Construction of a Nomadic Persian Home Decorated in the Timurid Style

Festival of the Passing of the

Ice Dragon

8 April 2017

There are three appendices at the end of this paper following the citations.

This is a link to the instructions used to make this yurt

http://www.solaripedia.com/files/764.pdf

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Construction of a Nomadic Persian Home Decorated in the Timurid Style

Of all nomadic groups that live in yurts/gers none of them uses "yurt" or "ger",(pronounced 'gaire'), to describe this kind of portable structure (Stronach 2004) The word ger is Mongolian and literally means "home," just as the Turkish term "yurt" can mean "homeland" and/or "dormitory". Since these two words have become so closely associated with these types of dwellings, yurt or ger will be used in this report.

A ger is similar to a tent. It is easy to dismantle and move and it has been used by nomadic people for thousands of years. It has no pegs or ropes to stake it to the ground, it relies on gravity to keep it in place. Gers have an opening in the center of the roof, through which air can circulate, and smoke escape. Air can flow in through the doorway, or the lower side walls. In hot weather the bottom portion of the ger covering can be raised up allowing the cooler (low to the ground air) in and the hotter inside air out via the top. There is usually a fire in the center that vents out the top hole, providing heat evenly throughout the ger when needed See figure 1.

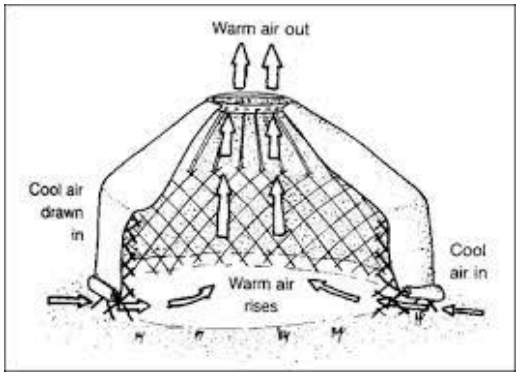


Figure 1 Air flow through a ger

The circular shape of the ger and the gently domed roofline deflect wind and keep the yurt very stable, regardless of the direction of the wind. See figure 2

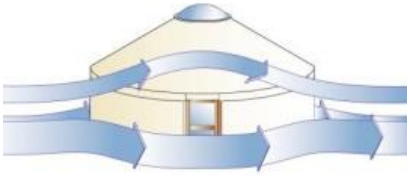


Figure 2 Air flow around and over the yurt

Ger/Yurt Time Line

648-647 BCE

In 1982 a discovery was made in Arjan, a medieval Sassanian (Persian) town. The depiction of a yurt was discovered in a Neo-Elamite burial site, (1100 – 540 BC). This timeframe coincides with the arrival of the Persians and the beginning of the Achaemenid period in 539 BC (Vallat 2015). The grandness of the tomb and its items indicates that it was the tomb of a person of high status. The date of this tomb has been established, through several means, as between mid-seventh and mid sixth BCE.

There were four items inscribed with "Kidin-Hutran, son of Kurlush" in a cuneiform script. Kurlush was a "provider of garments" for the Elamite Court at Susa and lived between 646-525. We know this because of an inscribed Neo-Elamite tablet that gave that informatio (Alvarez-Mon 2006). Additionally the Elamite cuneiform script that was used in this tome can be reliably ascribed to an interval between the mid-seventh and the mid-sixth centuries BCE (Stronach 2004). Another find at the grave

was a bowl, etched with the same Kidin-Hutran's inscription on the exterior, which confirms the time period.

This bowl is now called the "Arjan Bowl"; it is a bronze bowl that measured 43.5 cm (17 inches) diameter and 8.5 cm (3.4 inches) depth. It is highly inscribed in a set of five concentric circles on its interior surface. In his dissertation, Alvarez-Mon (2006) says:

> "A detailed study of the iconography of the bowl conducted by J. Majidzadeh determined that most features of the incised decoration found in the Arjan bowl were a product of Phoenician eclectic art combining Egyptian, Assyrian and Elamite features, in other words, "an excellent example of Phoenician art" (Majidzadeh 1990: 142). As to the date of the bowl, Majidzadeh indicated close iconographical parallels in the bowl with those represented in Neo-Assyrian reliefs at the time of Assurbanipal (668-627) placing the manufacture of the bowl in ca. 648-647 BCE. (Majidzadeh 1990: 141; 1991: 94-95)".

In its outer most ring, this bowl contains the earliest diagram of a yurt ever found. See figures 3 and 4

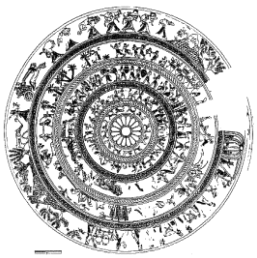


Figure 3 Interior of the Arjan Bowl

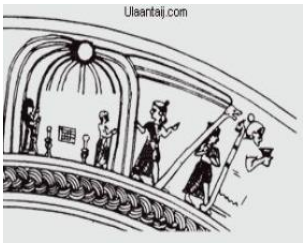


Figure 4 Enlargement of the yurt in the outer ring of the bowl

The yurt in the Arjan Bowl is a ribbed yurt, the wooden frame is made of struts which are staked to the ground, and then united in a roof wheel at the top. It is shown without a cover, probably so the inside the yurt can be seen. The door folds up from the bottom and forms an awning over the entrance way.

448 – 424 BCE

The earliest written description of a yurt comes from the Greek historian, Herodotus. Herodotus described yurt-like tents used as homes of the Scythians (Herodotus 440 BCE).

First century CE.

A yurt painted on the wall of a Sarmatian tomb of the city of Panticapaeum (near modern Kerch, in the Crimea). See figure 5.

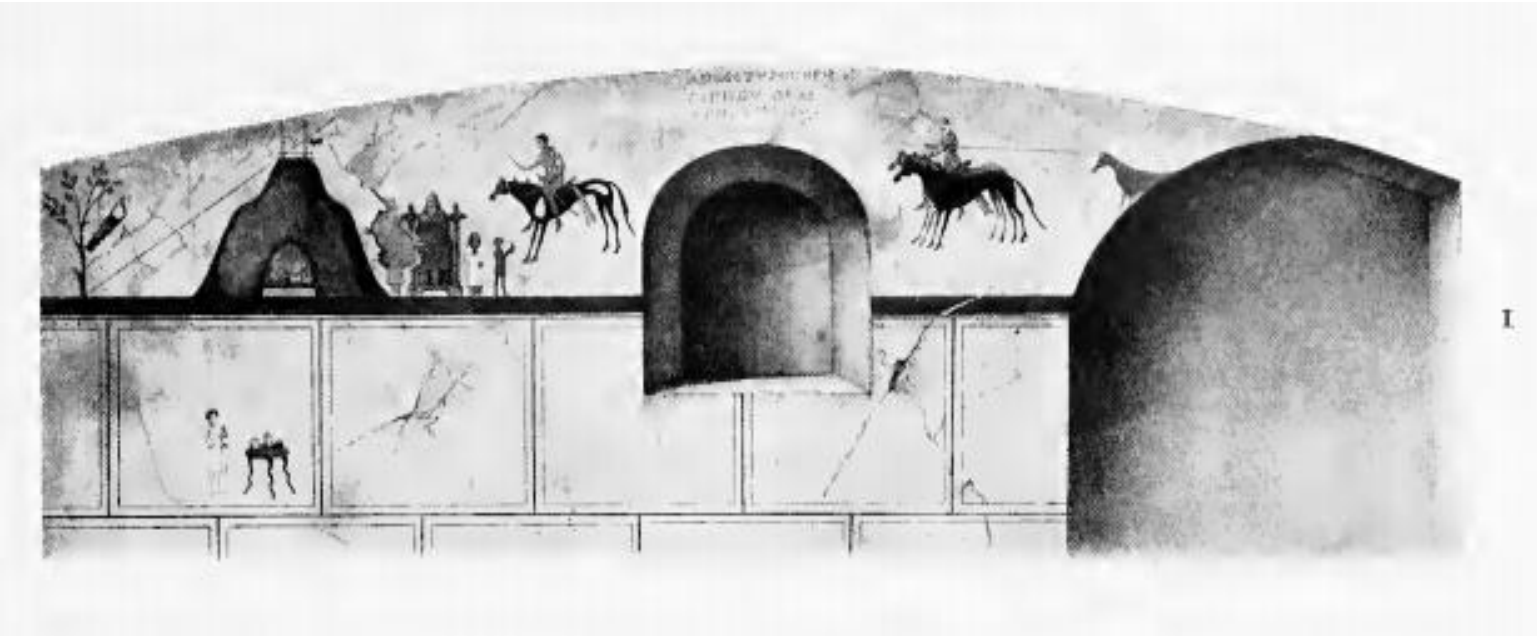


Figure 5 Sarmatian tomb with yurt painting

The dead were usually represented as horizontal in Greek scenes, so this painting by Panticapaean artists (who painted these tombs), created scenes from the social life of the deceased. In one of these tombs, the scene is of the dead man, armed, and followed by a retainer, riding towards his family residence, a yurt. His household, wife, children, and servants, are in the yurt and beside it is his long spear and. His quiver hangs from a tree branch (ROSTOVTZEFF 1922).

