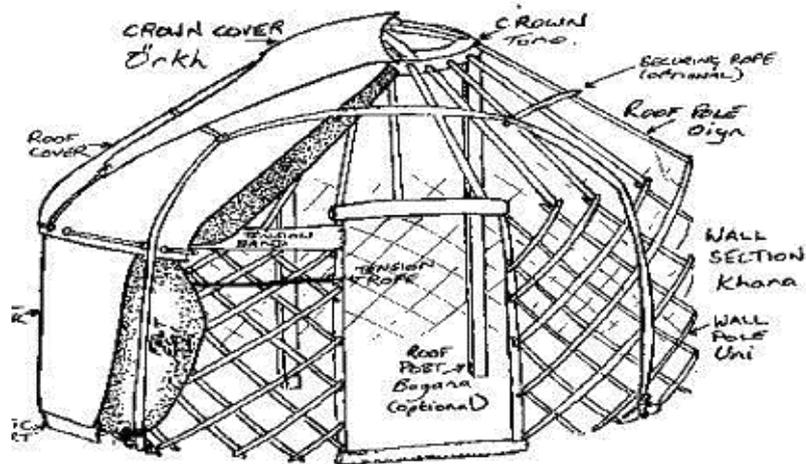


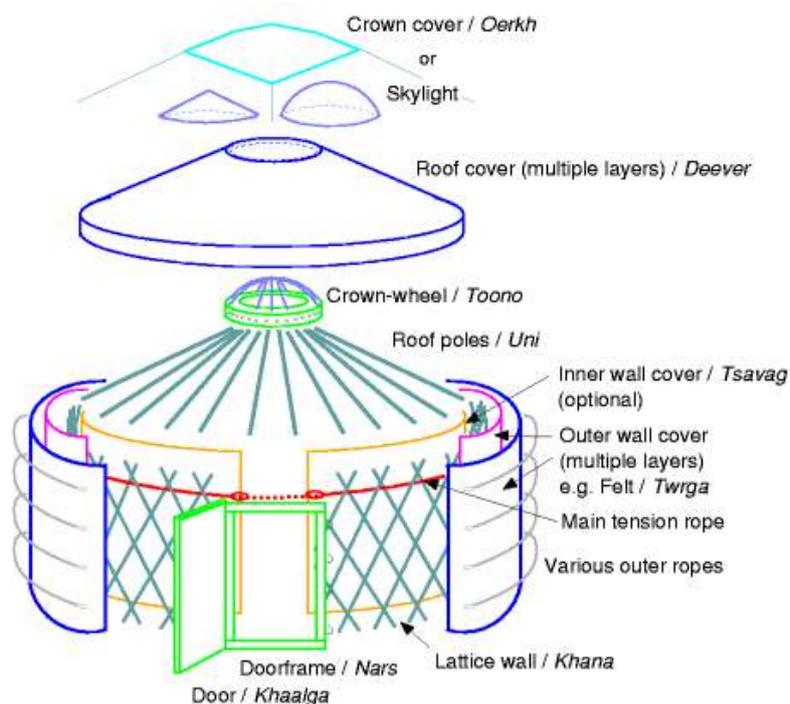
Yurts and Gers

The English word Yurt comes from the Russian Yurta describing a circular trellis walled framed tent. The Russian word Yurta is derived from a Turkic word describing a camping ground. The roof is supported by a conical or domed frame consisting of a number of ribs radiating from a central wooden wheel to the top of the wall trellis. The yurt is traditionally covered with felt, made by beating and rolling wet sheep fleece.



There are three main types of yurt:

- **The Kirgiz yurt** with bent-wood roof poles and crown and a domed overall shape. Used by the Turkish speaking Kirgiz, Kazak, Uzbek, and Turkmen people.
- **The two tiered yurt** with a pointed roof and two layers of wall section placed one on top of the other. Used by the Uzbek, and Arab peoples of Afghanistan.
- **The Mongol or Kalmuk ger** with straight roof poles, a heavy timber crown, often supported by two upright poles, and fitted with a wooden door. The Mongolian Ger (describing a Mongolian's tent as a yurt may offend his/her national pride) is a versatile dwelling with a proven pedigree, being home to the nomads of central Asia for many centuries. Throughout this time the design has changed little, the ger being perfectly suited to a nomadic lifestyle in one of the world's most inhospitable climates, with high winds, rain and snow, where winter temperatures regularly fall to -50°C . To this day it is still the preferred home to the majority of Mongolian people, and is widespread in the suburbs of the capital Ulaan Baatar. The use of the other two yurt types has declined greatly this century.



