

BUILDING A MONGOLIAN YURT (OR GER)

By Sir Ogami Akira
Diagrams by Lord Michael the Tinker

(Please note-- these plans were originally obtained from Dark Horde Moritu. The original set was produced with the knowledge of then Moritu KaKhan Todric.

These plans are for a 16' diameter yurt with a wall height of 5'8" and a center height of 8', producing a circular footprint of 201 square feet.)

Also included in the diagrams are modifications for 12 and 14' diameter yurts with the same wall and ceiling heights.

A yurt is a wooden frame with canvas hung over the frame. The frame consists of a two part expanding lattice sidewall (which includes a door frame assembly), roof poles which notch into the lattice walls, and a center ring into which the roof poles slot. The center ring is the key to the yurt's stability and structural integrity. It is important that you DO NOT TRY TO MODIFY THE CENTER RING. Build it exactly as described in the plans. Everyone who has modified the center ring has had serious problems, up to and including a roof inversion.

WHAT YOU WILL NEED:

Tool Checklist:

- Power drill (two, if possible) with both wood and screwdriver bits
- Two medium sized 'C' clamps
- Jig saw
- Power sander or sandpaper
- Yardstick
- Carpenter's 'L' square
- Measuring tape and pencils

Frame Materials Checklist:

- 70 pine lattice strips (1-½" X 1/4" X 8') These will become your walls, called khana)
- 40 spruce furring strips (1" X 3" X 8') These will be your roof poles and the spacers in your center ring. The wood is cheap and low quality, so select the best pieces you can find.
- One 4' X 8' sheet of 3/4" plywood. This will be the major part of your center ring.
- Three 2" X 4" X 8' studs. These will form your door frame.
- Eight 3" steel corner brackets. These will hold your door frame together.
- Two 1" X 4" X 6' boards. Use a medium-hard wood such as poplar.
- Six 3" steel 'T' brackets.

- One dozen 1 1/4" wood screws with heads slightly smaller than your canvas grommets.
- Four 4" steel screw hooks (to attach your roof pole rope and belly bands to).
- 300 1&1/2" drywall screws for the center ring and door frame.
- Two 2" X 2" X 8' studs.
- Two 4" common nails
- Waterproof wood sealant or water-resistant stain and paint brushes.
- These four things will be used to bolt the lattice strips together.
 - 276 1&1/4" X 1/4" round-headed stove bolts (or carriage bolts)
 - 260 1/4" hex nuts with nylon inserts
 - 25 1/4" wing nuts
 - 276 5/8" washers

Erection and Covering Materials Checklist:

- 20' X 20' canvas for the roof with a heavy grommet set into each corner. It should have a 24" diameter (NOT radius) cutout for a smoke hole in the center. Have a 36" X 36" canvas smoke hole cover sewn along the cutout, parallel to one of the sides (SEE DIAGRAM # 1). Both free corners of the smoke hole cover should have heavy grommets set into them.
- *** 20' X 20' is the recommended dimension. Canvas can come in 48" or 60" width material, the finished size can vary quite a bit (+/- 12" max). See seam layout on DIAGRAM #1. This diagram is shown with 48" material.
- 6' X 48' wall canvas with a heavy grommet set approximately every 36" along one long edge and 4-6 grommets along each of the narrow edges. (Note-- If you want an exact fit, you will need to trim your canvas after the yurt has been erected. Remember that canvas shrinks.)
- 50' of 1/4" nylon rope. This runs through holes drilled at the bottom end of your roof poles.
- 20 1-1/2" 'S' hooks. These are to hang your wall canvas from the roof pole rope.
- Two 50' nylon straps. These are used as 'belly bands' and wrap around the khana to provide support for the frame.
- Six 10' lengths of heavy nylon cord. These are your tie-down ropes for your roof canvas and smoke hole cover.
- Four tent stakes. I recommend 'magic sevens'.
- (Optional) 16' diameter above ground pool cover for use as a ground cloth.

*** Special notes for the canvas:

When ordering the canvas make sure to specify reinforcing at all grommet locations. The directions of the seams should be over/under and out from the center smoke hole, otherwise leakage will be a problem. Inquire as to the types available including fire retardant canvas.

HOW IT WORKS AND WHERE TO START:

The strength of a yurt is in its frame. The two sections of khana (lattice wall) are bolted together using wing nuts. The ends of the completed wall section are bolted to the door frame. Also attached to the door frame are two nylon straps which encircle the yurt (one at the top, one at waist level) and provide lateral support. The roof poles are slotted into the center ring and a rope is run through holes in the ends of the roof poles which is then tied very tightly to the door frame.

The wall canvas is hung from the roof pole ropes by the 'S' hooks. The roof canvas is then pulled over the top and secured by the cords to the stakes.

Read through these plans several times. Get a good idea for what it's going to look like and how to do it. Think about ways to make it easier, quicker, and better. Find a place to do the construction and gather round all the stuff that you'll want to make the day go faster, like a radio, a cooler full of Pepsi, and a few friends. Be sure to wear safety goggles and to use work gloves.

CONSTRUCTION

1) The Khana:

- a) Take a lattice strip and measure from one end, marking it in the center at 9", 21", 33", 45", 57", 69", 81", and 93". (This will give you a 9" space at the bottom and a 3" space at the top.) Using your 'C' clamps, clamp together four or five lattice strips with the marked one on top. With a 1/4" drill bit, drill straight through the center of the lattice at the marked spots. Repeat this until you have drilled all of the lattice. (SEE DIAGRAM #2) ***If you have access to a drill press, this will make the job both easier and more precise. To make consistent holes, always use the first piece as a template for all further drilling.
- b) Sand and stain all of the lattice and let it dry completely. (Note- You will be cutting some of the lattice later, but it is much easier to touch up the cuts with stain than it is to disassemble and reassemble.) Take pencil and number each strip, 1 - 68.
- c) Begin to bolt the lattice strips together. (All EVEN numbered strips should lie underneath all ODD numbered strips, or vice versa. What matters is that you are consistent and that you avoid 'weaving' the strips together.) The round bolt heads should all be on one side of the lattice, and you will need to put a washer under every nut. Continue until strips 1-35 are a single khana. (SEE DIAGRAM #3)
- d) Bolt strips 36-68 together. Cut the door frame ends off to give it a nice straight line, and use the cut ends to fill in where no strips were before.

2) The Door Frame

(Note-- the door frame requires a lot of careful work. Not only does it hold the door, but the khana are bolted to it, the roof pole rope ties onto it, and the side canvas is attached to it as well. All four of these things are important to the function of the yurt,

and they all come together on the two uprights of the door frame. For this reason, I have broken down the door frame construction into several parts.)

a) The basic frame and the khana attachment points

- i) From your 2" X 4"s, cut two pieces 5' 8" long. From your last 2" X 4", cut two pieces 36" long. On the end of each piece (on the 2" wide side), mark a 45 degree angle and trim them. Lay them out on the ground so the angles fit together and they form a rectangle. It should look like a picture frame. With a pencil mark the left long piece "left inside" and mark the right one "right inside". This will keep you from making a mistake later on.
- ii) Take the left inside piece and turn it to its narrow (2") side. From the bottom, measure up and mark the centers at 15-3/8", 32-3/8", and 49-3/8". Drill a 1/4" hole all the way through at each mark.
- iii) Measure 3" above and below each hole. Turn the piece to its wide side. With your jig saw, cut slots 6" wide and 1 1/2" deep. Repeat this with the right piece. (SEE DIAGRAM #4)
- iv) Lay the frame out again with the inside facing the ground. Screw a 3" steel corner bracket onto each corner. Turn the frame over and repeat. Your door frame should now be a single unit.
- v) From the outside, slide your 3 1/2" stove bolts through. Put on the washers and twist on the wing nuts.

b) The canvas attachment panels

- i) Take your 1 X 4s and cut them to 5' 8" long. Stain or paint them, and let dry.
- ii) Take your six 3" 'T' brackets. Clamp the top of the 'T' into a vise, and, with a hammer, bend the long end to a 90 degree angle.
- iii) Lay the door frame front down against the ground. Hold the narrow edge of a 1 X 4 tightly against the front edge of the door frame.
- iv) Position the 'T' brackets near the top, middle, and bottom of the 1 X 4 (with the wide end laying against the door frame) and mark the screw holes. Screw the wide end to the door frame first, then screw the 1 X 4 to the bracket. Repeat on the other side. (SEE DIAGRAM #5)

(Note-- You might want to do this next step when the yurt is erected for the first time. It will help in placement.)

- v) Determine where the grommets will be when the canvas sidewalls are up. Put your 1 1/4" wood screws on the inside of the attachment panels close to the door frame. When the yurt is erected, simply slip the grommets over the screw heads.

(Note-- An alternative method which does not use screws or grommets is to wrap the end of the canvas around a 1 X 2 and to jam it between the khana and the attachment panel. This works fairly well. The best method I have seen is to use

grommets on one side and 'jamming' on the other. This allows for canvas shrinkage and diameter variation when setting up.)

- c) The roof pole rope and belly band attachment hooks
 - i) Near the top of the door frame on each side, screw in the 4" 1/4" screw hooks. Repeat this at about waist height. It helps if you drill a small pilot hole first. Position the hooks so they face up. The top hook is used for both the roof pole rope and the top belly band.
 - ii) You're done with the frame. Have a beer and nurse your blisters.