1245-1247 CE

John of Plano Carpini, was a Franciscan monk, who traveled to Mongolia. He described the dwellings of the Mongols of that time, he wrote:

> “Their dwelling-places are round like tents and are made of twigs and slender sticks. At the top in the middle there is a round opening which lets in the light, and is also to enable the smoke to escape, for they always make their fire in the middle. Both the sides and the roof are covered with felt, and the doors also are made of felt. Some of these dwellings are large, others small, according to the importance or significance of the people; some can be speedily taken down and put up again and are carried on baggage animals; others cannot be taken down but are moved on carts. To carry them on a cart, for the smaller ones one ox is sufficient, for the larger ones three, four or even more according to the size. Wherever they go, be it to war or anywhere else, they always take their dwellings with them” (CARPINI 1966).

1276 -1291 CE

The Italian merchant, Marco Polo, saw yurts on his travels to Mongolia. He wrote; “…They [the Mongols] have circular houses made of wood and covered with felt, which they carry about with them on four-wheeled wagons wherever they go. For the framework of rods is so neatly and skillfully constructed that it is light to carry” (Polo 2004).

1404 CE

Gonzalez de Clavijo visited the camp of Timur at *Among*, he noted;

“The tent walls above and below are held together the one above the other by a series of staying bands, a hand breadth across. These pass down to the ground and are secured by stakes, or tent pegs, and they hold the walls of the tent stretched taut: but indeed it is a marvel to note how such thin stays can hold up so high a canvas wall. Above this wall is made of crimson tapestry, but below the material of the wall is strengthened by a cotton stuffing like that of a coverlet, this being added that the heat of the sun's rays may not pass through. The walls of these tents we are now describing are not ornamented with any pattern work or figures as elsewhere may be seen, their only ornament being bands of white which go all round the back up to about half way of the height, thus engirdling the walls outside. But further these bands are

> ornamented with spangles of silver gilt, each of the size of an open hand, and in these have been set jewel stones of diverse sorts. Again round the back part of the tent is to be noted half way up a linen band, set over in small loose pleats, as may be the facings of a woman's gown, and these are all embroidered with a pattern in gold thread; and as the wind blows these loose pleats set on the linen band wave to and fro in a manner pleasant to see. This particular tent that we have been describing had a high entrance, shut by doors, and these were made of red tapestry stretched over a framework of small canes" (Clavijo 1928).

1370-1507 CE

Timurid dynasty **–** yurts were depicted as highly decorated in the miniature paintings of the time. It is this basic style that I am emulating for this yurt.

Typical Yurt Structure

Walls - The walls are made of several flexible lengths of trellis which are held in place by several encircling bands, and creating a cylinder. The top of the wall has a compression band that wraps around each strut, and keeps the trellis from getting too wide at the top, as the roof poles exert pressure on them (Andrews 1997: 95). The lattice sections are called khana. The khana are made of light wood, such as willow, birch, or poplar. The individual pieces of the khana are attached to each other with leather ties.

Door Frame - The door frame is set on one side of the trellis wall, and is always pointed south. This makes a lot of sense, since in the winter, when the sun is low, more sunlight comes from the south, and would help to light up the interior of the yurt. In the summer, with the higher sun, most sun comes from the east and west, so having the only opening on the south side will help keep the unwanted heat out of the yurt.

Roof Ring - The ring, or toono, is about two meters in diameter. It is pierced radially with slots for the roof struts to fit into, and has an empty center to facilitate the flow of air and allow sunlight to enter. It also has canes arched over it to support the ring's separate felt cover. The toono is usually made from a piece of bentwood to create the ring, It has been proposed that by orienting the yurt in the same position at all the times, the toono can act as a clock, a sundial, since the moving sun will cast a predictable shadow on the floor (Noble 2014).

Roof rafters – The rafters, called uni, are a set of straight (ger), or curved (yurt) struts, which connect the khana tops and the toono (which is usually suspended some two - three meters above floor level). These uni are secured to the khana by ties, and insert into the toono slots. The toono is held in place only by the uni.

The toono at the top of the roof exerts pressure downwards along the uni, and an inward/upward pressure is made by the tension band where the roof meets the khana, the opposite forces help it stable, large yurts are possible as a result. This design creates a resilient home that can withstand earthquakes, winds and snow (Kemery 2006). See figure 6.

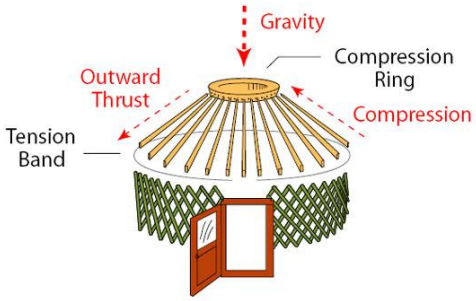


Figure 6 Forces at work on a yurt

Types of Yurts

There are two main types of yurts, gers and bentwood yurts. The only difference is their roof. A ger is the older, traditional style with a roof of straight poles attached to the circular crown associated with the Mongolians. Gers have a very gently sloping roof. Bentwood yurts are a later development. They are made by using steam to bend the roof poles before attaching them to the toono. Bentwood yurts have a steep roof and a taller, domed shape (Nationaln Geographic Yurts 2017). See figures 7-8.

Figure 7 Modern Mongolian ger

Figure 8 Moderen yurt

The Ger Covering

Gers were covered with a thick layer of felt. Felt has been made for thousands of years, for example, 3500 year old felt caps brom the bronze age (Jutland and north Slesvig) are now housed at the Copenhagen museum. There are also finds from 5th centure BCE Sythian graves of felted wool. The Mongolians did, and still do, use felt for their gers coverings, clothing and blankets among other things (Allsen 1997). Lengths of felt were stiched together using straw or bamboo needls to make these coverings (Fouchier 2007). At a minimum, it took 7 pieces of felt to cover a ger, four rectangular pieces for the walls, two semicicular pieces for the roof, and a diamond shaped piece to cover the smoke hole (Kemery 2006). If the ger was large, more side panels were needed. Even doors had felted wopol. Gers would have a solid single or double door, and athen a piece of felt over taht. According to Colin Duly, all this felt "was tied down with braided animal hair ropes" (Duly 1979).

The project - making a Mongloian style ger

After much searching on the internet and talking to people in the SCA, directions were chosen for the ger, written by Sir Ogami Akira, with diagrams by Lord Michael, the Tinker. These instructions were chosen for the precision and clarity with which they were written; only a few changes were made to the yurt frame instructions. The canvas covering was altered considerably from the original plans. See appendix 1.

Materials Used

The wood and hardware was purchased from Lowes and Home Depo stores. Since furring strips are not made of high quality wood it was necessary to sort through the available pieces to get ones that were not cracked, warped or containe large knots. This took several hours on each of three different days to accomplish. I could not get enough “good” ones in one trip after going through their entire stock. I did pay a little extra for high quality, sanded lattice strips. It took two trips to get enough that met my requirements

The canvas was purchased online from a wholesale supplier. Thread, needles and other sewing supplies were bought from Joann’s Fabric Store or online.

Frame materials, historical and my deviations from those materials

• 70 pine lattice strips (1-½" X 1/4" X 8')

Ruy Gonzalez de Clavijo was an ambassador to Timur (Tamerland) for King Henry III of Castile between 1402 and 1406 CE. He wrote that Timurid gers were made of canes joined together and by “poles of the size and thickness of our lances, which are wrought into the canvas wall, as might be to form a netting cross-wise. Above those of the side walls, rise other long poles which hold up the upper part of the tent forming the domed ceiling” (Clavijo 1928). Both willow and bamboo grow in Iran and the surrounding areas (Hopper 1937). Most likely these would have been the source for the “rods”. I did look into using Bamboo, but found that the cost of enough bamboo of the size needed to build the yurt

would have been too expensive, so I used the materials suggested in the directions, since they have been tried and proven to be adequate for the task.

• 43 spruce furring strips (1" X 3" X 8') See above.

• One 4' X 8' sheet of 3/4" exterior plywood and one 4' X 8' sheet of 1/2" exterior plywood.

The Egyptians and the Chinese have used a form of plywood for thousands of years, mostly for making furniture. Archeologists have found traces of laminated wood in the tombs of the Egyptian pharaohs and Chinese tombs, it consisted of shaved wood which was glued together (Schemerl-Streben 2017). It is not at all likely that laminated wood was used in the building of doorways or doors, nor would it have been used for toonos. I used plywood for these items, because I do not have the space, equipment or knowledge of bending wood (for the toono). I could have used a solid wood for the doors, but that was prohibitively expensive, so plywood was the most reasonable material to use, and it was at least known to exist in that time period.

• Three 2" X 4" X 8' studs.

Bamboo or willow poles would have been used, but I chose the 2 X 4’s for the reasons given above.

• Six 4" steel screw hooks (to attach the roof pole rope and belly bands to).

Gers would have used leather strips for this purpose, either tied around the doorframe itself, if a cloth door flap was used, or through a hole in the doorframe, if wooden doors were used. I chose to use the modern hardware because it would be more secure, not would it stretch and require adjustments. Since it would not be seen (hidden by the sidewall fabric on one side, and the wooden door frame surround on the other), I felt it would not detract from a period look.

• 300 1&1/2" drywall screws for the center ring and door frame.

Although screws were used in that period and place, the concept was used to lift water for the plants in Babylonia's hanging gardens in 700 BCE (Carr 2016) there is no evidence that they were used in the production of gers. Because of my equipment and skill limitations, I used the modern screws.

• A dozen or so flat headed 1 ½" wood screws – see above.

• 6 hinges – see above.

• Waterproof wood sealant, varnish.

