp thread and weft thread) they each fit a little bit into the other one. This makes it possible to pack the threads much more tightly together than in single-fill fabric. Tightly packed threads is good for water-resistance and strength, so go for the double-fill.

Treated vs. Untreated?

I like Sunforger treated fabric for two reasons.

1. Mildew resistance. - Though it is not mildew proof, the treatment does at least help. It's nice, when you have to pack up in the rain, to know that your tent will at least last until you get home to hang it out to dry.
2. Preshrinking - Running 35 yards of heavy fabric through the wash is a pain in the butt. With Sunforger you don't have to.

For the maximum in authenticity, an untreated fabric would be better, but the difference in appearance is minimal, so I consider Sunforger treatment to be an acceptable comprimise.

Do not use treatments like Thompsons waterseal or bees wax. Not only are they unecessary on good canvas, but they also can create an extreme fire danger. Cotton canvas, by itself, is not overly flammable, but soak it in beeswax and you've just created a giant candle.

Flame Retardant?

In most states, weather or not to use flame retardant coatings is a matter personal choice (check with your state government). I will give you a bit of information on which to base your decision.

1. It's a coating: Other than certain exotic fibers like Nomex, a fabric must have something added to it to be flame retardant. This stuff will wear off over time, typically a few years.
2. Flame Retardant, Not FIREPROOF: If you apply flame it WILL burn. However, with the flame retardant, it will go out as soon as you remove the source of ignition.

What Weight?

The two most common weights for cotton canvas are **10 oz/sqyd** (or 10.10 or 10.38) and **13 oz/sqyd** (or 12.68 or something like that) There are also "numbered ducks" like #12 (11.5oz/sqyd) or #8 (18oz/sqyd).

I think that 10 oz is perfectly sufficient for most applications. It is nicely water-resistant, as long as the weave is tight and it is plenty strong for moderate sized tents (certainly up to 20 feet or so) Heavier canvas may last longer, but good 10 oz canvas should still last at least 10 years and well cared for tents can last 20 years or more.

Finally, heavier canvas is, well, heavier. Going from 10 oz to 13 oz fabric may add 20 to 30 pounds to your tent. This is weight you have load, unload, lift in the air, take back down, fold, load, and unload again every time you go to an event.

So... while 13 oz or heavier fabric has its place, I feel 10 oz is a sweet spot for most personal pavilions.

3. Adds weight: The coating increases the weight of cotton canvas by about 20%.
4. More difficult sewing: The coating increases friction on the needle so it is more difficult to sew. This isn't really a problem with an industrial sewing machine, but will give you some trouble on home machines. *(This is changing)*
5. Odor: The coating has a slight odor. It's not terrible, some people don't mind, others find it objectionable. It fades somewhat over time.
6. Waxy texture: The coating leaves a slightly waxy texture to the fabric. *(This is changing)*
7. Whiter Color: Flame retardant canvas is a bit whiter in color than standard undyed cotton. Some like this, others don't. *(This is changing)*
8. Health hazard? The chemicals used in fire retardancy for cotton have been linked to a broad range of health issues including cancer. I don't know what the additional risk is, or how long and how intimate the exposure needs to be to have an effect, but.. there may be some risk. *(This is changing?)*
9. Cost: Flame retardancy typically adds about $2/yard to the cost of the canvas.

So... what about those things that are *changing*? The EPA is phasing out the chemicals previously used in cotton fabric fire retardants. While this is to take effect by the end of 2013, some suppliers (mine included) have already switched to a new fire retardant chemical. I don't know if there are other possibilities out there, but the stuff my supplier uses has a nicer hand, no waxyness, and is easier to sew. Unfortunately, all the other statements still apply. (actually, I think it smells worse than the old stuff did) At this point, the industry is claiming that the new chemicals are safe. Perhaps they are.

Recommendations?... If you live in one of the states where it is required, get the flame retardant. If not, it's a personal choice. For reasons of liability, I should probably decline to make any specific recommendation. Speaking of which... All of the above information is true to the best of my knowledge and I am providing it here in good faith, but I do not accept liabilty if I got something wrong.