3) The Door

I have not included instructions for the yurt door since there are so many ways to do one. The door seems to be where many yurt owners express their creativity. You can use a simple canvas flap (not good in bad weather) , a single plywood door, a double plywood door, or an elaborate double Dutch door. The only thing I haven't seen is an aluminum storm door with a screen. The nice thing about a wooden door is that you can put a lock on it. **REMEMBER THAT YOUR DOOR MUST OPEN OUTWARD TO MAKE ESCAPE EASIER AND FASTER IN CASE OF FIRE.**

4) The Roof Poles

- a) Take a 1 X 3 and cut it to 7' 6-3/4". Using your jig saw, cut and slot it as shown in DIAGRAM #6. Drill a 3/8" hole above the slot for your roof rope. The slot will rest between the 3" crossed lattice strips.
- b) At the other end of the 1 X 3, notch it as shown in DIAGRAM #6. This end will fit into the slots of the center ring.
- c) Using this piece as a guide, mark, cut, and drill 33 more 1 X 3s.
- d) The last two roof poles rest on top of the door frame. Trim the firing strip to 7' 3". Cut the top notch as in the others, but on the bottom trim it as shown in DIAGRAM #7
- e) Sand the roof poles thoroughly, especially the top edge and the curved bottom where the canvas will be touching them.
- f) Stain or paint the roof poles and let them dry completely.

5) The Center Ring

The center ring is the most difficult part to build. Take your time and do it right. **DO NOT TRY TO MODIFY THE PLANS AND DO NOT TAKE SHORTCUTS. YOU WILL REGRET IT IF YOU DO.**

- a) From your plywood, cut two 30½" circles. Mark the center points. Copy the page with DIAGRAM#9 and cutout the protractor, place the protractor in the center and put a nail in the center. With a string and pencil mark off each 10 degrees of the arc. Using your yardstick, draw a line through the center point along each mark. (These lines will tell you where to put the slots for the roof poles.)

- b) From the center points, mark 22½" circles. Using your jig saw, cut out the inner circles. This will give you two 4" thick rings with 36 lines drawn on each one. (SEE DIAGRAM #8)
 - c) Sand the non-marked side and edges of the rings. Do not sand the marked side or you will lose your guide lines.
 - d) Take the waste pieces from your roof poles and the extra 1" X 3"s and cut them into 2-1/2" long pieces. These will be the spacers, and you will need 72 of them. Cut several extra because some will break when you drill into them. Sand the cut ends lightly.
 - e) Line up the non-sanded edge of a spacer to the left (or right) of one of the lines drawn on a ring.. (It doesn't matter which side of the line you orient with, as long as you do it consistently.) Drive two drywall screws through the plywood and into the spacer.
 - f) Rotate the ring roughly 90 degrees and attach another spacer. Repeat until you have a spacer at the four points of the compass.
 - g) Take your second ring and lay it on top of the four spacers. Align the edge of the spacers to the lines drawn on the ring. Drive two drywall screws into each spacer.
 - h) Using a spacer as a gauge to tell you how wide to make the slot, place a second spacer next to the first and screw it into place. Don't make the fit too tight, or you will have problems setting the yurt up or taking it down when the weather is wet. Repeat this until your ring has 36 slots made from 72 spacers. (Note-- Occasionally you will need to shave a spacer in order to make it fit.)
 - i) Designate one side of the ring as the bottom. Drill two 3/8" holes on opposite sides about an inch and a half from the inner edge. These will be where you slot in your center ring support stand.
 - j) Sand the outer edge of the ring until it is reasonably smooth.
 - k) Stain or paint the center ring and let it dry.
(Note-- Many people (including me) put a low arch (no more than five inches high) over the smoke hole to prevent water pooling when it rains. I used scrap plywood, but I've seen band iron used very effectively.)
- 6) The Center Ring Support Stand
- a) Take one of your 2 X 2s and cut two pieces which are 32" long.
 - b) From your scrap plywood, cut two equilateral triangles which are about 10" on each side.
 - c) Center the edge of a triangle on one of the 32" pieces. Drive in several drywall screws. Do the same with the other two pieces.
 - d) Center the remaining 2 X 2 on one of the triangles, and drive in several drywall screws. Repeat this at the other end.

- e) Measure the distance between the two holes in your center ring (from the center of the holes.) It should be about 25 ½". At the top of one of the 32" 2 X s, hammer in the 4" common nails until about 2 1/4" remain. The nails will be inserted into the holes to lift the center ring into the air so you can slot in the roof poles. (SEE DIAGRAM #10)

7) How to Erect the Yurt

Putting up a yurt takes a little practice, so take your time.

- a) Stretch the two khana panels slightly and overlap them so that they line up. Insert the bolts through the holes and screw down the wing nuts snugly.
- b) Stand the khana up and stretch it into a circle. The 'diamonds' formed by the lattice should have 90 degree angles.
- c) Bring the door frame to the opening in the khana. Slip the holes in the lattice over the bolts in the door frame. Tighten the wing nuts snugly.
- d) Adjust the khana as best you can into a perfect circle. This never works as well as it should.
- e) Tie off one end of the top belly band to the top hook on the door frame. Slip the band into the crotch of each 3" cross at the top of the lattice. Snug it down and tie it off on the opposite top hook.
- f) Put on a hard hat (no joke, especially if you have lots of people "helping"). Hook the center ring into the nails on the center ring support stand. Lift the ring into the air and position it as best you can in the center of the yurt.
- g) Have a second person take a roof pole and fit it into one of the slots of the center ring. The bottom of the roof pole is then slotted over the belly band in the 3" crotch of the lattice.
- h) The remaining roof poles are put in an 'opposite' clock sequence-- if you started in the 3:00 position, you then do the 9:00, then 12:00, then 6:00. Continue to fill in with the 'opposite' clock sequence. After the first six or eight are in, both of you can put in roof poles until they are all in place. The ones over the door should be put in last.
- i) Tie off one end of the roof pole rope to the top hook on the door frame. Feed the rope through the holes in the roof poles. When you get all the way through, tighten the rope until the center ring support stand either falls over or is lifted into the air. Tie off the rope.
- j) Tie off the middle belly band and snug it around the middle of the yurt. Tie it off on the opposite side.
- k) Stretch the sidewall canvas out along the yurt. Hook the grommets into the attachment panel and, using your 'S' hooks, hang the canvas from the roof pole rope.
- l) Stretch out your roof canvas in front of the yurt. Orient it so that the smoke hole cover opens the way you want it to. (I prefer front to back.) Lift the edge of the

canvas over the front roof poles. Pulling by the corners, slide the canvas over the top. (It helps if someone is inside the yurt, pushing the canvas up with a padded stick.

- m) Push and pull the canvas until the smoke hole is centered on the center ring.
- n) Drive in stakes at the four corners and tie down the canvas. Tie off the smoke hole cover cords to the stakes, as well.
- o) You're done. Call your friends over to admire it.

General Notes:

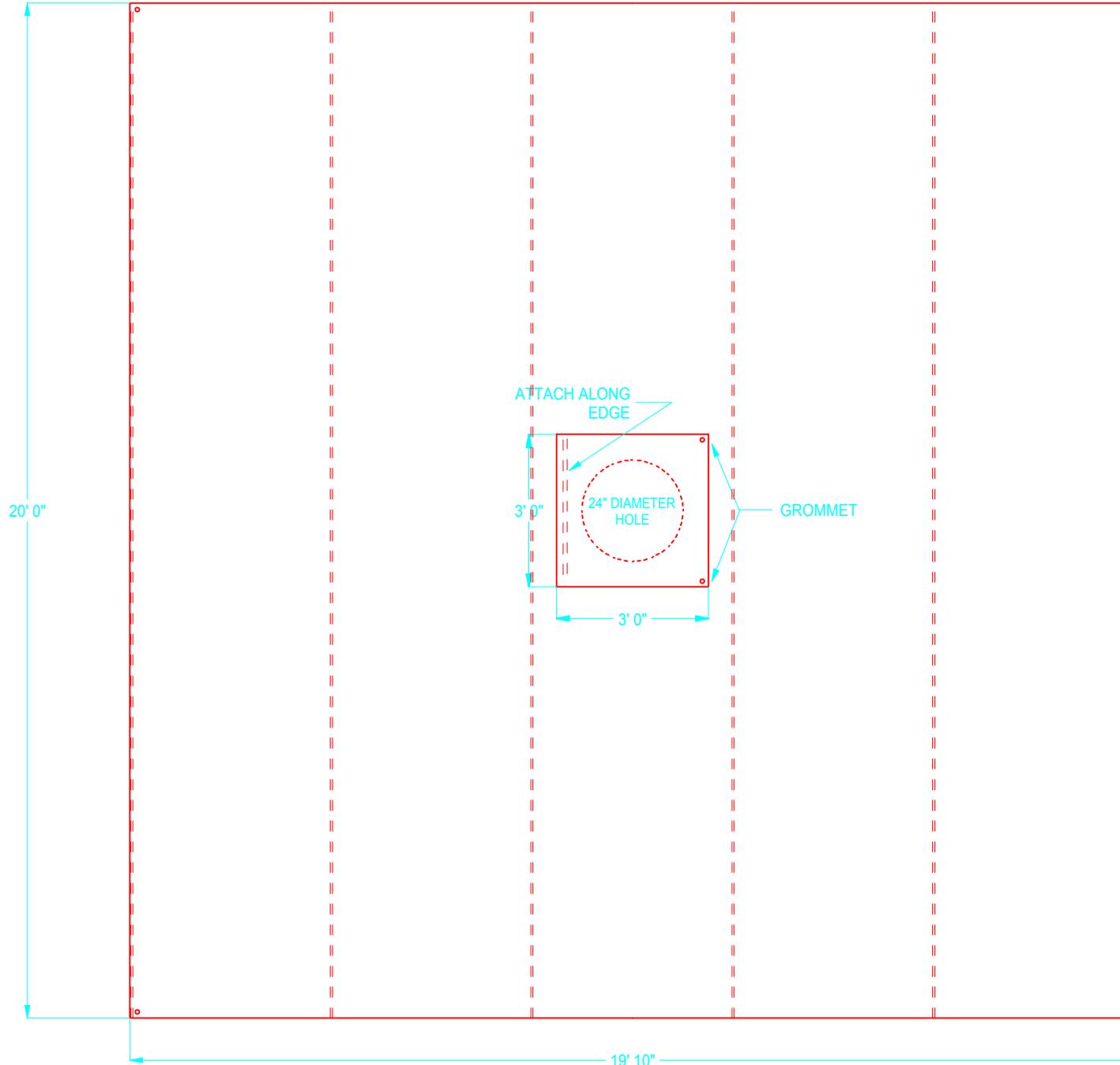
- 1) In very windy or bad weather, it helps if you tie a rope around the outside of the yurt, just under the protrusion of the roof poles. When I do this, I tie the rope off on the top hooks on the door frame.
- 2) Use a tarp as a floor on the yurt. It makes it much nicer if you cover the tarp with (cheap, old) rugs.
- 3) If you hang a chain from the arch in your center ring, you can use an 'S' hook to hold a lantern.
- 4) Yurts aren't bug-proof. Netting can be put over the worst openings, but bugs will get in. If you are in an area which is prone to insects like mosquitoes and flies, consider buying a Mombassa net for over your bed.
- 5) Yurts are big and heavy. If you transport it with a roof-rack on your car, then put down the door frame first and lash everything else on top of it.
- 6) To make it easier to transport and handle the khana, take two 1' X 3" pieces of wood. Drill 1/4" holes near the tops, and insert a couple of 4" bolts with wing nuts. Make two of these. Lay the khana sections down on top of each other and slip the ends between the boards, Screw the wing nuts down and you will have a neat package to carry instead of a floppy and difficult to manage bundle.
- 7) Get a small sized Tucker Tote and put all of your yurt stuff in it-- ropes, belly bands, 'S' hooks, stakes, etc. Be sure to carry along a flashlight and extra 'S' hooks, bolts and nuts, and wing nuts. Having everything in one container makes life a lot more pleasant, especially for night time set up.
- 8) Clothing can be hung on hangers on the inside walls. You can also hang shelves, equipment, small baskets, and lots of other things.
- 9) If flies are a problems, take several silk (or rayon or nylon) scarves and hang them from your roof poles. The flies will be attracted to the swaying motion of the fabric and spend less time on you.