Varnishes made of wood resins have been used as far back as 3000 BCE in Egypt (Painted Wood: History and Conservation 1994). The Mongolians would probably have used natural wood oil, such as linseed oil, Theophilus, (11th century) suggested using linseed oil on wood. I used marine spar varnish since this wood (at least the bottom ends) would be exposed to water, and it would not need to be reapplied as frequently as a natural oil would need to be.

• Paintbrushes

These would have been made of animal hair tied and glued to handles (a. W. PURINTON n.d.). I am currently learning how to make my own brushes, but at the time the ger was made, I had not looked into it, so modern brushes were used.

• Gesso

Heraldic banners and other tent decorations were often done on linen or buckram cloth in the Middle Ages. As an example, Joan of Arc had a painted buckram (similar to canvas) banner made while she was on campaign against the English (Arc 1996) . Cennino Cennini's described how to stretch and apply a layer of gesso (with egg added to it) to linen or silk fabric before it was painted for banners, he also suggested it be varnished to render it waterproof for outdoors use. He also says that silk for banners should have seize added after drawing the design on it (Cennini 1960). The gesso that Cennini describes is made of plaster of Paris or gypsum with animal skin glue added to it. Modern gesso is usually made of calcium carbonate, and latex (F. Morgan 2019). Not having a ready supply of animal skin glue, nor wishing to obtain one, modern gesso was used in the project when gesso was needed.

• Wood glue and wood putty

May glues were known to the people of the middle ages throughout all regions, gum Arabic, animal skin glues, resins, even honey etc. Theophilus (1070–1125), a medieval artist and possibly a Benedictine monk, gave directions for making wood glue out of cheese and quick lime (Benton 2009). China and Persia also have evidence of the use of glues, in their art and construction (a. W. PURINTON

n.d.). Although I saw no mention of glues used in ger construction, I would be surprised it was NOT used, epically in the toono, to reinforce the bent wood joints. Wood glue, mixed with saw dust or brick dust was used as a filler for imperfections in wood for as glue has been around (Thrton 1998).

I used white wood glue, a polyvinyl resin glue, and Minwax wood filler. I will make the cheese glue for a future project I have in mind.

• Sand paper

Sandpaper was first used by the Chinese in the13th century. It was made of crushed seashells bonded to parchment paper (Sandpaper: Ancient Invention Increasingly Becomes High-tech Marvel 2017). I admit to using commercially made, mundane, sandpaper and did not make my own, although someday I will try it, just because.

• The following four things were used to bolt the lattice strips together.

o 276 1&1/4" X 1/4" round-headed stove bolts (or carriage bolts)

o 260 1/4" hex nuts with nylon inserts

o 25 1/4" wing nuts

o 276 5/8" washers

Leather was used for this by the Mongolians and other yurt/ger builders. I found several ways to do this, but felt they were not strong enough, or did not provide enough movement to be a good method. See figure 9-10

Figure 9 one way to tie Khanna

Figure 10 another way to tie khanna

Frustrated that I could not find a reasonable way to tie the khana, I used modern hardware. I have since discovered how this was accomplished, and will incorporate it into the ger as khana pieces are broken and replaced. In effect, a rivet is made of leather. A wet strip of leather is tied into a knot close to one end. It is then threaded through the two holes (made in the wood where the pieces overlap). Then the leather is pulled out on the other side and another know is made tight against the wooden strip. As the leather dries it will tighten a bit more resulting in rivet that will hold the khana securely and allow enough motion for it to fold and unfold. See figure 11

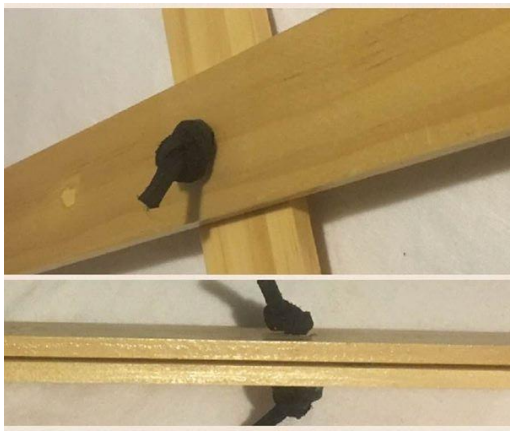


Figure 11 Mongolian way to tie khanna

Covering Materials

- 100 yards of Sunforger waterproof, fire proof, mildew resistant 12 ounce canvas. While using felted wool, as the Mongolians did, would have produced a much more authentic ger, the cost of the wool and the considerable labor of felting it compared to the amount of use the ger would experience did not warrant doing so. I chose 12 ounce rather than 14 or16 ounce canvas because it is lighter when setting up, taking down and transporting the ger, but it was also chosen for another, more important reason. When canvas gets wet it can, and will, mildew unless it is completely dry before packing it away. 12 ounce canvas will dry faster than 14 or 16 ounce canvas, helping to reduce the time needed to dry after a rain, or to burn off the dew in the morning.

- 30 spools of upholstery thread/craft thread. Cotton covered polyester.
  The thread was chosen for several reasons. It needed to be thick enough to plug up the holes left by the sewing machine needles. A smaller gauge needle would break when sewing on canvas, so the larger bore needle needed to be used. Poly core thread was used because it is much stronger than cotton (due to cost and availability no suitable silk thread was found). The advantages of having the poly part of the thread covered in cotton means that when it rains, the cotton will shrink in length just a bit, and swell up in width just a bit, helping to seal the tiny holes left by the sewing machine needles, discouraging leaks through the holes

- Sewing machine, older is better

  The choice to use an electric sewing machine was obvious. Sewing canvas is very difficult by hand, much like sewing canvas and would have been prohibitively time consuming. The felted wool sections that are used in the Timurid (and earlier) periods is much easier to sew. Felt is not woven, but compacted, even when compacted extremely well, it is not difficult to get a needle through it. Even using the bamboo or reed needles of the time it would have not been a terribly laborious task.

  Old garage sale machines are usually best because the older ones have internal parts and gears made of metal. Newer ones are mostly made of plastic and will not hold up to the heavy canvas fabric. An industrial type machine is not required.

- 50 ea 18-20 gauge sewing machine needles. Even being and experienced seamstress, lots of needles will be bent, and if not broken, and the needles will become dull pretty quickly from the thickness of the fabric. When seams are three or more thicknesses of canvas thick it is extremely difficult to sew over them without damaging the needle. I am estimating the number here, you will probably need more. Several times the sewing had to stop while more needles were procured.
- 30' of white 1" wide cotton webbing. Animal hair (camel. Sheep) cords and ropes would have been used for loops or as a way to connect things. Not having an

adequate source for such hair, this was not attempted. Wanting to keep it as true to authentic as possible, cotton webbing was used instead of a synthetic material. This was not a wise choice; see the section on “What I would do differently”.

Supplemental materials

• 3 ea 50' sections of 1/4" plastic covered cable. 2 turnbuckles

Horsehair ties were used in traditional Mongolian tent dwelling (Yazdzik 2011) . The ropes made of hair were better than leather in wet conditions, water can be shaken out of a hair rope but not a leather one. William of Rubruck (ca. 1210-ca. 1270), a Flemish Franciscan monk, went on a missionary mission to the Mongols in 1253. , In his writings he tells of a traditional rope-making technique which called for a combination of one third horse hair to two thirds wool (RUBRUCK 1942).

The instructions called for rope here, I chose to use the plastic coated cable. Ropes can stretch and would need tightening up, the cable does not stretch, and once the length is determined, it would be easy to set up again without a lot of adjustments to be made. Since neither alternative is an authentic solution, the cable was used.

• 20 1-1/2" ‘S' hooks to hang the side walls with.

The Mongols would have ties the sides to the frame with hair ties. The use of the ‘S’ hooks was not positive, they frequently fell off and left the side walls drooping down.

After a few experimentations, small, 1/2" locking hooks were used. These are left attached to the side wall loops, so they are not lost and never fall off.

- 100" sisal rope.

  Horse/camel hair ropes were not used (as they would have been), instead sisal ropes were chosen to tie the smoke hole cover to the stakes. It is made from a natural material (agava plant) more authentic than modern synthetic ropes.

• Four tent stakes

  There are hand forged iron stakes made for me by a man at Pennsic several years ago.

- Latex exterior house paint was used for wooden objects

  Gum Arabic or egg was the binder that is most often seen when studying Persian miniature paintings. Gum Arabic mixed with water would not hold up on wood so it was not used. It is known that oil was sometimes added to gum Arabic or egg binders by the Persian artists to increase flexibility (Grohmann 1967). Most likely an egg based paint, like temper would have been used for painting wood in the Timurid period. It seems likely that oil would have been added to make it more durable. Since tempura must be made and used each time painting is done, and thrown out when the painting session is ended, it was not a good option for this project, since it would be worked on in small segments of time. The next most authentic paint would something with oil in it, but oil based house paints are no longer available for purchase, so the modern latex paint was used.

Tools –these modern tools were used for reason sated several times above.

- Power drill with both wood and screwdriver bits.

  In the medieval time period holes could be made in variety of ways, by a chisel or awl, even burning. If absolutely necessary, a bow drill could be used (Morgan 2014). See figure 12

Figure 12 Bow drill

• Jig saw

  Hand saws, not much different from modern ones were used as far back as 1500 B.C. These had a broad blade, some as long as 20 inches, curved wooden handles, and irregular metal teeth (Morgan 2014).

- Wood chisel

  Chisels, not much different from today's instruments, have been found by arachnologists sating back to 8,000 BC (Morgan 2014). Knowing this information several chisels were used in this project.