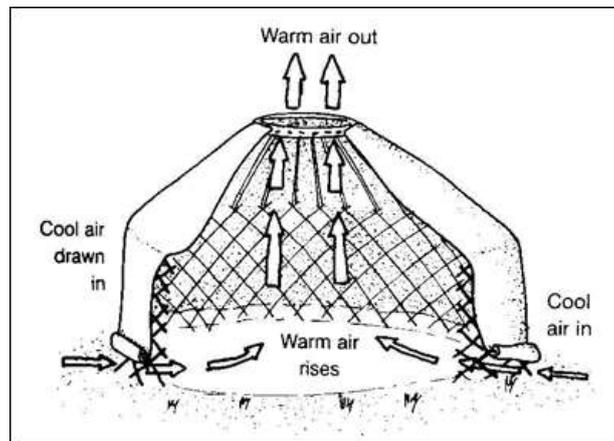
Yurt Terms

A brief overview of the Mongolian terms:

english	mongolian	pronunciation
yurt or nomadic house	ger	gair
lattice wall	khana	haan
crown-wheel or ring	toono	toon
roof pole	uni	oon
door	khaalga	haalak

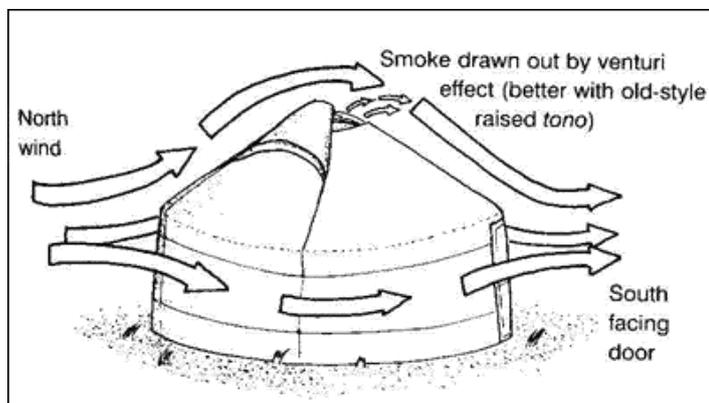
How the Yurt Works

The yurt is a self-supporting structure; the frame holds its shape with no help from guy ropes or a stretched cover. In all but the strongest winds the yurt will stand with nothing but gravity attaching it to the ground. This rigidity is maintained by opposing forces exerted by different parts of the frame. The walls are firmly tied to the doorframe to form a complete circle. The conical or domed roof, with its heavy crown exerts a force on top of the walls. This force is kept in check and put to advantage by strong bands tied tightly around top of the wall. These opposing forces give the frame great rigidity, which is further reinforced with the addition of downward pressure from a heavy roof cover and the inward pressure from tight wall covers.

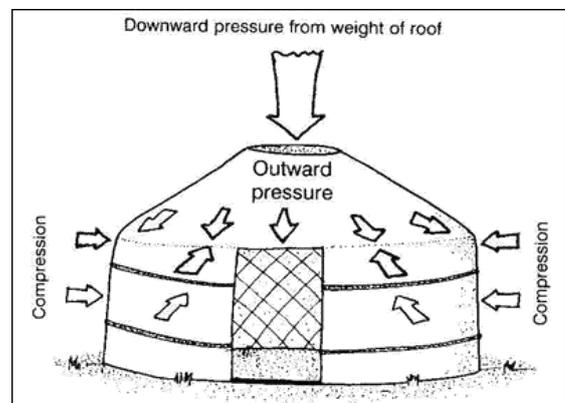


Opposing pressures which give the yurt its rigidity

The yurt has an aerodynamic shape, the wind slips over the structure with minimal resistance. There are no flat or concave surfaces to catch the wind. The yurt will not blow down like an ordinary tent but can, in exceptional circumstances, be lifted by a strong gust of wind through the door. So always peg the yurt down.