Miscellaneous Specifications

Yurts Size	Kana Roof Poles	Door Roof Poles	Actual Diameter	Roof Pole Length	Roof Angle
16'	32	2-3	15'9"	90-3/4"	20.5 Deg
14'	28	2-3	13'11-3/4"	80-13/16"	23.5 Deg
12'	24	2-3	12'2-1/16"	70-7/8"	27 Deg

DIAGRAM #1

ROOF CANVAS



GROMMET ALL
CORNERS

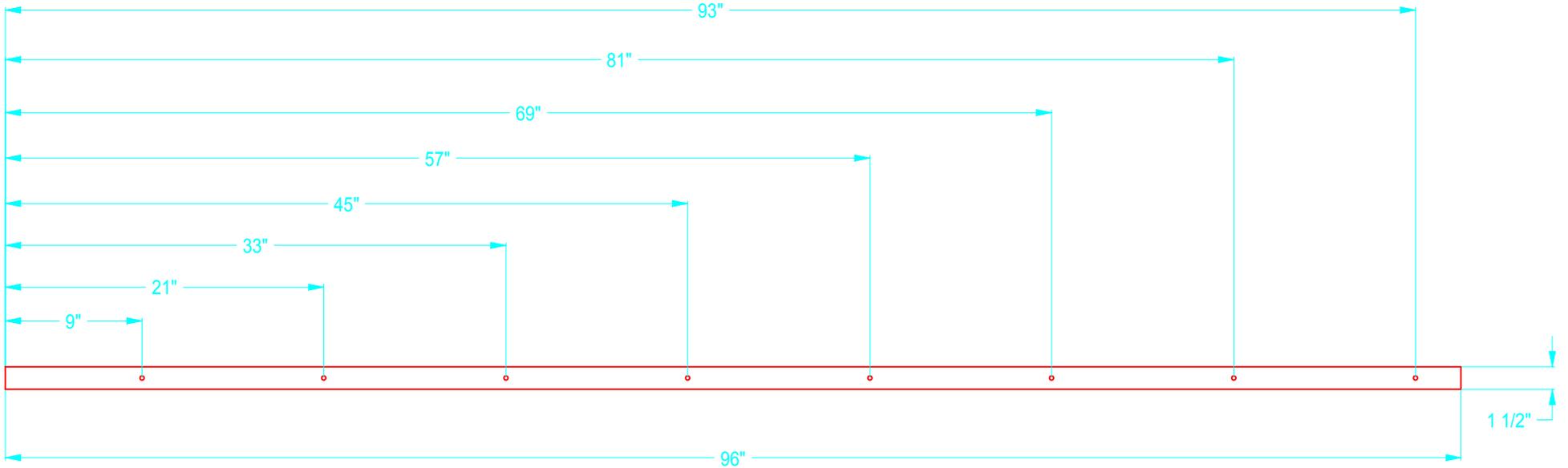
CENTER HOLE
AND ALL GROMMET
HOLE LOCATIONS TO
HAVE REINFORCEMENT

SEAM OVERLAPS SHOULD BE
OVER/UNDER FROM THE CENTER
HOLE OUT FOR PROPER RAIN
RUNOFF

ACTUAL DIMENSION WILL VARY DEPENDING ON
SEAM ALLOWANCES AND ACTUAL CANVAS WIDTH

DIAGRAM #2

KHANA DRILL GUIDE



ALL HOLES 1/4"

DIAGRAM #3

KHANA ASSEMBLY 16'

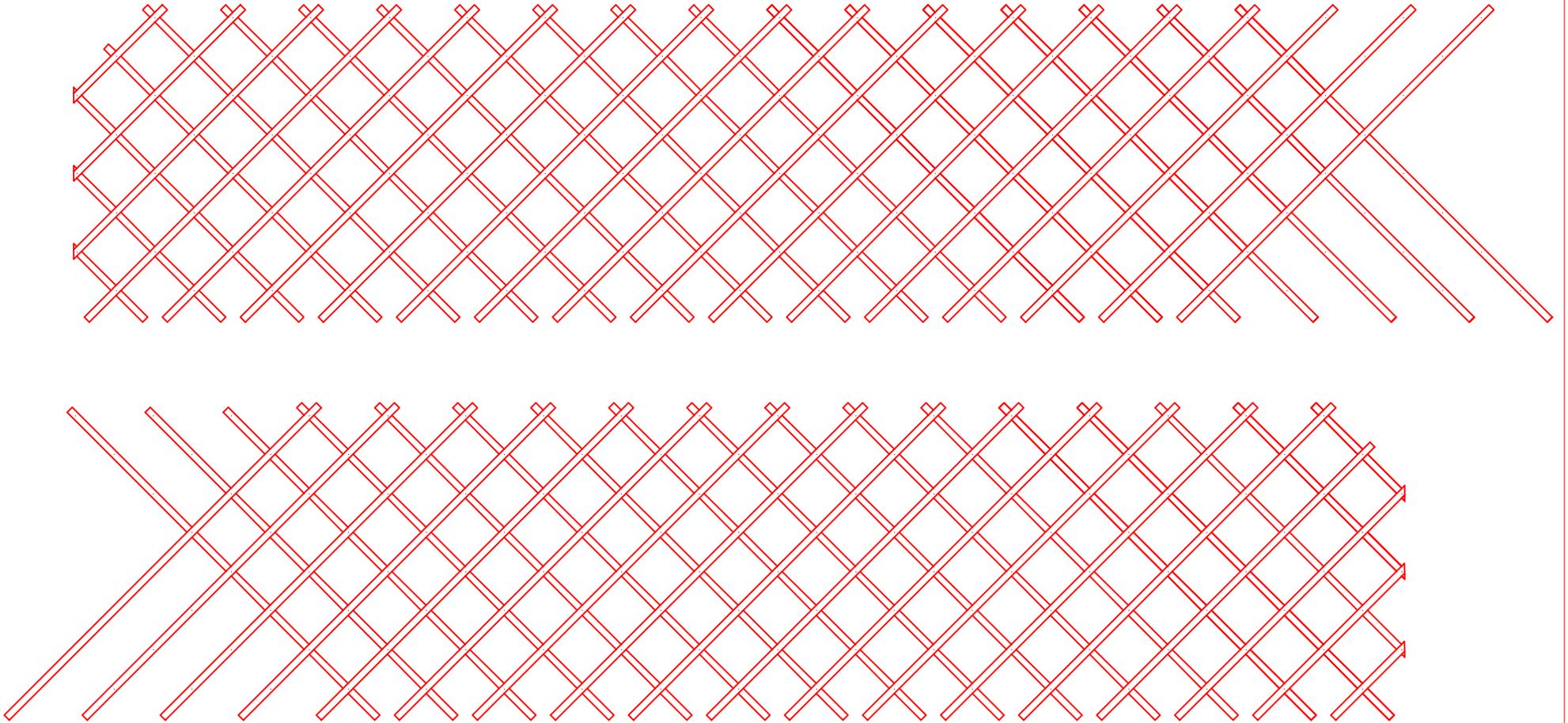


DIAGRAM #3b

KHANA ASSEMBLY 14'