Constructing the khana

All the lattice strips were drilled at 9", 21", 33", 45", 57", 69", 81", and 93" from one end, then they were sanded and four coats of varnish were applied Unfortunately I made a measurement error on the first few pieces of lattice strips and drilled in the wrong location. These holes were puttied and new holes were drilled in the correct location. See figure 13

Figure 13 repaired holes

All of the Khana wood strips were laid out, in two layers across two tables. The bottom layer were slanted in one direction, the top layer was laid out with the tops pointed in the opposite direction. The holes were lined up – creating a crisscross lattice pattern. Carriage bolts (with a washer) were inserted from the top through each hole, and secured on the bottom with another washer and a nut. These were tightened but allowed slight movement of the strips of wood. See figures 14-15

Figure 14 Bolting the strips together

Figure 15 Two khana sections completed

The khana was made in two sections that can be joined together when used. This is to keep the sections less heavy and the khana more portable. On the two ends that meet the door frame, the strips were cut so that they formed an even vertical edge when open, and would meet the door evenly. The cut off bits were used near the top and bottom where shorter pieces were needed. The extra strips were kept for replacement parts.

The Uni, or roof poles

The uni were made from the 1’ X 3’ the furring strips, they were first sanded and given three coatings of paint in an azurite blue using exterior latex house paint. See figures 16 and 17.

Figure 16 Painting the uni

Figure 17 Uni paint drying

Thirty-eight of the furring strips were cut to 7' 6-3/4" length, then they were cut and slotted as in the diagram, see figure 18. A 3/8" hole was drilled above the slot. The opposite end was cut as in the diagram. Only 33 are needed, but 5 extras were made in case of breakage. See figures 19-20

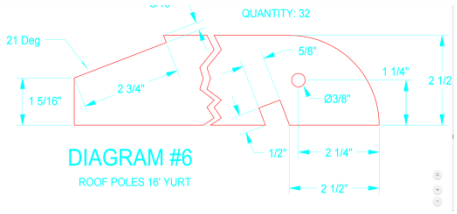


Figure 18 Diagram for cutting uni

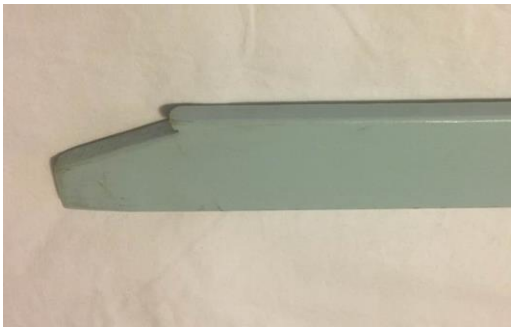


Figure 19 Cut Uni toono end

Figure 20 cut uni Khanna end

The remaining 6 pieces of wood were cut shorter, to 7' 3". One end was cut, as indicated in the drawing, without the curve. The curve was not needed since the canvas would not be draped over this area and therefore it would not experience wear on the squared end. The other end was cut in the same way as the first 38. Only 2-3 will be used, the others are for replacement parts. See figures 21-23.

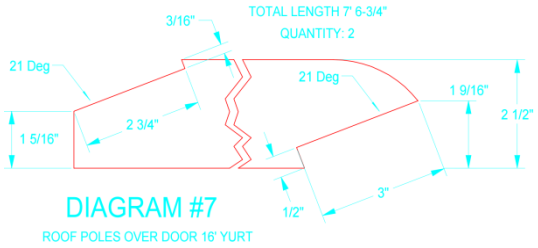


Figure 21 Diagram for uni

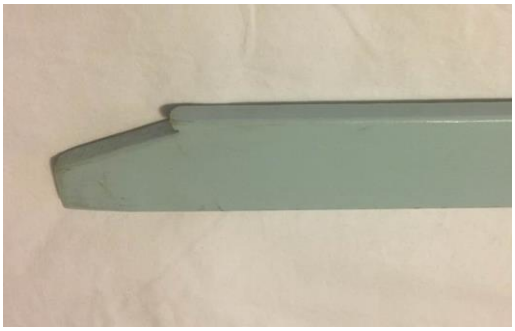


Figure 22 Uni cut for toono end

Figure 23 Uni cut for over the doorway.

Normally the cutting would have been completed before the painting, but I did not have the jigsaw at the time, so I painted first and cut after purchasing the jig saw. The cut areas then were painted to match.

*** After setting up the ger for the first time an adjustment was made to the uni. The deepest part of the notches were beveled on both sides to better fit onto the cable that was woven between the top of the khana slates. These notches were then repainted. See figure 24.

Figure 24 Beveled notch

The door frame

A rectangular shape was made of four lengths of 2 X 4's, butted up against each other. The 2 X 4's were kept narrow side to the front and back. Screws were set at the top and bottom of each long side into the short sides of the door frame. This was a deviation from the instructions, although the overall size was kept the same, 36" X 68" outside measurements. See figure 25.

Figure 25 Ger door frame

On the left inside piece of the door frame, ¼” holes were drilled all the way through at the 15-3/8", 32-3/8", and 49-3/8” marks from the bottom of the door frame, going from front to back. The wood was marked 3”above and below each hole. The wood was turned to the side and slots were chiseled out making a 6”wide and 1.5” deep space. This was done on the opposite door frame as well. See figure 26.

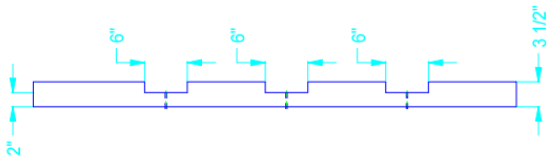


Figure 26 hole and slot positions

From the front side, 3 ½" stove bolts were put through these 6 holes and a washer and wing nut were added to the back.

This is where I deviated from the instructions again. I wanted a wide door frame surround, so a full sheet of ½” plywood was cut so that the shape of the door frame (38” X 68” rectangle) was removed from the center leaving the rest of the plywood to form a frame around the doorway. This was glued and screwed to the 2 X 4 doorframe so it would be flush with the front of the door frame. On the back side of the door frame assembly, reinforcing 2X4’s were placed against the door frame and the surround (wider side flat against the surround and narrow side against the 2 X 4’s) this was done on all three sides. Then they were glued and screwed to the 2 X 4 doorframe and the surround. Near the top of the door frame on each side the 4" 1/4" screw hooks were screwed into the frame, with the hook part on the outer side of the doorway. This was

repeated about midway on the door frame, and again near the bottom. Cracks were puttied; the entire door frame assembly was sanded and then painted to match the uni. See figures 27-29

Figure 27

Reinforcing wood added to back

Figure 28

Painting the frame with a little help

Figure 29

Door frame and surround tested out

The toono, center ring and canvas supports

Unfortunately, when I get engrossed in something, time stands still and nothing else exists. The toono was such a project. I completely forgot to take pictures of the process.

Two circular "doughnuts" were cut from the ¾" plywood, with an outside diameter of 30 ½" and an inside diameter of 22 ½". On the top of each ring, radial lines from the inner edge to the outer edge were drawn, 10 degrees apart, completely around the circle. See figure 30.

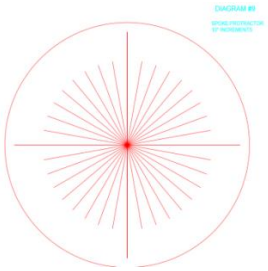


Figure 30 Diagram for toono lines

Using the bits of wood cut off of the uni, as they were cut to size, spacers were made by trimming these bits to 2-1/2" long pieces. 75 were made. 72 are needed, but extras were made in case they were needed. One four inch long piece was made to use as a measurement example for the correct width of the spaces to be made.

Although the directions said these needed to be 2 ½" long, I found that there were too crowded at the inside of the ring, and they had to be recut to 2 ¼" long. The ends were sanded, as were the inner and outer edges of the two rings.

Along one of the marked radial lines a 2 ¼" spacer was placed on its long, narrow edge, with one end even with outer edge of the ring, and the other towards the inner edge. This was done flush with one of the lines, just to the right of it. All other spacers would also be placed flush right of the marked lines. This spacer was then anchored to the plywood with glue and two drywall nails driven through the plywood into the spacer. Three more spacers were placed onto this ring, at 45 degrees, 90 digress and 180 degrees. Each placed along the right side of the marked line, and secured in the same manner as the first.

The second ring was placed on top of the first, with its drawn lines facing up, and lined up with the lines of the first ring. The rings were carefully matched up with the edges of

the four spacers below. Wood glue was applied to the top of each spacer, and two nails were driven through the top plywood into each of the four spacers. This created a 4" thick doughnut with a space between the top and bottom, and a spaced at the four compass points.

In the space between the two rings, the 4" piece of wood was placed to the left of one of already nailed down spacers, in the same orientation. This acted as a place holder and was not nailed down. To the left of this "space holder" another 2 ¼" spacer was placed flush with the spacer holder, again with the same orientation. These were not crammed in tightly, but left slightly lose to facilitate the insertion of the inu later. This was glued on both sides and nailed in place with two nails from the top. The 4" space holder was removed. This process was repeated completely around the circle. After about every five or six slots that were created the ring was turned over, and nails were placed in the spacers that needed them from the other side. When finished there were 36 slots made out of the 72 spacers. Often the spacers had to be sanded a bit to make them fit the space,without crowding the line to the side of it. This occurred quit frequently thoughtout the placement of these spacaers. See figure 31 which indicated where the spacers were placed to create the slots.