Where to buy canvas

For larger quantities (100 yard rolls), ITEX ((800)-525-7058) is a great source. If you are just making one tent (or for smaller projects), I sell cut yardage of the same 10.1 oz, 58", Sunforger canvas that I use. For prices check my price list. If you are interested contact me.

Thread

You want a heavy cotton-covered polyester thread. Pure cotton is not strong enough in weights that you can use on a sewing machine. Pure polyester or nylon has two problems. First, it's stronger and harder than the cotton yarns in the fabric. This means that, over time, the thread may cut the fabric. Second, synthetics won't swell when they get wet. Cotton swells and helps seal the hole that it is going through. Cotton wrapped poly is a good compromise.

So... what does "Heavy" mean? Thread Sizing is mind boggling. There are half a dozen different sizing schemes in use. Most manufacturers don't say what size their thread is and even if they do, often don't tell you what sizing scheme they are using, so you still don't know anything.

TEX

One recent attempt to standardize this mess has given us the sizing system known as TEX. The TEX number is the number of grams that 1000 meters of the thread weighs. This means that bigger numbers mean bigger thread.

Cotton Count

Another common system is the "Cotton Count" system. This refers to the number of 840 yard hanks of yarn in 1 pound. Small numbers mean big thread, the reverse of the TEX system. Also note that I said hanks of Yarn, not of thread. That means that if we say #12, we haven't actually defined the thread yet. We also need to say how many yarns make up the thread. Most thread has 2 yarns so often people say #12 when they mean 12/2.

By the way, 12/2 comes out to TEX-105 and is a pretty good size for making tents.

Where to buy thread

Where to get it is a bit tricky. The best thread that I've found available in retail is Coats & Clark "Button and Craft" thread ("Button and Carpet" in some locations). It is a three ply (three yarns) TEX-105 thread with a glacé finish (helps for hand sewing). The problem is that it only comes in 50 or 75 yard spools. Given that you are going to need 500+ yards to make a pavilion and most stores only carry 3-4 spools at a time, this can get old. If there is enough interest, I will look into some way of winding spools for sale from the large cones I use.

Webbing

You can make your own webbing for straps and stake loops and such by cutting strips of canvas about 2" wide. You roll this and top stitch it and you can get nice tough "webbing" about 1/2" wide. However, there are also sources for narrow loom products (another name for webbing). It's generally inexpensive and saves a lot of work over rolling your own. Also, webbing is period. Narrow looms were common household items as well as being used commercially and some, but not all, of the extant period tents used webbing extensively in their construction.

Where to buy webbing

I sell cut yardage of the webbing (check my price list).

Jas. Townsend (on the links page) also has a number of sizes of medium and heavy cotton webbing available by the yard. The 5/8" medium works well for ties, the 1" Heavy for stake loops, and the 1" medium for pretty much everything else.

Wood

Wood Selection

Ideally, you want a wood that is strong, flexible, and a at least close in appearance to a wood used in the period. Straight grain and freedom from knots are very important to both strength and flexibility.

Ash is, in my opinion, the best choice. It is strong, flexible (also used to make bows), and American white ash is similar in appearance and characteristics to European Ash, which was one of the premier woods used for weapon hafts and poles of all sorts.

Oak (white) is acceptable. It is stronger than ash, but not as flexible and is also denser. Red Oak is a new world wood. It is both weaker and less flexible than ash and its appearance is distinctly different to anything used in Europe during the middle ages. It might be justifiable for a late renaissance use as an import, but its other characteristics make it less desireable for our use anyway.

Pine is much weaker and nearly as expensive if you want it knot free (you do). Since you'd need to make the poles significantly thicker to make up for the weeker wood, you may well end up more expensive than ash (if you can find a good source for clear pine, this might not end up being true).

Poplar is reasonably priced, but still a lot weaker than "real" hardwoods and, personally, I think its coloration is rather ugly (if you paint your poles, likely the most period solution, then ugly grain won't matter). While poplar or “popple” wood is often mention in period texts, this refers to true poplar. The wood sold in the U.S. As poplar is more correctly known as “tulipwood” and bears very little resemblance to true poplar (which is more like cottonwood).