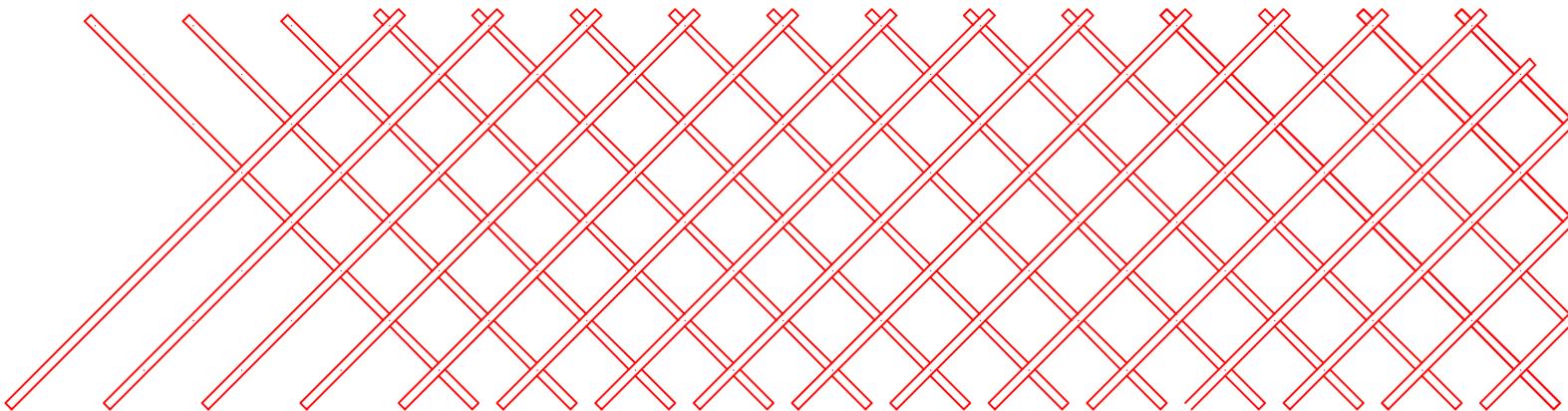
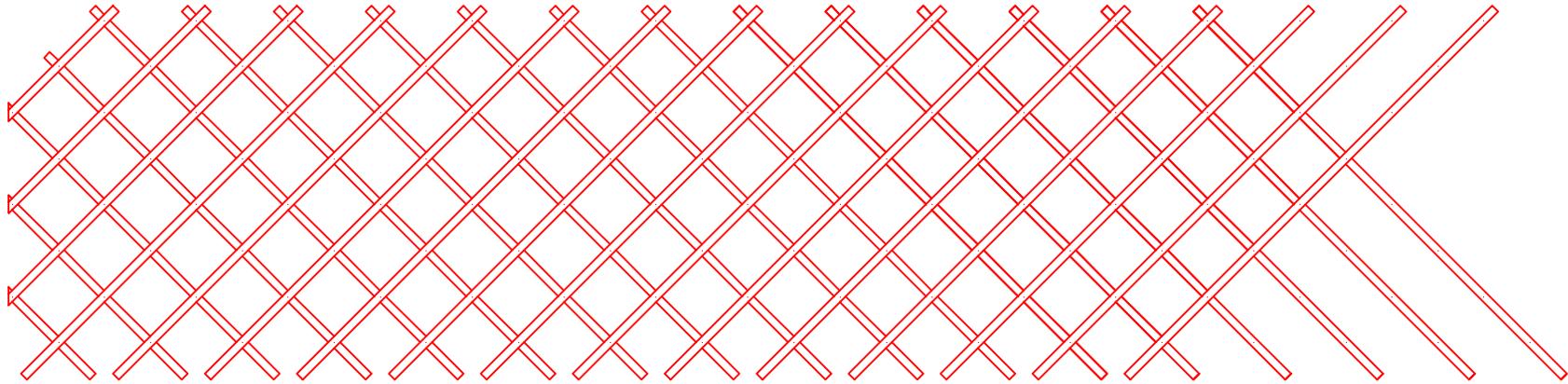


DIAGRAM #3c

KHANA ASSEMBLY 12'

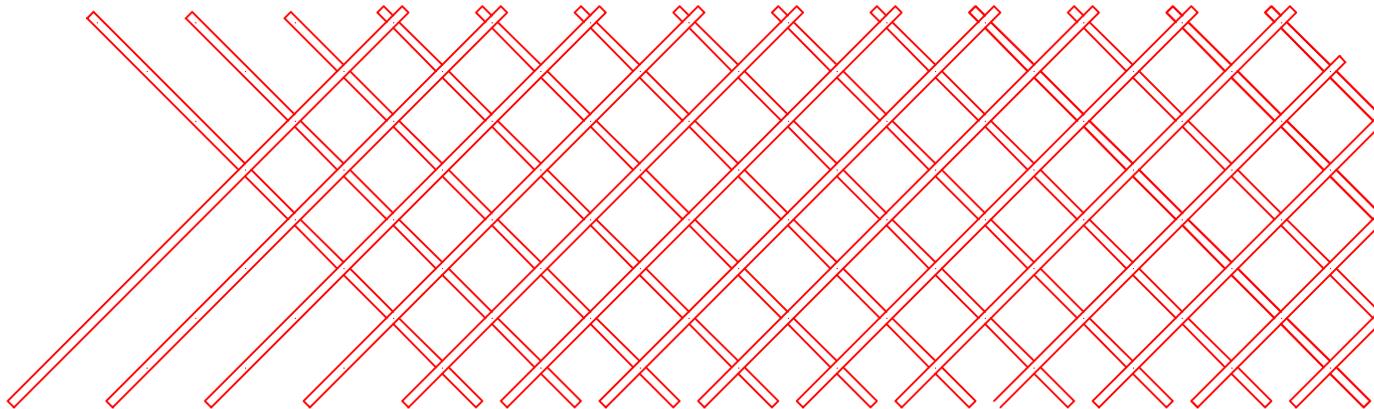
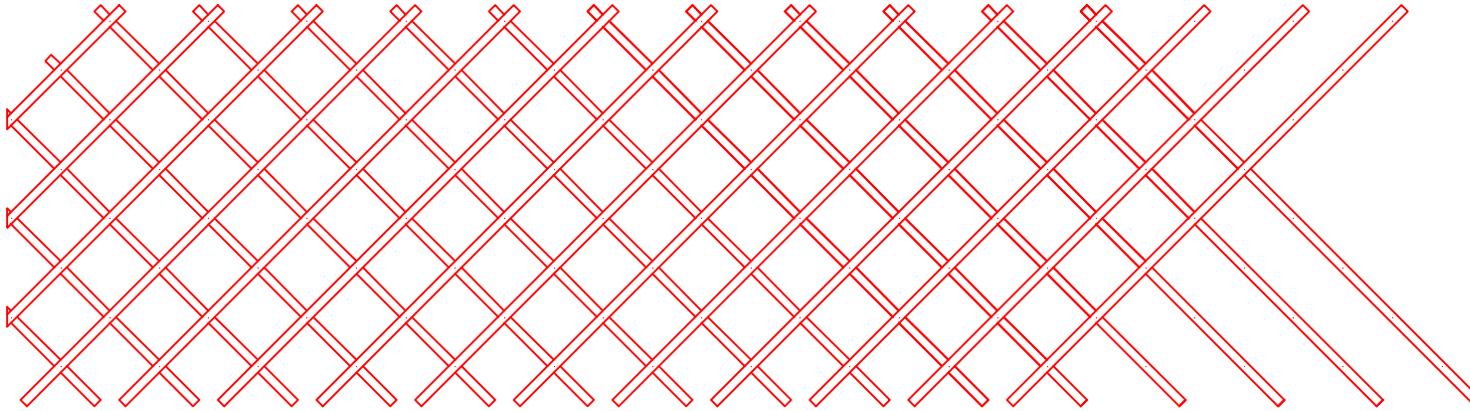