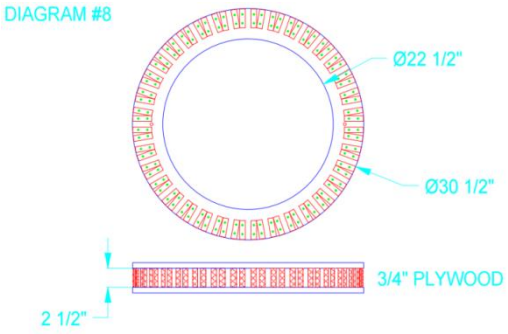


Figure 31 Diagram of spacer placement

The finished toono ring was sanded top and bottom and along all edges.

A center support was made to go over the toono ring, to lift the canvas. This support prevents the canvas from being forced down into the toono center hole by the weight of any rain water that might fall, so there is no pooling of water there.

Two pieces of wood were cut into arch shapes (they were made from scrap ½" plywood), 30" wide and 6" tall. One was slotted in the center, half way up from the bottom with a 1/2" slot and the other slotted halfway down from the top with a ½" slot. These could then be connected to make a four legged arch. On the bottom, along the straight edge of each piece, the center was marked. Then another two marks were made 10" out from the original center mark to each side. A cut was made on these two outer marks ½" deep into the wood and 90 degrees to the straight edge. A line was drawn from the end of each cut to the outer edge of the wooden arch. The wood was cut out along the drawn lines, resulting in a ½ tab along the center length of each arch. When the two pieces are slotted together, this allowed the canvas support to sit ½" down into the center of the ring, and the four cut out areas to sit on the ring itself, so the canvas support would stay in place on the ring, but be easily removable for transport later. See figure 32

Figure 32 Toono ring with arches on top

The covering

There is no need for a heavy wool covering for an SCA use ger, so a simple cover of canvas was made. I used fire retardant, water proofed and mildew resistant Sun Forager canvas, 12 oz. This canvas is good for a yurt covering for the obvious reasons.

The top

Using the directions given five strips of canvas were sewn together to make a large 20' 20" square cover (give or take an inch or so). See figure 33.

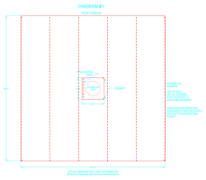


Figure 33 Pattern for top covering

The center strip was made first since it needed a 24" round hole in the middle. It is easier to sew a round hole in a 5' wide piece of heavy canvas, than to sew a round hole in a 20' X 20" piece of canvas. A round facing of canvas, 36" in diameter was cut, with a 24" hole in the center. The outer edges of this facing were folded under and machine sewn into a hem. Then it was placed over the 24" hole in the long strip of canvas with the folded hem edge up. It was machine stitched, twice, all around the 24" hole, about ¾" in from the edge. The seam was graded, by cutting ½" off one of the seam margins. The curves were clipped close to the seam, but not into the seam. The facing was then flipped through the hole to the other side, leaving the top side of the tent canvas strip facing up, and the hemmed facing on the underside. One more line of

sewing was done from the top side, through both layers of canvas, and through the seam allowance, about ¼” from the inner edge of the circle. This was done to help keep the facing on the inside, so it would not come back up through the center hole.

This long piece was then sewn to the next long strip, and then a third strip was added to the other side of the second strip, leaving the pieces with the hole on one side (not in the middle), this was set aside. See figure 34. The other two pieces were sewn together, and finally, the two larger pieces joined together, so the hole was in the center of the now 20’ X 20” square.

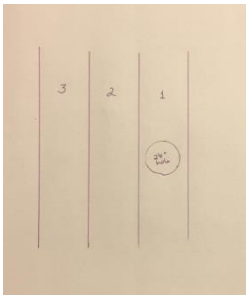


Figure 34

First three strips sewn together

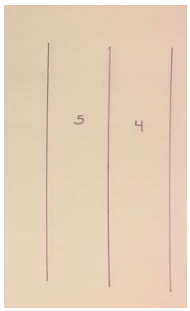


Figure 35

Second set of two strips made

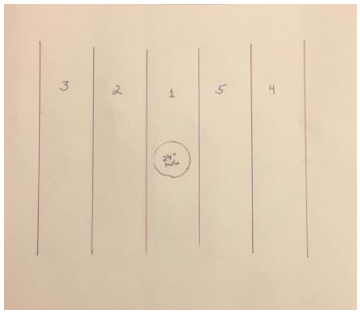


Figure 36

Both sections joined together

These seams were done as French seams. See appendix 2 to see how French seams are made. This required three passes along each of the seams. It is important to note that the direction the seam is turned (on the underside of the canvas) is extremely important. The seam allowance must be flipped towards the center hole and stitched down in that position. Since the center hole is the highest point on the ger, any rain water or accumulated morning dew will run down the roof of the ger. When it encounters a seam, IF the seam has the highest point upwards, and the lowest point downwards, the droplets of water will slide over the seam and down to fall off at the

edge of the ger's roofline. IF the seam is folded the other way, it will produce a little ditch. Droplets will slide along the ditch in a lateral direction until they reach the edge of the ger roofline, but still in the ditch. This means the entire length of the seam water will be present, allowing it more time to seep into needle holes (from sewing the seam) or between fibers and cause leakage of the roof. See figure 37-38.

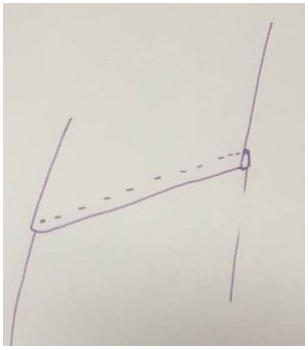


Figure 37, seam folded and sewn upwards, rain runs off

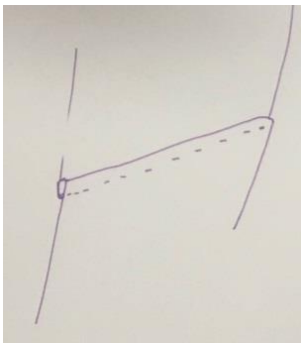


Figure 38 Folded down, rain runs laterally, along seam

A loop of cotton webbing was sewn at each of the four corners and the entire top was hemmed.

In the directions, a square smoke hole cover was made and sewn to the top cover along one side of the square, so that it would cover the hole evenly. It could then be flipped open or closed. I did not do that, instead I made a separate cover in the traditional Mongolian four pointed star shape (Kemery 2006). While only one reference was made to describe this shape, it can be seen on thousands of modern yurts and gers in use in the Near East today, and on art of the period.

A 40"square was cut of canvas. On the each side of the square, at the center point of the side, a dart was sewn, about one foot long, towards the center. The darts were 12 inches long. This gave the cover a domed shape, to go over the wooden arch

that sits on the toono. The exact width of the dart (at the straight side) was determined by draping the cloth over the smoke hole cover support and seeing what worked best. I am not sure right now the exact depth of the dart.

Next a piece of rectangular canvas was cut, 49 ”X 3’. Along one 49” side a mark was made at the 1” place, at the opposite end of that same side, another mark was made at the one inch place. Next the center of that same side was marked. On the opposite side of the fabric a mark 20” in from each corner was made. Lines were drawn from the one inch mark to the opposite side at the 20” mark. This was done on each side. Then a line was drawn from the 20” mark, to the opposite side to the center mark. This was done for both 20” marks. The result is a “W” marked on the fabric. One unmarked side was marked “a” and the opposite, unmarked side was labeled “b”. See figure 39.

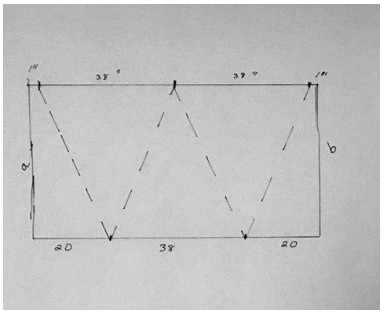


Figure 39 Smoak hole pattern

The fabric was cut along the marked lines, resulting in three isosceles triangles, and two right triangles. The two right triangles were sewn together along their hypotenuses (a and b), with the bases at the bottom of the seam, and the seam ending at the points. This was a 1” deep seam. Then there were four isosceles triangles of equal size, 3’ X 38”

Each of these triangles was sewn to the square, one along each of the four sides. The triangle with the seam was sewn so the seam was on the underside, the same side as extra material from the darts. See figure 40.

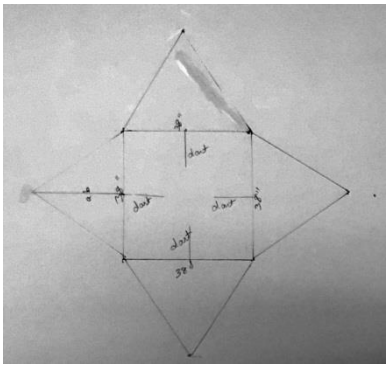


Figure 40 triangles added to the center piece with the darts showing

Once attached on each of the four sides, the entire thing was turned over. At each of the four points a loop of cotton webbing was placed. These were sewn down securely. Then two inches of fabric was turned under to make a hem all around and this was stitched down. See figure 41.