Construction materials, i.e. two by fours and the like, are cheap, but nearly impossible to find knot free, straight, and dry. I'd avoid these for pavilion purposes.

No Quarter Asked?

Hardwoods are generally sold as a certain number of “quarters” in thickness. You will see something like 4/4 or 8/4 listed as the thickness of the board. This is, in theory, the thickness in inches, of the board when it is rough cut (before planing smooth).

A 4/4 board is therefore 1 inch thick. Planing a board smooth takes about ¼ inch off, leading to the 3/4” thick boards you find in a hardware store.

However, the actual thickness you will find at a hardwood store may vary considerably. My supplier tends to run a bit high, so 8/4 boards can be as thick as 2¼”, but I will often see boards in the same stack varying by ¼” or more.

Depending on your supplier and the species of wood you use, you will probably find 8/4 to be good for center poles and ridge beams, 6/4 or 5/4 good for awnings and perimeter poles, and 4/4 good for spokes on round pavilions.

Where to buy wood

Most decent sized cities will have a hardwood store or woodworkers supply store with much better selection and prices than building supply stores (i.e. Home Depot). Locally, I can get ash for $2.50 to $3.00 per board foot.

Regardless of where you get it, make sure it was stored indoors. Dried wood does not stay dry for long if it's stored out in the rain and straight boards will not likely stay straight when they dry out.

Due to shipping costs, I would recommend investigating your local stores, but if you don't turn up anything, contact me and I'll do what I can.

Rope

What Fiber?

Your first choice is natural vs. synthetic fibers. Given that you are going to the trouble and expense to build a Period tent, I think we can discard the synthetic ropes right off the bat.

However, there are actually some pretty neat synthetic ropes made to look and feel like natural hemp (for use on classic sailing vessels) I have used the Hempex brand and it's a pretty decent look-alike for hemp. Its “hand”, or feel, is a bit slippery and knots don't hold quite as well (splices need at least two extra turns). The price for Hempex is comparable to hemp. Other synthetics, such as the nylon or polypropylene rope you can find at hardware stores are expensive, slippery, and very, very plastic looking, let's say no more about them.

For natural fibers, your choices are Cotton, Manila, Jute, Sisal, and Hemp (or silk if you have lots of money) Of these, probably hemp was commonly used in Renaissance Europe (add cotton if you go east to Turkey or south to Egypt). Additionally, Manila, Jute, and Sisal have hard fibers that can give you splinters (actually, there's nothing wrong with the fibers, it's just that the ropes made from these fibers are usually cheaply made and the fibers are not well processed).

Cotton clothesline is very cheap and strong enough for use as a set-up rope on a self-guying round pavilion. Manila, Jute, & Sisal rope are usually inexpensive are and often available at local hardware stores in sizes reasonable for guy lines. However, my favorite is hemp, for its nice hand, authentic look, good strength, and workability.

What Size?

For most tent purposes 6mm (1/4”) rope is plenty. 6mm hemp has a breaking strength of nearly 400 pounds. Cotton clothesline is still in the range of 200 lbs or so. For some reason, people feel like guy ropes need to be big. Most tents I see have 3/8” or even 1/2” ropes. For really large tents, larger ropes would be appropriate, but in my experience, this is just unecessary cost, weight, and bulk for the size tents we use for personal uses.

Where to buy

You can buy 6mm hemp or hempex from me (check my price list). Or, for more choices, try R&W Rope Warehouse (on the links page). The price ends up being comparable to buying Manila locally.

Steel

I use 1/2” round stock for top spikes on center-poles and 3/8” round for spikes on awnings and such. 3/8” square stock makes nice stakes in the 12” long range (go to 1/2” square for big stakes) Square tubing can make nice sleaves for pole splices, 14 gauge wall thickness is generally sufficient.

Where to buy

Most cities will have a steel supplier. This is probably your best bet for materials for spikes or for sleeves pole splices. If you can't find a steel supplier, see if you can find a welding supply store and ask them or ask around your local re-enactor groups to find a blacksmith.

If the steel yard doesn't want to sell small pieces of tube and you don't want to buy 20 feet, contact me and we can work something out.

Good Luck and Happy Tentbuilding,

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Proprietor