DIAGRAM #4

DOOR FRAME

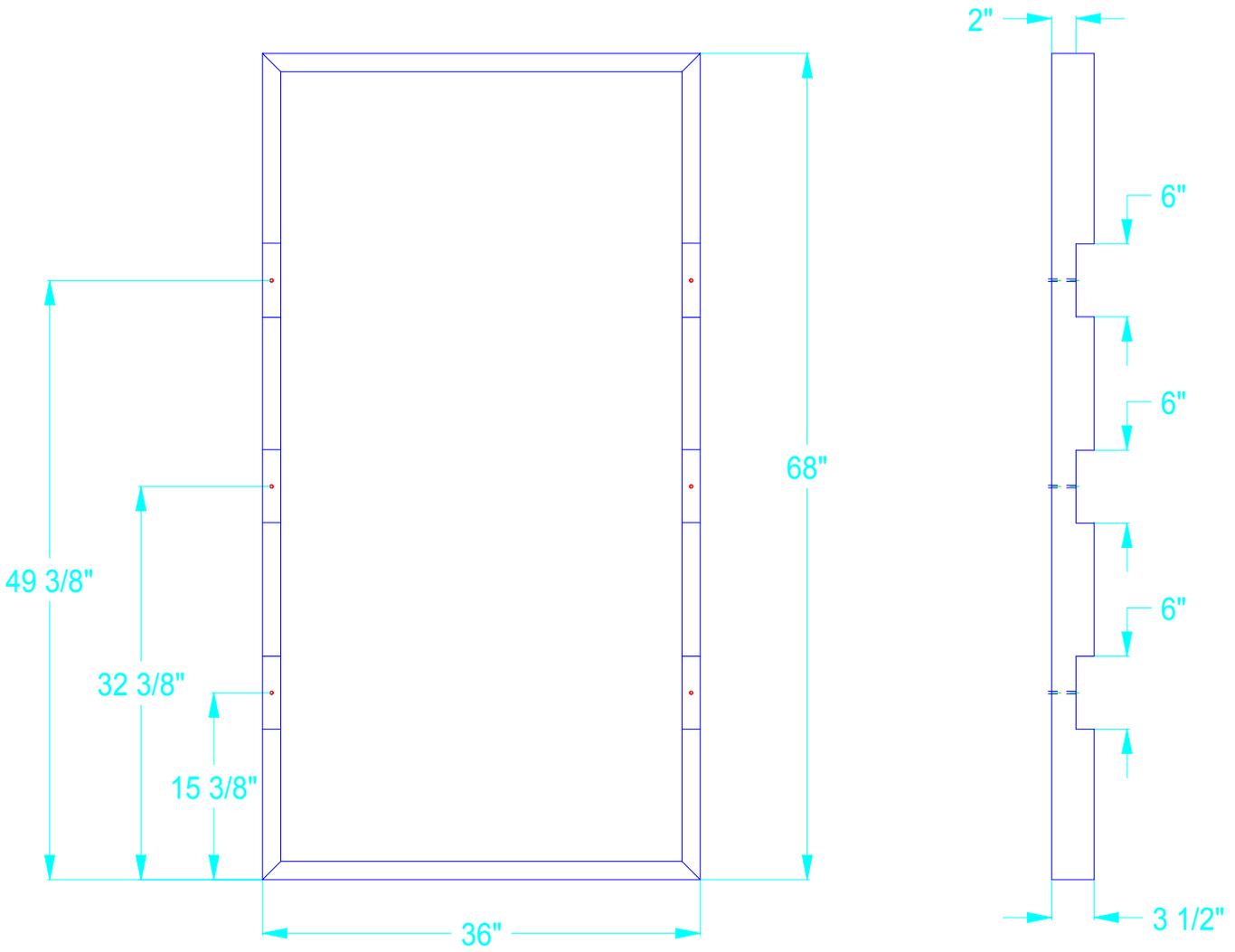
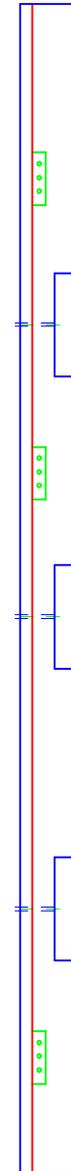
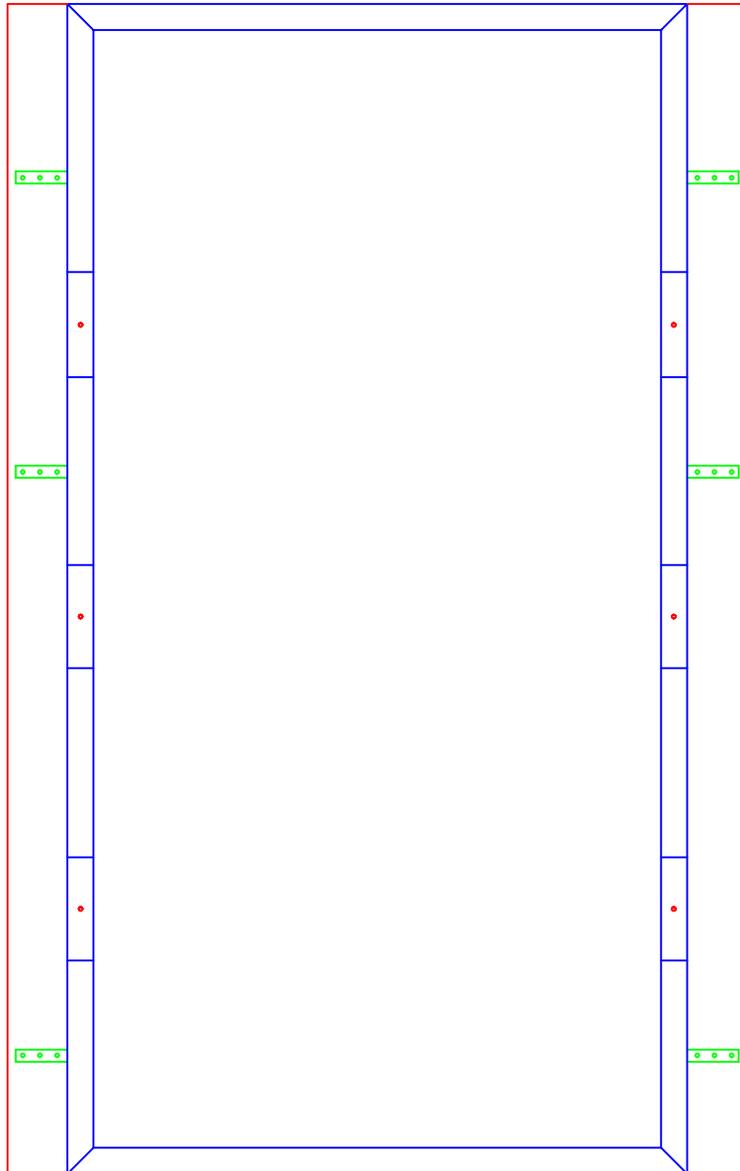