Figure 41 Loop added to each corner

The Sides

The canvas was cut into 9, 6’ 2” lengths; these were sewn together along the 6’2” sides using a French seam to create a long piece, 6.2’ wide and about 54’ long. Along one long side a hem was made by folding under 1” of fabric, and then folding over again, a 2” width, so 3” total was used for the hem, this was sewn twice to create the hem. The top edge of the fabric was folded over to the same side (so all seams were on the inside). This fold was 1” and then another 1 ½” fold was made, it was sewed down. Fifteen feet of the cotton webbing was folded longitudinally, and sewed together to make a more narrow strip. This was then cut into 6” lengths, which were folded double to make 3” loops. These loops were sewn along a 54’ piece of the same cotton webbing, at 3’ intervals, so the cut edges of the loops were even with the “bottom” edge of the 54’ strip, and the top of the loops protruded above the top edge of the 54’ length by about 2”, they were all sewn to the same side of the long strip.

Lastly this 54’ band with the loops was sewn along the entire top hem, trapping the bottom of the loops between the webbing being sewn down and the top hem of the yurt side walls. The loops protruded above the top edge of the side walls. This had two rows of stitches, one near the top edge of the webbing and one near the bottom edge of the webbing. See figure 42.

Figure 42 Webbing with loops being sewed to the top of the side wall

The short sides of the side walls were hemmed and had several loops sewn on along their edge as well.

Door Flap

A door flap was made by hemming a piece of canvas 4’ wide X 8’ tall (before hemming). Three loops were added at each long side evenly spaced from top to bottom, and four were made along the top from which to hang it in front of the door. It was made extra-long, so it could be rolled up at the bottom a bit and a weight or two placed on the extra fabric to form a dam and keep rain out if needed.

A note about the sewing process. Canvas is very heavy, and sewing large pieces together makes it even heaver. The sewing machine was set up next to my bed; a long folding plastic table was set up next to it on the left side. The canvas pieces to be joined were laid together (on the living room floor usually) and rolled up in a scroll fashion. This was placed on the table to the left of the machine. A section was pulled out and placed under the presser foot of the sewing machine, there was usually about a foot or so of slack kept in the fabric so it would not pull on the needle and break it. Only 4 – 5 “of the seam could be sewn before I had to stop sewing because of the fabric bunching up on the far side of the needle. I would get up, walk around to the side of the machine (or other side of the bed, once it reached there), and tug gently to pull the fabric out and away from the needle area, so it wasn’t bunched up. Next I had to unroll a bit more fabric from the scroll at my left, on the table. Then I could sit down and sew another 4-5” of seam. Then repeat. In this way all the seams were sewn. Keeping in

mind that French seams need to be sewn three times each, one can imagine how long it took to sew the fabric for the yurt. Far more time consuming and more difficult than making the frame! See figures 43-44, these pictures are of the side walls. I seem not to have pictures of the top being sewn – it was larger and took up more space.

Figure 43 Sewing the canvas side walls

Figure 44 Sewing the canvas side walls

At his point everything that needed to be made was completed – three days before Pennsic. Yes, I went. My brother helped me set it up once in the yard to make sure it all went together, and then it was packed into the trailer. See figures 45-48

Figure 45

Hanging from the toono

Figure 46

Canvas on and sideswalls pulled up

Figure 47

Top from the inside

Figure 48 The

Inside view

But it wasn't finished yet.

Decorating

There are many examples in paintings of Timurid gers being beautifully decorated. The Timurids loved beautifully decorated homes and encampments. In Clavijo's 1404 stay at a Timurid camp, he describes the Royal Pavilion:

> "The inner walls of the pavilion are lined with crimson tapestry very beautifully woven in patterns of diverse designs, further it is hung with silk stuffs of many colours in places worked over with embroidery of gold thread. The ceiling of the pavilion is its mark of greatest beauty for at the four corners are figured four eagles sitting with their wings closed. The exterior walls of the pavilion are made of a silk cloth woven in bands of white and black and yellow that to us appeared made of silk sarsenet. Outside at each corner there is set a very tall staff capped with an apple of burnished copper above which is a crescent. The summit of the pavilion further is square shaped with four tall staves at the corners, each with its apple and crescent. These staves are set at a great height, being also of considerable size, and they form the framework of what is like a turret made of silk cloth, set with what simulates battlements. There is a gangway from below to come up into the turret, for should the force of the wind disarrange any part of the upper works of the pavilion, or cause damage to the poles, men go up thither and walking afoot on the canvas screens repair the fault. From a distance indeed this great tent would

> appear to be a castle, it is so immensely broad and high. It is a wonder to behold, and magnificent beyond description. Inside within the pavilion there is set a dais, in one part, it is flat and covered over with a carpet on which have been placed three or four mattresses one above the other. This is the seat where his Highness takes his place giving audience. To the left, as you face this, is a second dais also flat and covered with a carpet; it is at some distance apart from the main dais, and beyond it again is a third dais which is lower than the others".

This idea of the lavishness of the Timurid home and camp is seen in the art of the time. Beautifully decorated Timurid gers are seen in art of the time. See figures 49-51

Figure 49 Timerus inspecting his camp

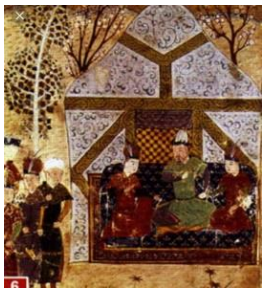


Figure 50 Gingus Khan, Timurid painting

Figure 51 Carpet from Timurid Empire

It seems, however, that the elegant trappings were reserved for the large pavilions, banners, and cloth walls of the encampment itself, but the gers tended not to be so elaborately decorated. "The Mongolians used felt to cover their ger and typically do not decorate them (Kemery 2006)." A second source confirms this saying that the felt of gers, was not dyed, but left plain (Hanson 2004).

The lovely gers seen in the art of the time are probably the artist's embellishment to demonstrate the high status of the subject of his painting, rather than a true

representation of the gers of the time. In his same report, Clavijo confirms what both Kemery and Hanson reported, that the felt of the Timurid gers were not embellished. “The walls of these tents we are now describing are not ornamented with any pattern work or figures as elsewhere may be seen, their only ornament being bands of white which go all round the back up to about half way of the height, thus engirdling the walls outside”.

But Calvijo continues on to describe these bands, “these bands are ornamented with spangles of silver gilt, each of the size of an open hand, and in these have been set jewel stones of diverse sorts. Again round the back part of the tent is to be noted half way up a linen band, set over in small loose pleats, as may be the facings of a woman's gown, and these are all embroidered with a pattern in gold thread; and as the wind blows these loose pleats set on the linen band wave to and fro in a manner pleasant to see. This particular tent that we have been describing had a high entrance, shut by doors, and these were made of red tapestry stretched over a framework of small canes” (Clavijo 1928).

Clavijo does describes what we now call “belly bands”, wide bands that encircle the ger with the function of helping to keep the felt in close contact with the khana. These, it seems, were covered in copious ornamentation, as were the solid doors.

In this same manner I decided to decorate my yurt. I did not use silver or jewels, or gold thread, but I did use Timurid colors and elements chosen from Timurid art.

Two shades of blue, as well as red and gold dominate the Timurid period of art, so these are the colors that I chose to use. Azurite blue is the second most common

blue used in Persian art after ultramarine blue (PURINTON 1991). An appendix to Qadi Ahmad's(1552 –1616, judge and mathematician) text included instructions for making red orpiment (Minorsky 1959). Although the writers used different names for a red pigment, red orpiment, vermilion and cinnabar the pigment are the same chemically (Gettens 1966). Gold was used lavishly.

Long decorative borders are frequently used in Timurid art, around architectural elements and around pages in books. It seemed appropriate to utilize their love of borders for the design on the belly bands. See figures 52-53

Timurid architecture, Samarkan

Timurid Tilework Friday Mosque Isfahan

In addition, the intertwining vines with flowers, presumably pomegranates, and the white five leafed flowers so commonly seen in their art were also used. See figure 54.

Figure 54 From the manuscript of Sa'adi's Kulliyat,1486 CE

Belly Bands

The belly bands of the Timurid period would most likely have been made of felted wool and tied onto the ger using animal hair ties. Rather than felt, like the ger covering itself, these bands were made of canvas. I made two bands about 20” tall and 52’ long.

Having no large area to lay the canvas out, it was measured by laying it on the floor and folding it multiple times and measuring the folded piece, then multiplying. These were hemmed on all four sides; each of the four corners was folded down, so that access to the hem “pocket” was available for all sides. Shock cord was put into both long sides as they were hemmed, to help it stay in place on the ger, Dowels were put through both short ends in the hem pockets.

A templet was made on cardstock weight cardboard. Using this templet, the design was copied onto the fabric. There is one difference between the two bands, one has the central portion left blank, and the other has it filled in. Persian calligraphy is to be added to the blank spaces. Latex house paint was used to paint these bands. The same light blue azurite, that was used for the uni, ultramarine, vermilion and gold, in keeping with the colors used in the Timurid period. The hemmed long strips of fabric were scrolled up and put into a plastic bin at the left end of a long table, one end was stretched out onto the table, and as a portion was painted, it was pulled to the right and laid over anything and everything in the house to let it dry. The canvas was primed with gesso, stenciled, then painted. This meant that each band went across the table three times. See figures 54-56.

Figure 54

Canvas waiting to be painted

Figure 55

Section of painting

Figure 56

My helpers painting

Once completed, it was hung outdoors for a few days to completely dry before being rolled up and stored. See figures 57 and 58.

