

TENT CONSTRUCTION I:

Materials and Seams

by William Martin

A tent is no better than the fabrics, poles, stitches and zippers it's made of.

The tent that you carry into the woods or to the top of that mountain is probably the largest, heaviest and most expensive single piece of gear in your pack. A good tent should keep you dry in storm, fog or mist, warm in the winter and cool in the heat of the sun. It should protect you from bats, beetles and black flies, and keep you secure from curious eyes.

The qualities you want in the tent are determined most by its construction—what it's made of and how well the job was done. Before you buy your next tent, you should familiarize yourself with the techniques and materials tent manufacturers have developed to achieve the best combination of desirable qualities.

The primary ingredient of your tent is its fabric. Before woven nylon was introduced after the second world war, backpackers' tents were made exclusively of canvas. Canvas (which can be any heavy, closely woven cloth of hemp, flax, tow, jute, cotton or linen) still has many advantages over nylon, although nylon usually is preferred in the United States because it is so much lighter.

Thread Count.

All tent fabrics are designated by the weight in ounces of one square yard before treatment with waterproofing or mildewproofing chemicals. More important than the weight of the fabric, though, is the thread count. This is the number of threads in one square inch of material. It's sometimes given as two numbers, such as 100 x 100, or it might simply be given as one number, say 250. When the thread count is given as one number it usually means that there is an equal number of threads in each direction.

The higher the thread count, the tighter the fabric will be. A tightly woven material repels rain and wind better than a loose one, requires less waterproofing and is more resistant to tearing and catching on sharp objects.

In addition to the weight of the ma-

terial, fabrics are also judged on the basis of porosity (how much air the fabric passes—its wind resistance), tear strength (the fabric's resistance to continued tearing once it has been ripped), abrasion resistance and water repellency.

COTTON

Cotton has many advantages as a tent material. All cotton fabrics shrink when wet, and this shrinkage allows the cotton threads to close up the small air holes between the threads, making the tent more waterproof. An untreated cotton fabric may shrink excessively the first time it gets wet, even to the extent of tearing apart seams and ripping tent pegs out of the ground. Waterproofed cotton does not shrink nearly so much, and all cottons have the advantage of being able to take and hold waterproofing chemicals.

Another advantage of cotton as a tent fabric is its ability to dispel condensation. When you're camping in hot, sticky weather and the mosquitoes are out for blood, a canvas tent's ability to absorb and pass moisture from the inside to the outside will be very welcome. In nylon tents, the moisture from your body is more likely to remain on the inside surface of the nylon, making the atmosphere inside feel a lot wetter. Good quality, properly waterproofed cotton will keep you as dry in a downpour as a coated tent fabric and probably a lot more comfortable. Cottons range in quality from Wyncol (Everest) fabric that is even more wind resistant than coated nylon, down to cheap fabrics whose waterproofing will wash out in the first rain.

Sizing.

If you are looking for a quality cotton tent, beware of tents advertised as "fully sized." This means that the fabric has been dipped into a sizing bath (usually a thick paste made from such things as rice, potatoes or wheat) to "starch" the material and give it the appearance

of sturdiness. As likely as not, this sizing will wash out of your tent the first time it's rained on. The easiest way to test a material for excess sizing (a little sizing is usually necessary in the weaving) is to rub it vigorously between your hands. If a lot of powder comes off, the tent is probably not for you.

Combing.

Another point to look for in a quality cotton tent is combing. Fabrics that are advertised as merely "carded" have had only the foreign matter removed from them before being made into thread. Combed fabrics have had the short fibers removed as well. They are stronger and more durable than cottons woven from uncombed thread.

On the negative side, cotton's main disadvantages are its low tear strength in comparison to nylon, its greater weight, and its tendency to mildew or rot.

Mildew.

Although mildewproofing is available that will slow down the growth of mildew fungi, there is no way to ensure that your cotton tent will not rot except by giving it a good drying. Mildew forms in the creases of a tent that has been stored wet, so the best way to protect against mildew is to set up the tent to dry in the sun before storing it away for any length of time.

Despite its many advantages, cotton has been almost entirely displaced by nylon as the best all-around fabric for quality lightweight tents. The two major advantages of nylon are its great tear strength (durability) and its lightness.