DIAGRAM #5

DOOR FRAME WITH CANVAS ATTACHMENT PANELS



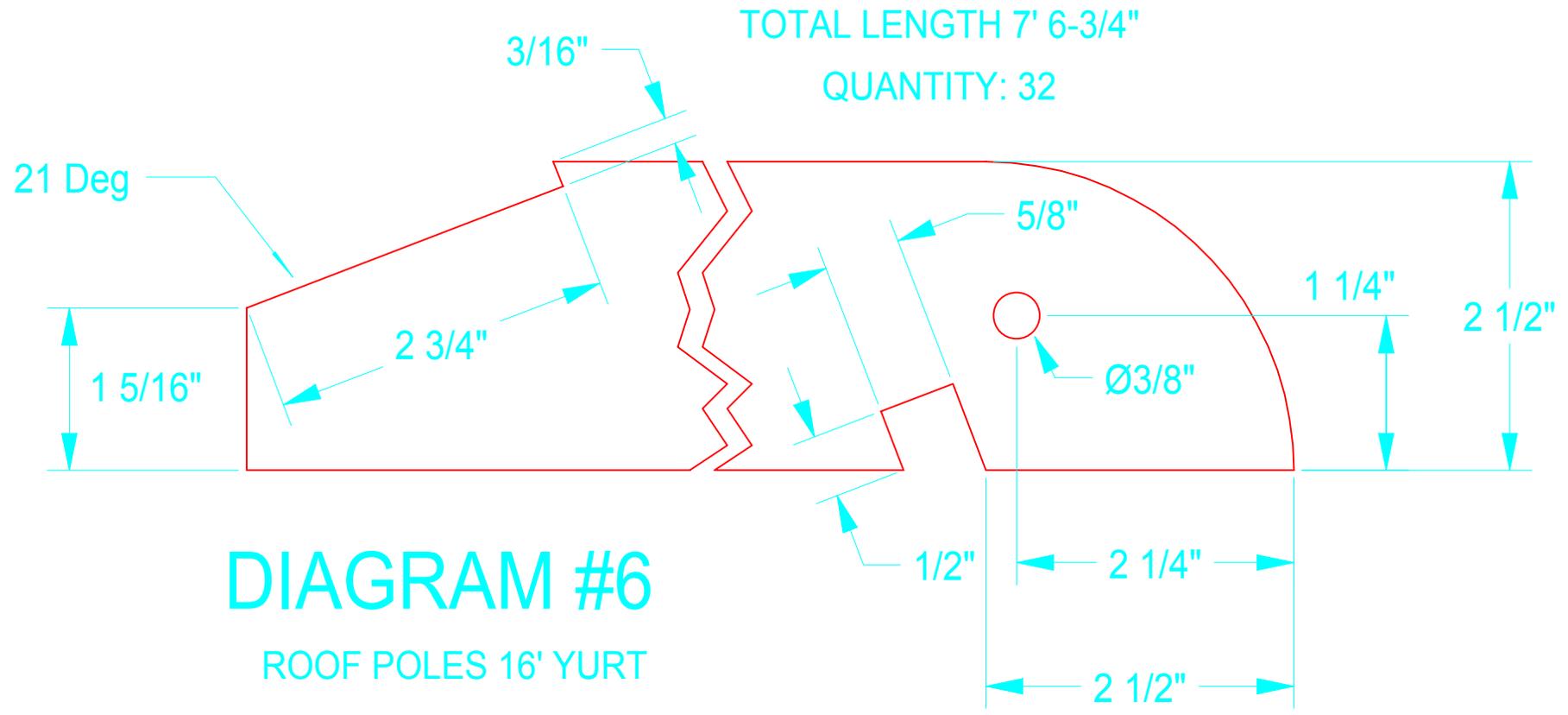


DIAGRAM #6
ROOF POLES 16' YURT

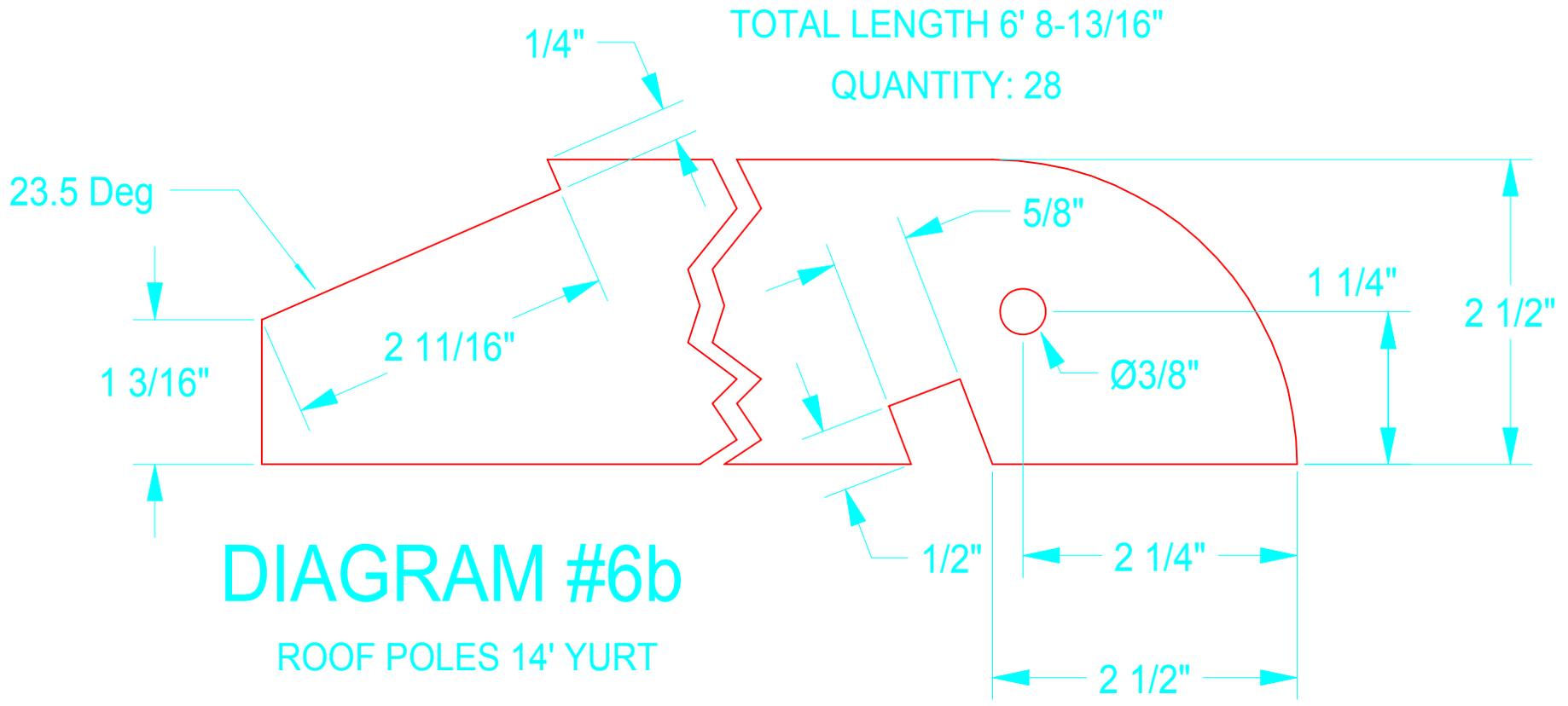
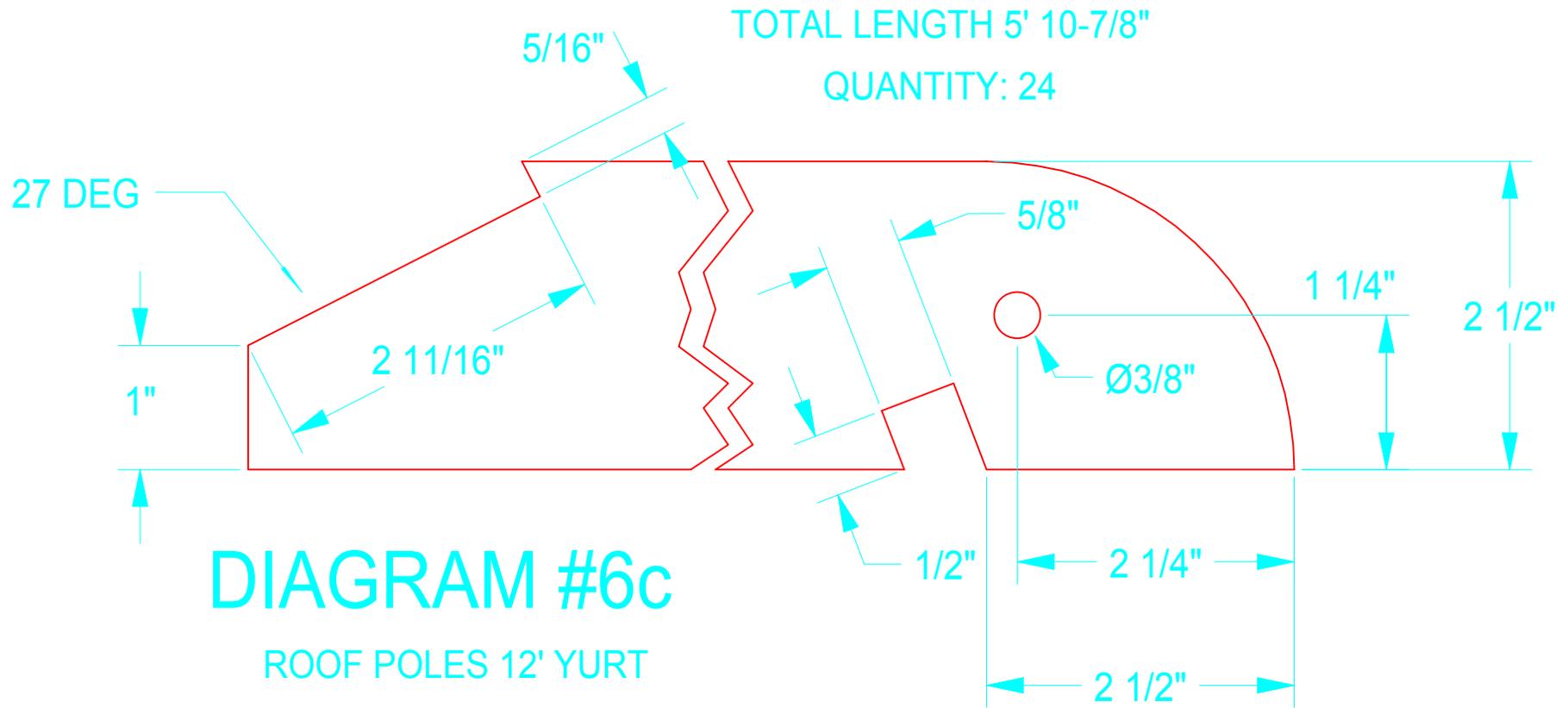
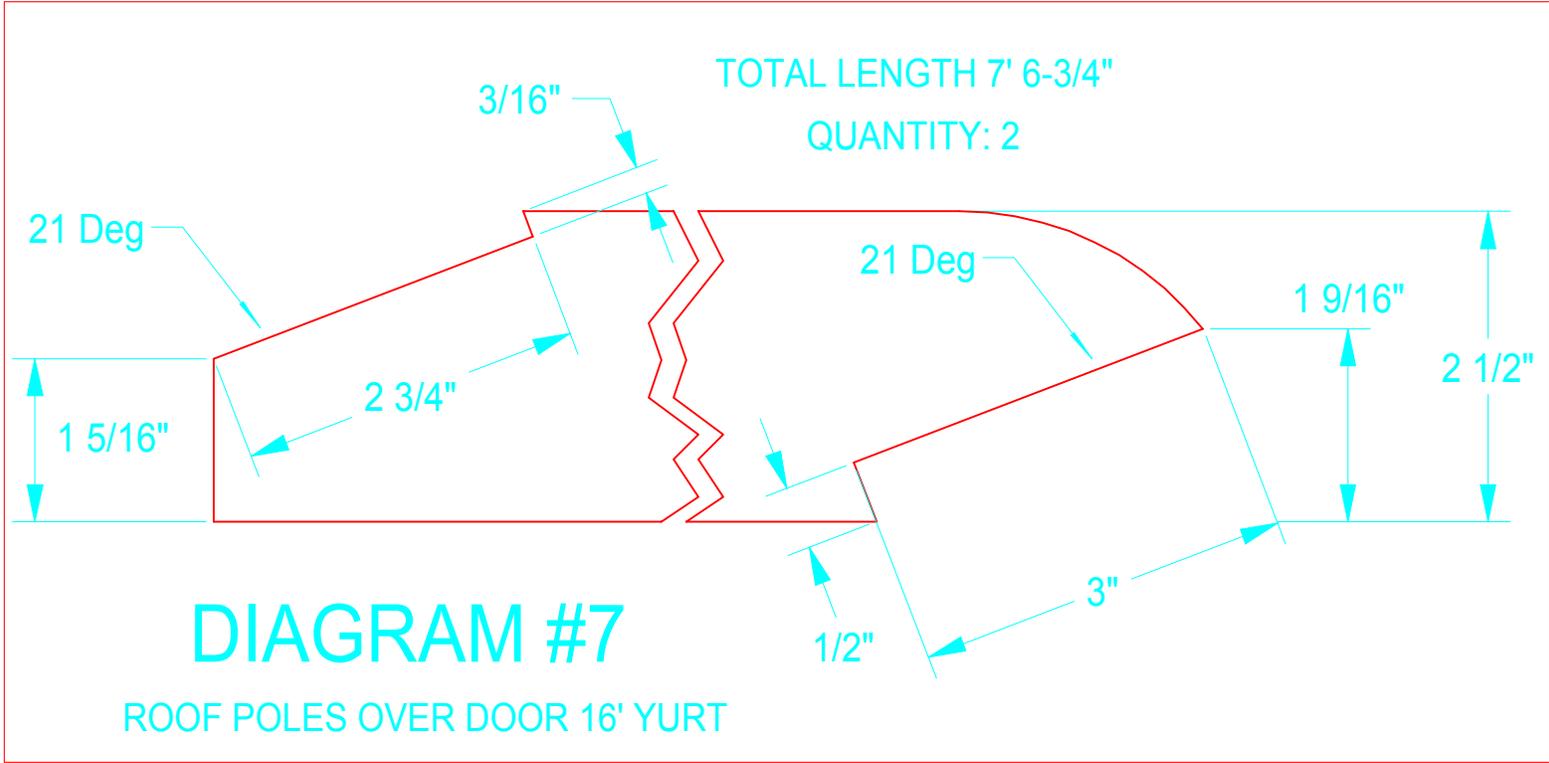