Figure 57 Spread out in the house

Figure 58 Drying outdoors

Toono

The toono was painted and decorated using designs taken from Timurid period mosaics, keeping the colors in the same scheme as the other parts. The gold arabesque and little white flowers are frequently seen in their work. See figures 59 -61. While I did not find any reference to the decoration of the toono in my research, current Mongolian gers have beautifully decorated toonos, and I believe that comes from a long

tradition. Given the love of the Timurids for ornateness, I felt this was not too much of a stretch.

Figure 59
Modern Mongolian toono

Figure 60
Late Timurid mosaic,
from shrine of Zayn al-Mulk, Isfahan

Figure 61
Timurid, Khargird,
North-east Iran 1442-1443 CE

First the Toono was altered a bit. I personally did not like the appearance of all the extra holes (spaces between the holes for the uni). This would not have occurred in a traditionally made toono. To make it appear more traditional, I glued a canvas strip over all the holes, going completely around the circumference of the ring. Next, only the spaces needed for the uni to be inserted into were carefully cut out of the canvas using an exacto knife. The other holes remained covered. Another ring of canvas was glued to the inside of the ring, covering the ends of all the spacer blocks. No need to cut anything on this. Then the entire toono was sanded and painted with three layers of the blue, to match the uni and the belly bands just finished. The design was stenciled onto the toono around the entire bottom surface and painted in gold. The now canvas covered extra spaces, on the edge, were painted as well with gold paint in a design common to many Timurid pieces of art. See figures 62-24

Figure 61 underside of tono

Figure 62 Underside vompleted

Figure 63 Edge completed

Since the other side of the toono would face up, towards the sky, there was no need to decorate it. BUT - As the ring was leaning against the wall, I noticed it looked like a familiar object from one of my favorite TV shows, so it too, was painted. It HAD to be done, Yes, I have my own Stargate! It is never seen unless the ger is dismantled. See figure 65.

Figure 65 Top of toono

Canvas support

The interlocking pieces that hold the canvas up over the toono were painted in the same pattern. All were sealed with a spar varnish since they could be exposed to rain. Sadly, the varnish did make the gold less vibrant and caused a small bit of yellowing of the colors. See figure 66

Figure 66 Canvas support

Door and door frame

The door was the next item to be made. The original canvas flap was replaced with a solid door (aslike those used by the Timurids’ for gers, as reported by Clavijo). The plywood section that was cut out of the piece of 4’ X8’ plywood to make the door frame surround, was used for this purpose. It was cut in two longitudinally, forming two doors that perfectly fit the opening of the door frame. In the door frame places for hinges were chiseled out and then the door frame itself was painted the same blue as the other wooden objects. The two doors had counter sunk hinges attached to them, so they would not be visible. No hinges have been visible on any yurt doors that I have examined, so I did not whan them seen on these doors. Then they were puttied, as needed, sanded and painted the same blue. See figures 67-69.

Figure 67-69 Dore frame and doors painted blue

After much searching for design ideas I came across a large paper medallion, corners and border in a Timurid/Persian design, similar in color to what had had used for the other items. Although I had planned to paint these myself, the items I found were just to nice, and fit too well with my other designs, that I chose to use them.

This was applied to the door frame and doors with glue. Three coatings of sealant were applied over this to completely seal the paper to the door. Since the door is covered with paper, a canvas shade is always put up so that the edge goes over the door frame to protect it from the rain. See figures 70-73

Figure 70
Doors with design applied

Figure 71
Door frame with border applied

Figure 72
Close up of door frame

Figure 73
Frame and doors

Smoke hole cover

Lastly the canvas smoke hole cover was painted in the same light blue with a narrow dark blue border. See figure 74.

Figure 74 Smoke hole cover

After getting all the “necessary” decorating finished, it was time to make some adjustments.

Post Production Adjustments

The top cover

The original canvas cover instructions resulted in a large square canvas that was staked down at the four corners. While it was efficient, it certainly was not in the tradition of gers of the time. The two roof felts of a ger would overlap and create a smooth top with the edges folded down over the side. They did not end in four corners. So the canvas was cut to a circular shape, hanging down about 18 inches past the top edge. See figures 75 and 76.

Figure 75 Square top

Figure 76 Top cut round

This was a vast improvement, but due to the conical shape of the top and the flat shape of the canvas, bits of it drooped down between the uni. Not pleasant and not correct. To solve that problem, two darts were sewn into the top canvas going from the outer edge of the fabric to within two inches of the center hole. These were on opposite sides of the canvas, in the longest center panel, the strip that the smoke hole is cut out

of. This location for the darts was chosen because it meant there were no other seams that would have to be caught in the tuck, making it necessary to sew over those seams – something that is difficult to do. These tucks were about six inches deep at the outside edge and ended in a point near the center hole. To do this, the ger was put up, the canvas top put on, and two folds were made in the fabric at the perimeter until the canvas was snug against the Khanna edge.

The local library allowed me to use their conference room to lay the fabric out. It was folded in half, and the darts were marked according to the measurements taken. See figure 77.

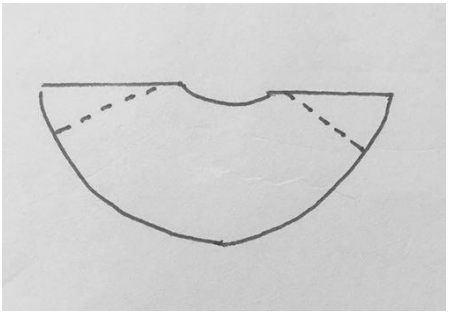


Figure 77 Darts marked

The fabric was sewn along the marked lines at home, and re-hemmed. A smooth top was achieved.

A second issue with the top canvas is wind. In high wind, even with the compression band and the belly bands, wind gets under the edges of the top canvas and tries to lift it off. Eight or ten loops will be sewn into existing seam areas around the edge of the cover, at the point where it folds down over the Khanna. These loops can have rope attached and then be staked to the ground on the inside edge of the khana

(by pulling the ropes through the khana lattice). It will not detract from the outer appearance of the ger, and should stop the top canvas from trying to escape.

The sidewalls

Another issue I had with the ger was the heaviness of the side walls. To remedy this, the sidewall was cut into three pieces of equal size. A 6 foot long piece was added to the center section (to allow for overlap). The newly cut edges all had a series of ties sewn onto them, about 1 ½' from the short edge where it was just cut, so the three sidewall pieces could be overlapped and tied snugly. This also made it easier to pull the canvas away from the Khanna and let fresh air flow through the ger.

Belly Bands

The decorated bands ended up being almost too small. Not having a true space to measure them was the problem, they were cut shorter than intended. They will go from the edge of the door frame surround to the edge of the door frame surround, but there is nothing left to fit behind the surround to meet with the 2 X 4s as was intended. With just a little drooping of the bands, the end of the fabric is exposed and it is not pretty. To solve this problem some fabric was added to both ends, these pieces were painted in the same design. At the same time, the top piece of shock cord was replaced with a plastic covered cable and turnbuckle, to allow it to be more securely fastened to the

khana walls, hopefully helping to keep the roof canvas secure, and to estop the band from drooping (as it does now, a bit). See figures 78-79

Figures 78-79 Added on ends painted

Uni

Some of the uni were very difficult to fit into the slots of the toono, making set up and break down difficult. I believe this was because of the paint on the uni, it was just thick enough to create a problem. Those uni which had a sticking issue were sanded to be a bit more narrow, and repainted. There is no problem with sticking uni anymore.

Smoke hole cover

The smoke hole cover is too small. In high winds it can shift a bit. While no rain has ever come in from this, it is a very real possibility. This is in the process of being

altered by adding an extra foot of fabric around its perimeter. This new area will be painted, probably with a border of some kind.

Things I would do differently

I would join all the strips of the khana with knotted leather strips. I did not find out how this was done until after the ger was made.

I would use nylon webbing instead of cotton; cotton webbing is not strong and rots too fast. I had to replace the webbing on the smoke hole cover. The webbing on the sides is under cover and has not had any issues.

I would get two very patient friends to help with the sewing, one to feed the fabric to me and one to pull the fabric way. Having to jump up and walk around the room ever 6 or 7 inches, for that much sewing was tiring and really slowed the entire process down.

Works Cited

Allsen, Thomas. *Commodity and Exchange in the Mongol Empire: A Cultural History.* Cambridge: Cambridge University Press, 1997.

Alvarez-Mon, Javier. *THE ARJAN TOMB:AT THE CROSSROADS BETWEEN THE ELAMITE AND THE PERSIAN EMPIRES.* Dissertation s, Near Eastern Studies, University of California, Berkley: University of California, 2006, 58-150.

Arc, Joan of. *Joan of Arc: In her own words.* Translated by Willard Trask. Santa Fe: Turtle Press, 1996.

Benton, Janetta Rebold. *Materials, Methods, and Masterpieces of Medieval Art.* Santa Barbara: Greenwood Publishing, 2009.

CARPINI, JOHN OF PLANO. *MISSION TO ASIA.* Edited by Christopher Dawson. Translated by TRANSLATED BY A NUN. New York: HARPER & ROW, 1966.

Carr, E, C. *Screws.* 8 2016. http://quatr.us/physics/machines/screw.htm.

Cennini, Cennino d'Andrea. *Il Libro dell'Arte.* Translated by Jr., Daniel Thompson. New York: Dover Publications, 1960.

Clavijo. . *Embassy to Tamerlane 1403-1406.* Translated by Guy Le Strange. New York and London: Harper, 1928.

Duly, Colin. *House of Mankind.* London: Thames and Hudson, 1979.