NYLON

Nylon tent fabrics are available in several weaves. The two most common are called nylon taffeta (a flat-weave fabric that comes in several grades) and ripstop nylon (a nylon weave that has extra-heavy threads woven in at about one-quarter inch intervals to stop tears from running and to distribute the stress over a large area of the fabric). Ripstop nylon is the lighter of the two weaves, usually weighing about 1.9 ounces. Although it is less likely to tear than nylon taffeta, it is less abrasion resistant. Nylon taffeta

usually weighs between 2½ and 3½ ounces. When coated with polyurethane to make it waterproof, it can weigh as much as 6½ ounces, with a tear strength of up to 40 pounds (uncoated nylon has a tear strength of about 6 pounds). Coated nylons usually have a very low air porosity (a high wind resistance), though certain tightly woven cotton fabrics are equally good.

The primary disadvantages of nylon are: (1) it is not waterproof (no matter how tightly it is woven); (2) it will not take waterproofing treatments well; and (3) it is unpleasant to live with when condensation is a problem.

Waterproofing.

Since nylon fabrics are made from a continuous rodlike filament, even the most closely woven material will not be waterproof. Nylon does not expand when wet to fill the holes between the threads. Waterproofing chemicals are not absorbed by the threads as they are by cotton threads, so nylon fabrics must be coated with a polymer, polyurethane or vinyl coating to keep out the rains. This coating can crack or peel off, and enough weathering (on the order of two weeks) may call for a recoating job. On some heavy coated nylons, the vinyl coating material is applied to both surfaces. Although this double coating also doubles the weight of the fabric, it has the advantage of bonding right through the nylon weave.

Condensation.

When condensation is a problem, nylon tends to breathe somewhat less than cotton. Unless good ventilation is provided by screens and vents, nylon will drop more water down on the people inside than cotton, since none of the collected moisture is absorbed into the thread.

Fire.

Another disadvantage of nylon is its greater vulnerability to fire. There are times when even the hardest hiker will give in to the urge to do his cooking under a shelter. You won't perish in a roaring inferno, but letting the flame lick the walls of your ultralight nylon packtent would be a big mistake. You might find yourself sleeping curled around the trunk of a nearby tree.

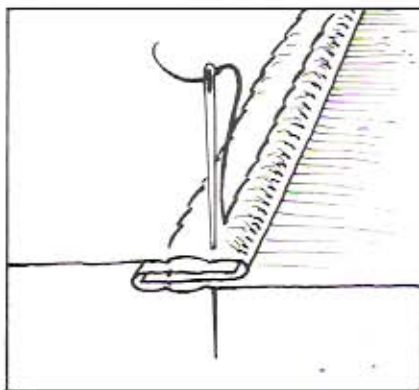
Seams.

Because nylon does not expand when wet, the stitch-holes are apt to leak when the weather is damp. To solve this problem, some tent manufacturers provide the customer with a small quantity of

seam sealant. It usually is a good idea to seal both sides of the seam. This protects the thread from the elements and allows the sealant to bond through the stitch-hole. Airplane glue or rubber cement also will do the job; a small bottle kept in your pack will fix any small leaks that spring up.

A good way to judge the quality of a tent is to take a close look at how the seams are sewn. Probably the best seam for tent construction is the flat fell seam. You can recognize it by the way the fab-

Cotton will keep you as dry in a downpour as coated nylon. But why carry the extra weight?



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ric edges are folded around each other before being sewn. There are no exposed rough edges, and the thread passes through four layers of material. A flat fell seam will withstand much more strain than a simple hem or flat seam, and its shinglelike construction sheds water when properly doped.

Stitching.

Check the stitching carefully, also. A well-constructed tent will have stitching that is evenly spaced and straight along the entire length of the seam. Some tents have 4 or 5 stitches per inch of seam, but a better quality tent will have as many as 8 or 10.

In general, the smaller the stitching, the better the seam, but watch out for excess needle-holes, dangling loose ends where the stitching stops and puckering along the seams. A puckering seam was sloppily sewn and is likely to weaken and leak. On some cheap tents, you may even see seams in which the stitching runs completely off the

edge of the fabric.

Most tents are sewn with a variation of the lock stitch, which will not pull out even if the thread is broken. Avoid the chainstitch, which should not be used in tent construction.

Thread.

Several kinds of thread can be used to sew tent seams. Most cotton threads are not strong enough to withstand the strain of a heavy wind. Nylon thread is the strongest, but it stretches a great deal and is difficult to use on a home sewing machine. Dacron thread, almost as strong as nylon, does not have the same elasticity and is somewhat more resistant to the elements. A good compromise natural-synthetic thread is Coats & Clark's Dual Duty Thread—a cotton exterior with a polyester core for strength. The cotton exterior swells when wet to fill the needle hole and will retain waterproofing very well.

Reinforcement.

Well-constructed tents should have reinforcements at points of stress—such as at the peg loops and where the grommets and straps are attached. Reinforcements spread the strain over a large area of tent fabric. Most tents are reinforced by a heavy hem sewn around the edge of the area to be strengthened.