Airflow over the Mongolian yurt



Airflow inside the yurt during hot weather

The shape of the yurt is very thermally efficient. A large yurt can be easily kept warm using a small wood burning stove down to -5°C without any additional insulation. In Central Asia layers of thick felt keep the yurt warm as the outside temperature drops well below -40°C . In hot weather the sides can be lifted: warm air rises and exits through the open tono drawing cool air in at the bottom.

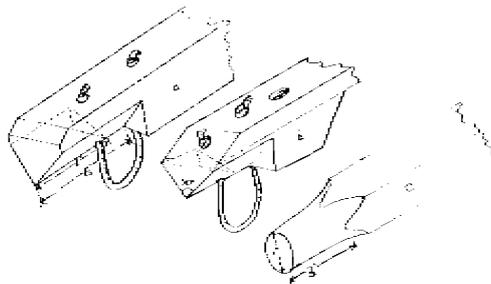
Yurt Frame



Here (above left) are the complete parts of a yurt frame laid out. From left to right and top to bottom they are:

1. Two rafters which have longer strings at the wall end to tie them to the top of the doorframe. These can be made from futon couch slats.
2. The bundle of the other 30 rafters. These are all the same, 3/4" rods with a loop of cord at the wall end and a short taper down to 9/16" at the hoop end.

You will need thirty two roof poles in total. These normally consist of the same rods as are use to make the walls. If the slats for the walls are not be rigid enough to support the roof, thicker or square section timbers should be used. If using round section poles drill two 3.5mm holes, 25mm apart in one end and pass a piece of string through these to form a loop, which fits over the top of a wall pole. The other end fits into the holes in the crown.



3. The wall lattice. The example is a small yurt so there's a single wall lattice with thirty tops. At the top the sticks are whittled into a "thumb" shape to insert in the rafter loops. There are 30 "heads" or peaks to the lattice.

Where the lattice sticks cross cords are inserted in holes and knotted for pivots. This is done at crossings 1,2,4,6,7. Crossings 3 and 5 have no pivot cords.

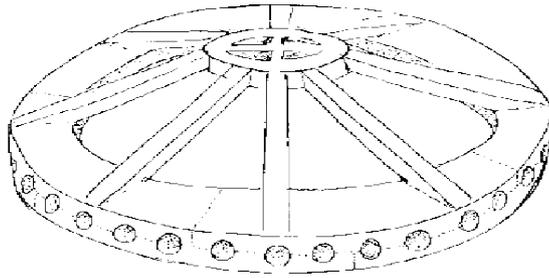
4. The door frame. It's a trapezoid of ash hockey stick pieces that fit together with mortise-and-tenon joints. A rectangle would have been just as good a door, easier to make and set up.

The simplest and most portable door for your yurt consists of two uprights of willow or hazel 38-75mm in diameter and 1.2m long tapered at each end to fit into 25mm holes drilled into the top and bottom of the frame. The top and bottom consists of lengths of the same wood about 75mm in diameter and 75cm long drilled at either end to take the tapered ends of the uprights. The top part of the frame is drilled to take two of the roof poles. The door consists of a canvas curtain, weighted at the bottom. This frame is easily disassembled and strong.



A more elaborate and weatherproof, but less portable door can be made with a solid timber frame, fitted with a double or single door, this is traditionally elaborately carved or painted. This door can be made in its own separate frame which can be fitted to the front of the hazel door frame when required.

5. The crown, or roof wheel is the most difficult part of the yurt to make. This is the hub of the wheel that is the roof. It consists of a wooden "wheel" approximately 75cm in diameter with hub held 25cm above the height of the rim by eight spokes. The rim has 32 holes drilled at an angle in the outside edge to take the roof poles. The finished crown may be elaborately decorated to form the major feature of the inside of the yurt.