DIAGRAM #6b

ROOF POLES 14' YURT





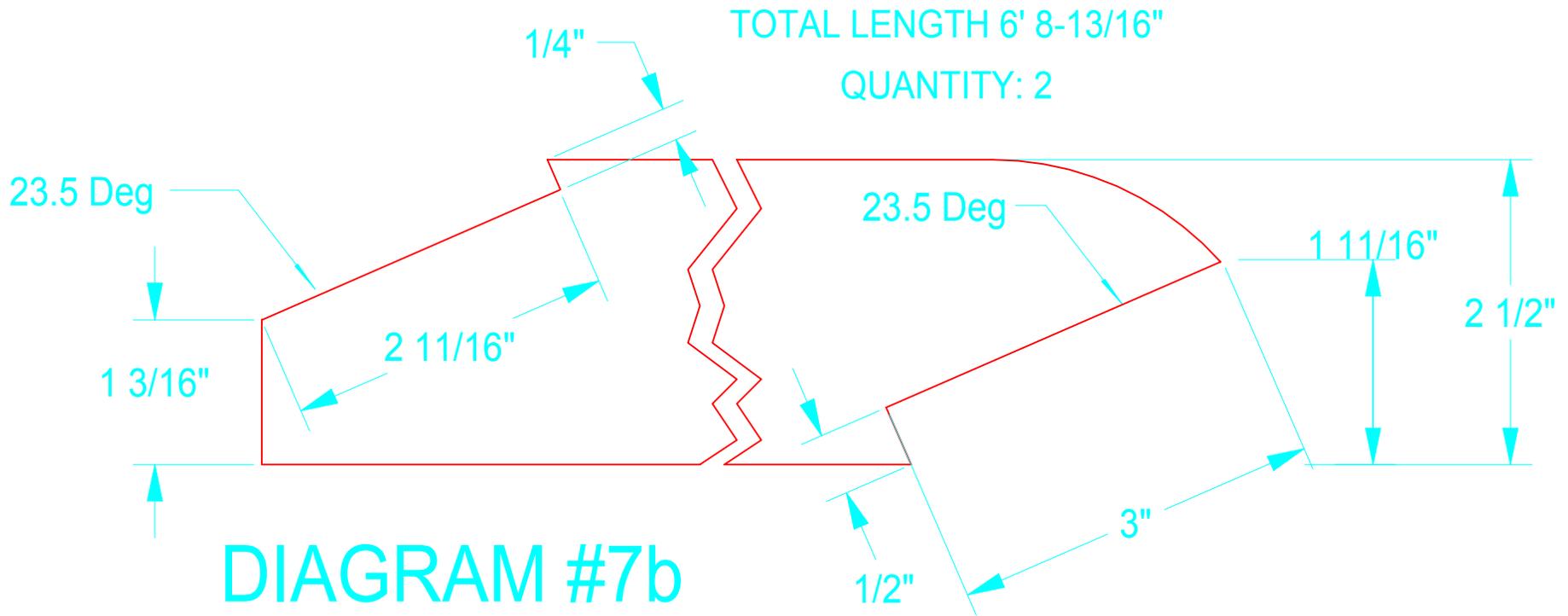


DIAGRAM #7b

ROOF POLES OVER DOOR 14' YURT

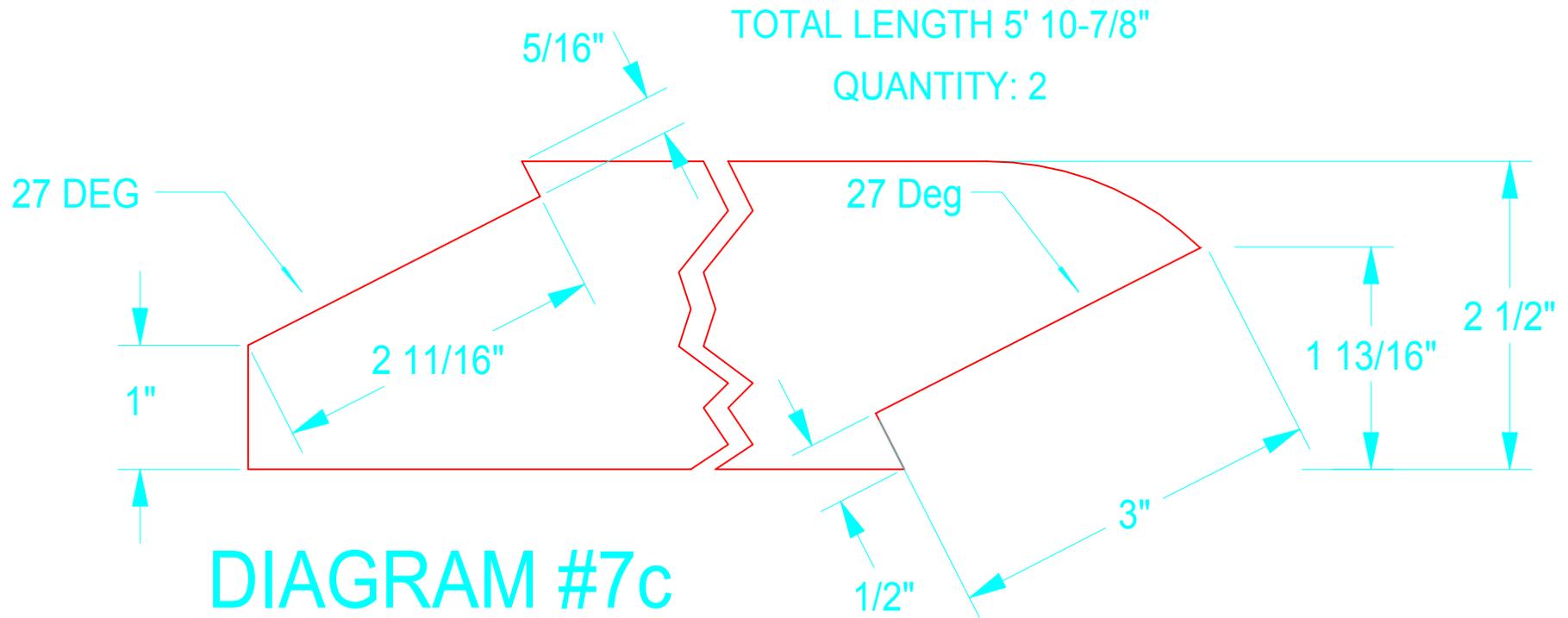
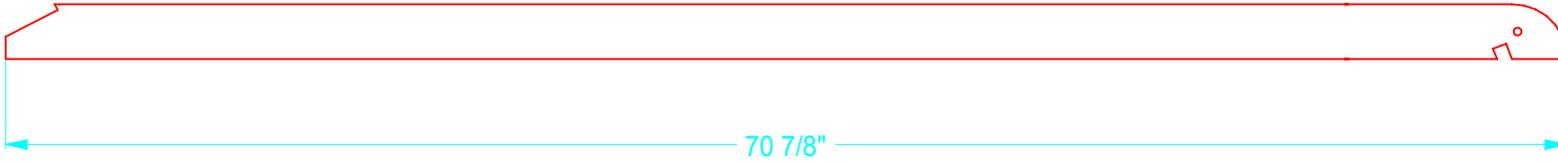


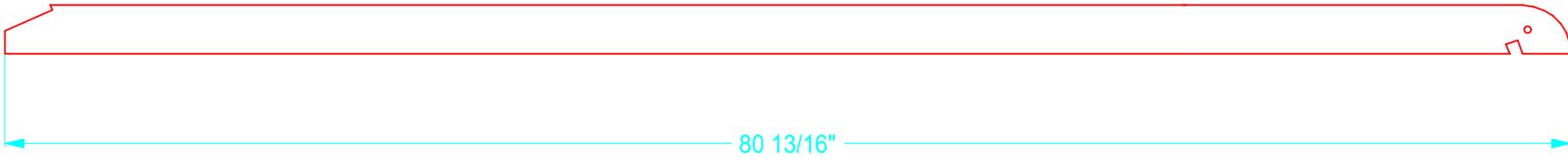
DIAGRAM #7c

ROOF POLES OVER DOOR 12' YURT

12' Yurt Roof Pole



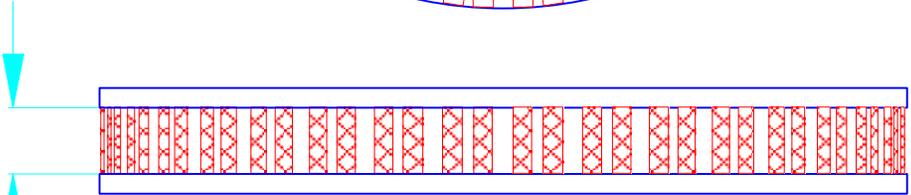
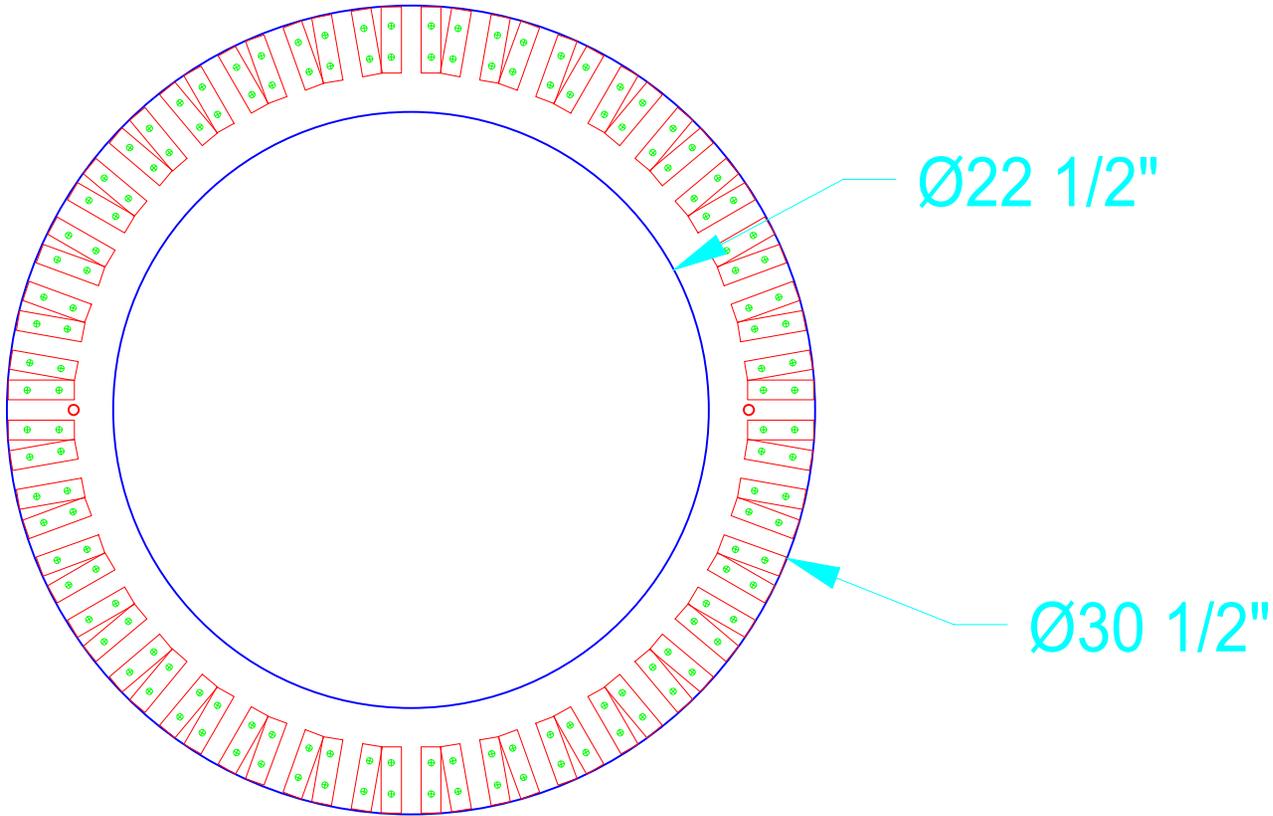
14' Yurt Roof Pole