A better reinforcement is made by sewing a separate piece of nylon to the tent, stitching it well and securing the strap or loop through the double thickness.

The strongest reinforcement is one in which strips of nylon webbing are sewn around the edges of the fabric to absorb the strain. As with all reinforcements, check to see that the stitching is uniform and even, with no stitches out of line. Displaced stitches will bear more than their share of the strain and are likely to start a rip in the fabric. Three-quarter-inch nylon tape also makes a fine reinforcement.

On cheaper tents, peg loops are sewn into a quarter inch hem along the edge of the tent floor. Loops attached in this way may someday pull free just when you need them most.

Zippers.

Another important tent detail is the zipper. Only large-size zippers should be used on heavy outdoor gear (sizes 5, 6 or 7). Some of these have strengths of up to 250 pounds across one inch of teeth. Nylon zippers, though somewhat less likely to freeze, are neither as durable or free-moving as quality die-cast

metal zippers.

Zippers are frequently sewn in such a way that the zipper is covered by a flap of fabric to protect it from freezing. Although this flap can sometimes be a help, it is equally likely not to be. Nylon zippers do a good job, but even they have been known to freeze up.

Poles.

A backpacking tent is a series of design compromises. One of them is the tent pole itself. Aluminum for poles, cross-pieces and wands is sold in various sizes and qualities. Poles should be sturdy and yet portable. They should fold small enough to be easily stowed but should not have too many joints. The more joints in a tent pole, the more likely it is to wobble. A typical compromise is a pole in three sections of 12 to 18 inches each.

Probably the best aluminum for small tents, according to some industry spokesmen, is 6061-T6, with an outside diameter of $\frac{3}{8}$ inch and a wall thickness of .028 inch. Brass-on-aluminum or plastic-on-aluminum joints are superior to aluminum-on-aluminum because they are less likely to freeze or wear.

Tent-pole sections can be kept from getting separated by lengths of shock cord that are run up through the hollow tubes. These elastic cords are made of bands of rubber sheathed in nylon. In addition to keeping your tent sections together, they are also handy for absorbing the strain of a rain fly that flaps in the wind.

Tent poles often are made of magnesium, which is even lighter than aluminum but somewhat less durable. Aluminum magnesium alloys (duralumin) are light, strong and weather resistant, but the most expensive. A good quality tent pole with shock cords weighs as little as two ounces, yet is strong enough to support a windblown rain fly.

Until recently, fiberglass wands were used mostly in winter tents, to hold the canopy out against the wind and increase room inside. Now several manufacturers offer summer tents erected on curved fiberglass poles of varying dimensions. In general, a hollow pole is much lighter than a solid one and, if properly designed, just as strong. But it's also likely to be more expensive. Many researchers are working to develop a glass pole which won't fatigue or destroy its own joints. The last word has yet to be written. ■

Where They're At

Adventure 16
10050 Bert Acosta Street
Santee
California 92071

Alpine Designs
6185 East Arapahoe, P.O. Box 3407
Boulder
Colorado 80303

Ascenté
Pacific Tent
P.O. Box 2028
Fresno
California 93721

Atlantic Products Corp.
1 Johnston Avenue
Trenton
New Jersey 08605

Eddie Bauer
P.O. Box 3700
Seattle
Washington 98124

L.L. Bean, Inc.
Freeport
Maine 04032

Camp Trails
4111 West Clarendon
P.O. Box 14500
Phoenix
Arizona 85063

Coworkers Development Corp.
108 Lawrence Street
Brooklyn
New York 11201

Eastern Mountain Sports, Inc.
1051 Commonwealth Avenue
Boston
Massachusetts 02215

Eureka Tent and Awning Co., Inc.
625 Conklin Road
Binghamton
New York 13902

Gerry
5450 North Valley Highway
Denver
Colorado 80216

Holubar Mountaineering, Ltd.
Box 7
Boulder
Colorado 80302

Laacke and Joys Co.
1432 N. Water Street
Milwaukee
Wisconsin 53202

Moor & Mountain
Concord
Massachusetts 01742

North Face
Box 2399 Sta A
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Recreational Equipment, Inc.
1525 11th Avenue
Seattle
Washington 98122

Ridge Line
Anglo Traders Limited
1315 Davenport Road
Toronto 4, Ontario
Canada

Sears, Roebuck
925 South Homan Avenue
Chicago
Illinois 60607

Sierra Designs
4th and Addison streets
Berkeley
California 94710

Ski Hut
1615 University Avenue
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Stephenson's Warmlite
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