The crown can be made using an aluminium bicycle wheel with 32 evenly spaced holes drilled into it at a downward angle.



6. Shoulder cord. Circles the wall lattice at the top to keep it from spreading outward while setting up.

Umbrella cover for smoke ring hole. It's a silvered parasol of the type Chinese women use instead of sunscreen lotion. The crown can also be covered with glass or polycarbonate to form a skylight.



7. Shoulder Band. Circles yurt where the rafters meet the wall lattice. Makes this area smooth rather than bumpy and keeps the sticks from poking holes in the yurt covering.
8. Bicycle innertube. Tie the ends of the wall lattice to the sides of the door frame with this.

Yurt Cover



Roof Liner

It takes some trigonometry to figure out the pattern for the roof covering. Using the wall diameter, the rafter angle, and the door dimensions you can generate a pattern to cover the yurt.

The cover is shaped like the red 'C' in the Colorado state flag.



The roof liner can be made from any fabric – cotton t-shirt material is ideal. It's easy to stretch over the frame. A drawstring in the outer edge of the roof liner helps it hook over the tops of the wall lattice.

Wall Liner

The wall liner is easy – a long strip with a width the same as the wall height plus a little bit to hook over the tops of the walls under the shoulder band. Make yours long enough to wrap around the inside of the door frame and secure inside to the lattice. The stretchiness of a knit fabric makes it easy to hook over the tops of the walls under the shoulder band. If your fabric isn't stretchy or if it's slippery you'll need to sew loops into the edge to hook over the tops of the wall.

Outer Skin

The outer skin should be weatherproof (at least water resistant) and insulated. Traditionally it would be made from felted wool rubbed with lanolin, oils, or animal fat. Mason's tarps (two layers of aluminized polytarp with a sheet of "ethafoam" polyethylene foam insulation in between them) are ideal.

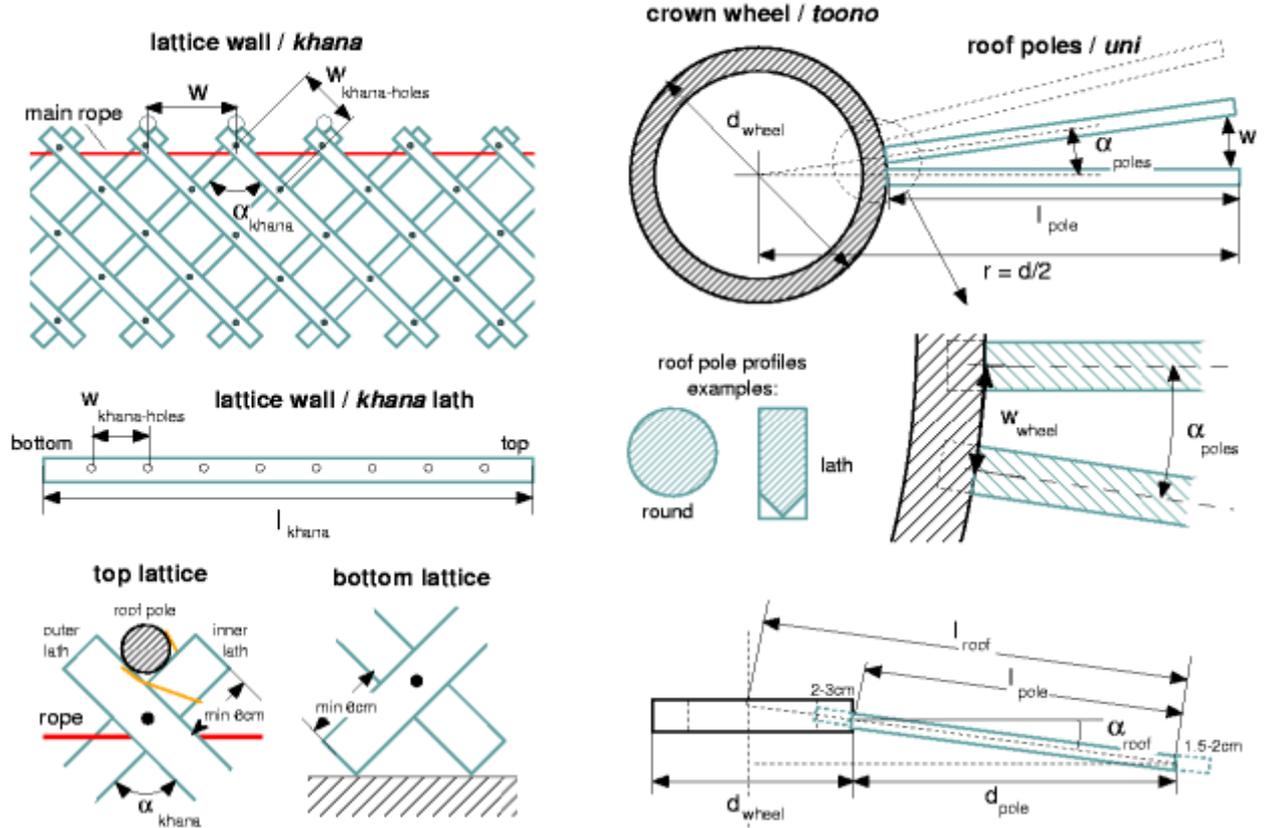
The canvas will shrink slightly when it first gets wet so allow an overlap of at least eight inches (20cm) between the roof and walls and make the walls at least three feet longer than the circumference of the frame (minus door). Alternatively pre-shrink the canvas.