16' Yurt Roof Pole



DIAGRAM #8

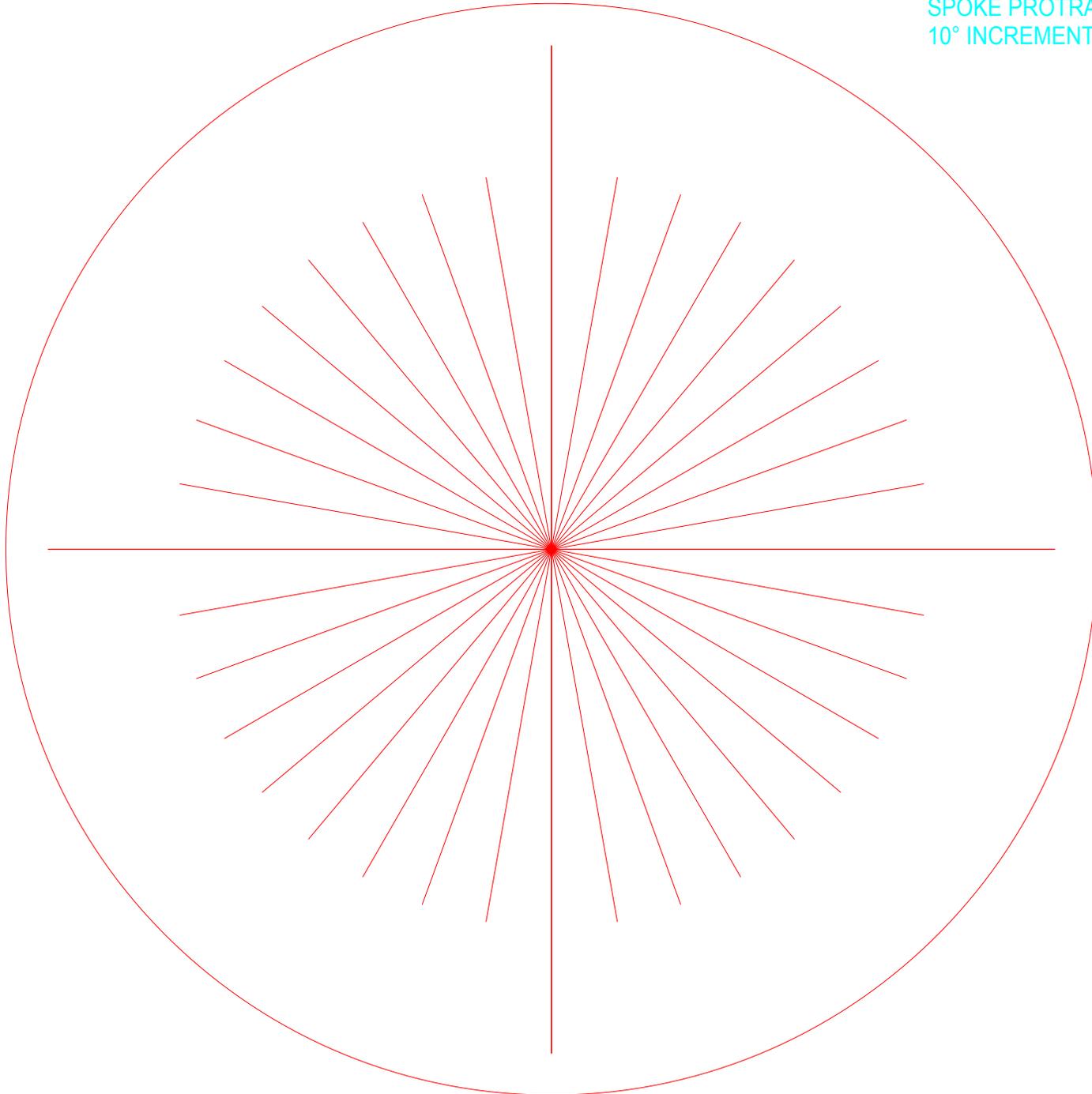


3/4" PLYWOOD

2 1/2"

DIAGRAM #9

SPOKE PROTRACTOR
10° INCREMENTS



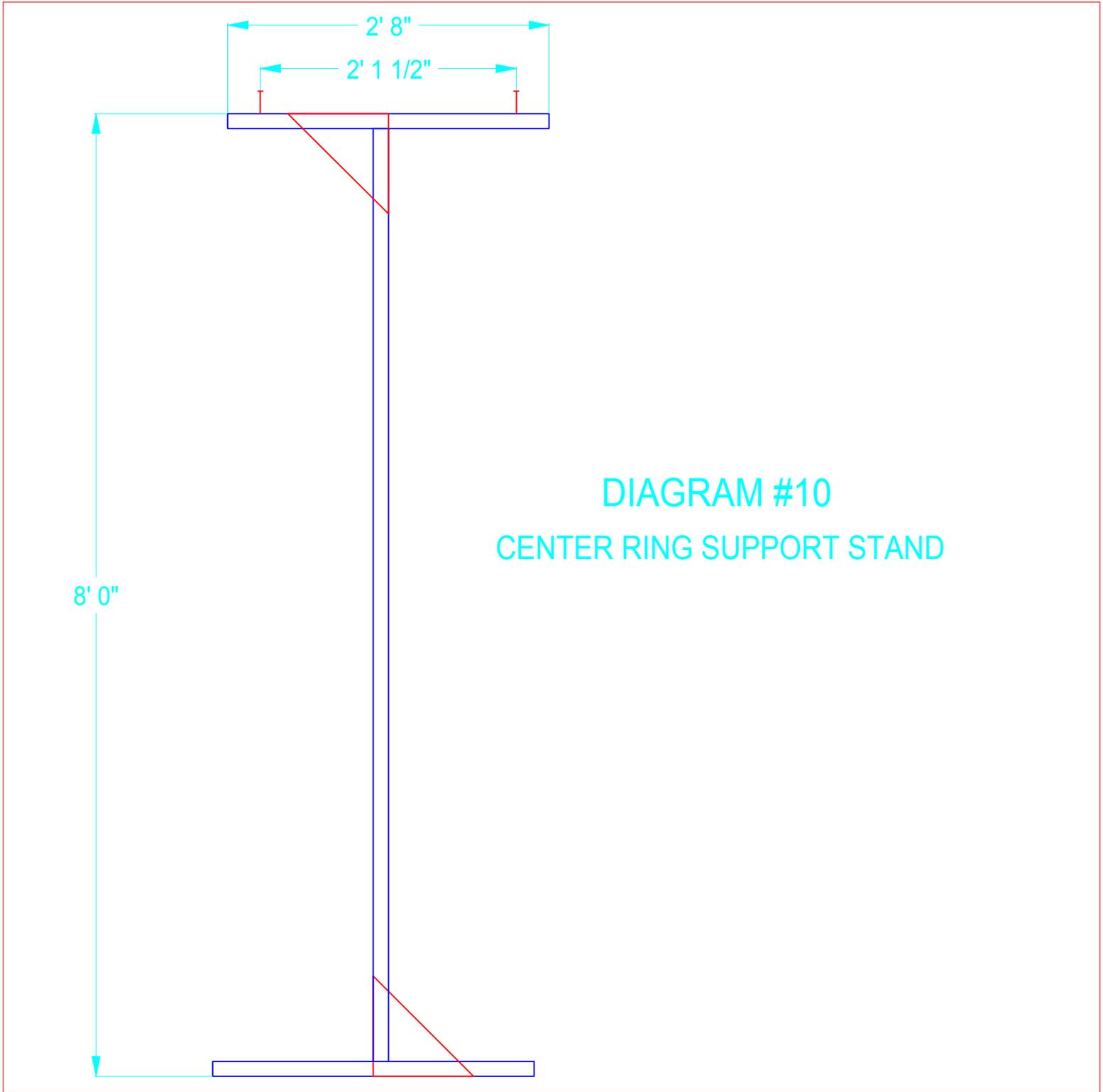


DIAGRAM #10
CENTER RING SUPPORT STAND