Durand-Guédy, D. "Khargāh: An inquiry into the spread of the "Turkish" trellis tent within the ʿAbbāsid world up to the Saljūq conquest." *Bulletin of the School of Oriental and African Studies.* Vols. 57-85. doi:10.1017/S0041977X16000021. 2016.

Fouchier, Sabine. *Felt.* London: A & C Black, 2007.

Gettens, R. J. *Painting Materials.* New York: Dover Publications, 1966.

Grohmann, A. *Arabische palaographie, pt. 1.* Vienna: Kommissions verlag der osterrelchischen der Wissenschaften in Wei, 1967.

Hanson, Jennifer. *Mongolia.* New York: Facts on File, 2004.

Herodotus. *The History of Herodotus, Book IV.* Translated by George Rawlinson. MIT, 440 BCE.

Hopper, David. *Useful Plants and Drugs of Iran and Iraq.* Chicago: Field Museum of Natural History, 1937.

Kemery, Becky. *Yurts: Living in the Round.* Stalt Lake: Gibbs, Smith, 2006.

Minorsky, V., trans. "Calligraphers and painters: A treatise by Qadi Ahmad, Son of Mir Munshi." *Paper.* Washington, DC: Smithsonian Institute, 1959. 174–201.

Morgan, Fiona. *GESSO VS PRIMER VS GROUNDS VS SIZE - WHAT'S THE DIFFERENCE?* 5 18, 2019. http://spacesbetweenthegaps.wherefishsing.com/2010/05/gesso-vs-primer-vs-grounds-vs-size.html.

Morgan, Tony. *What Do You Know about the History of Woodworking?* 11 13, 2014. https://www.wagnermeters.com/woodworking-history/ (accessed 6 3, 2016).

Nationaln Geographic Yurts. 2017. http://www.nationalgeographic.org/encyclopedia/yurt/.

Noble, Allen. *Vernacular Buildings: A Global Survey.* London: Taurus and Co. Ltd, 2014.

Valerie Dorge, F. Carey Howlett, ed. "Painted Wood: History and Conservation." Los Angeles, Williamsburg: Getty Conservation Institute, 1994. 46-48.

Polo, Marco of Venice. *THE TRAVELS OF MARCO POLO, THE VENETIAN, 1298.* Translated by W, and Wright, Thomas Marsden. SOAS BULLETIN OF BURMA RESEARCH, 2004.

PURINTON, and WATTERS. "A STUDY OF THE MATERIALS USED BY MEDIEVAL PERSIAN PAINTERS." *Hournal for the American Institute for Conservation* 30, no. 2 (n.d.): 125 - 144.

PURINTON, Nancy, & WATTERS, Marc. "A STUDY OF THE MATERIALS USED BY MEDIEVAL PERSIAN PAINTERS." *Journal fo the American Institute of Conservation* 30, no. 2 (1991): 125 to 144.

ROSTOVTZEFF, M. *IRANIANS & GREEKS IN SOUTH RUSSIA.* Oxford: CLARENDON PRESS, 1922.

RUBRUCK, WILLIAM OF. *The Journey of William of Rubruck to the Eastern Parts of the World 1253 - 1255.* London: The Blanket Society, 1942.

Sandpaper: Ancient Invention Increasingly Becomes High-tech Marvel. American Chemical Society. 3 17, 2017. https://www.sciencedaily.com/releases/2007/07/070723095258.htm.

Schemerl-Streben, Nicole. *History of veneering – from handicraft to industrialisation.* 2017. http://bene.com/en/office-magazine/history-veneering-handicraft-industrialisation/.

Stronach, David. "On the Antiquity of the Yurt." *Silk Road Foundation News Letter* (University of CA) 1, no. 2 (6 2004).

Thrton, Johnathan. "A BRIEF HISTORY AND REVIEW OF THE EARLY PRACTICE AND MATERIALS OF GAP-FILLING IN THE WEST." *Journal for the American Institute for Conservation* 37, no. 1 (1998).

Vallat, François. *THE HISTORY OF ELAM.* 2015. http://www.cais-soas.com/CAIS/History/Elamite/elam_history.htm (accessed 3 10, 2017).

Vasari, Giorgio. *VASARI ON TECHNIQUE.* Translated by LOUISA S. MACLEHOSE. London: DENT & COMPANY, 1907.

Yazdzik, Elisabeth. "The Mongolian Horse and Horseman." *Independent Study Project (ISP) Collection. Paper 1068.* 2011.

Appendix 2

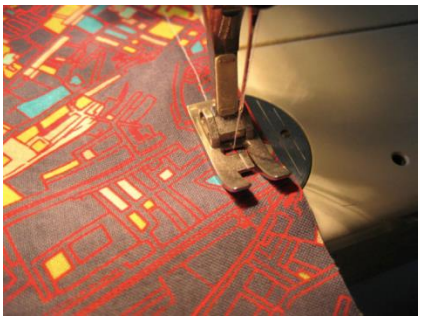
French seam, Sewed down

STEP 1:

Pin wrong sides together and place in the machine at 4/8" seam allowance.

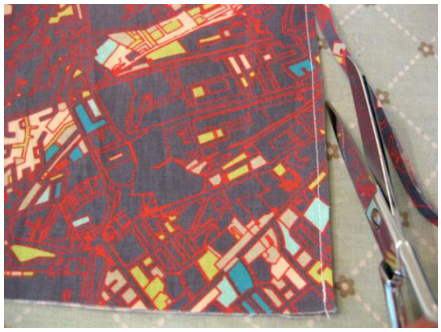
STEP 2:

Sew the entire seam at the 3/8" seam allowance.



STEP 3:

Trim the seam allowance down to 1/8". I did not do this for the ger, but left it as it was



STEP 4:

Open the seam, right side of the fabric facing up.

STEP 5:

Finger press the crease, then pin the layers together along the pressed edge.

STEP 9:

Insert the seam into your sewing machine. Sew the quantity to equal the project's seam **allowance based on what you used in step 1. If you sewed at 3/8" and the seam** allowance is 5/8" that means you should sew this step at 2/8" or 1/4". **For the ger this** seam was 1" deep.

STEP 10:

Continue sewing the entire seam, trapping the original seam and allowance in the fold.

STEP 11:

Press on the wrong side of the seam, pressing the entire French seam to one side. I finger pressed this.

STEP 12:

Top stitch the seam allowance to the canvas top so it cannot shift position. Keep the seam on the higher side of the canvas top, folded towards the smoke hole. In the picture, below, the smoke hole would be to the right side of the seam.

Appendix 3

Setting up / breaking down issues

I won't go into how to set up a ger, that is not relevant to this paper, but I will share several things I have done to make it easier and possible to do it alone. A very important thing when you camp by yourself.

1. I cut a tarp to the exact inside diameter of the yurt. This serves as a template for where to put the khana, without having to measure each time, no adjusting repeatedly to get the correct diameter, or a proper circle.

2. One problem is holding all the khana up while attaching the doorframe, it is wobbly and wants to collapse, two hands can't get around the entire thing. I now carry four foot tall plastic coated wire plant stakes – sold in garden supply stores. I can push them into the ground on alternating sides of the khana as I set it up on edge, letting me eventually get the entire khana to stand up without any assistance.

3. Holding the heavy doors and door frame while attaching it to the khana.

I purchased an eight foot tall "little giant ladder", (that will be used for the roof ring), but it also is used for the door. By putting it over the door it will hold the door upright while it is being attached. I can then collapse the legs on the inside, pull it over the doorframe and into the center of the yurt. I marked the center of the circular tarp so I know where the exact center its.

4. Holding the toono up, about 7 feet high, while inserting the uni is the next problem. Sometimes supports are made to hold the ring up, but these then must be held by people to steady them. I set the ladder in the center of the ring at the eight foot height. Next I hang two "platforms" (which are widely available, specifically made for the little giant ladder), one on each side, making a shelf on each side of the ladder at about the 7 – 7 ½ 'height. A short board is placed over these two shelves and the toono can then be set onto this. It is not extremely steady, but does work. Carefully, uni are added the first two opposite each other, the next two at 90 digress, then half way between each of the previous uni. This is done carefully, so the ladder and toono are not knocked over. By the time 8 or 10 uni are in, the ring has started to lift and the ladder is no longer needed. It is handy still, to help adjust the ring so it is level. The rest of the uni can easily be added.

5. Before putting up the uni over the doorway, the roof canvas is shoved up onto the roof. It is pulled to the center of the yurt, an uni pole can be used from underneath to help push the canvas bundle towards the center hole at the top. Using the ladder, I can stand with my upper body through the hole and spread out the canvas to cover the yurt. Then the last uni are positioned over the doorway. When taking the down the yurt I do much the same. I use wood clamps and clamp the canvas to the uni ring on one side only. Then I pull half the canvas over to the other side making it a semi-circle. I move the clamps now so only ¼ of the canvas is clamped to the ring. Next I fold it into fourths, then I can fold the sides in to form an almost rectangle. This rectangle is folded on its self a few times, and dropped down through the space over the door. Now it is folded up and ready for the next time – easy to unfold and spread out.

6. After the structure is set up entirely, I spread out a 18-20 foot above ground pool cover. It serves as a second floor over the tarp and will go up the sides of the ger on the inside about 6” (it’s not easy to spread out evenly, so a bit larger than the actual yurt diameter is easier to work with). I use bull dog clips from the office supply store to anchor the cover to the khana about 6” over the ground. At the doorway it is just folded down so no one trips over it. In the event of a big rain, it can be pulled up there too.