The pattern for the roof is the same Colorado flag thing as the roof liner. Allow for the thickness of the insulation, but measure carefully so that you don't make it too big. The walls, as with the wall liner, are relatively simple. In an ideal world, the outer skin for the roof should overlap over the wall skin to avoid leaks along the top of the wall. A drawstring just in from the outer edge of the roof skin would help keep it in place while allowing a rain-avoiding overlap.



Yurt Construction Details

The lattice-wall (*khana*) is made up of laths (or sticks) and angled to each other to create a lattice. The angle is usually 90°, but smaller also possible, in which case the lattice wall / *khana* becomes taller. The roof-poles are assumed to lay on the top lattice crossing of the wall / *khana*, with a space of w as seen on the illustration.



Lattice Wall / Khana Details

All laths of the lattice wall / *khana* have the same number of holes, and the same distances. The top crossing needs to have enough space to carry the roof pole/lath. You can also decide to not lie the roof poles on the lattice end crossings, in which case you can choose your own lattice-wall geometry and number of poles.

The poles are inserted into the toono (crown/roof wheel). The final roof pole length is longer than calculated by 4-6cm, as some space is required to enter the toono/wheel, and also for the tail of the roof pole to reach beyond the wall.



Setting It Up



1. Smoke ring. Put the smoke ring in the middle. It's bad Mongol luck to carry it through the door or lift over the wall.
2. Door frame. Assemble it.
3. Wall Lattice. Spread it out in a circle and tie it to the door frame.
4. Shoulder cord. Tie it around the wall to keep it from spreading too far.
5. Rafters. Insert a lattice thumb in the cord loop and insert the other end in a hole in the smoke ring. Install three widely spaced rafters first to support the smoke ring.
6. Smoke ring. Write numbers next to each hole and the same number on the correct lattice thumb. That makes it easier to not get crossed up.
7. Tie the two odd rafters to the top of the door frame
8. Shoulder band. You might prefer to put it on now, or after the linings. Try it both ways.
9. Roof lining. Throw that over the top and hook the drawstring over the wall. You could also sew the walls to the roof part and install them both at once.
10. Wall lining. Wrap it around the walls, At the door you can either have flaps or wrap it around the sides of the door and secure it inside.
11. Outer wall cover. Do the same as the lining. Line the door flap up with the door frame.
12. Outer roof cover. Throw it over the top and tighten the drawstring around the edge.
13. Halter. Throw some ropes over the top to keep the whole thing together and keep it from blowing away.
14. Smoke hole cover. Use your umbrella or a small tarp with long cords from the corners as you see fit.



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