



Free

LETTER

Building guide and drawings

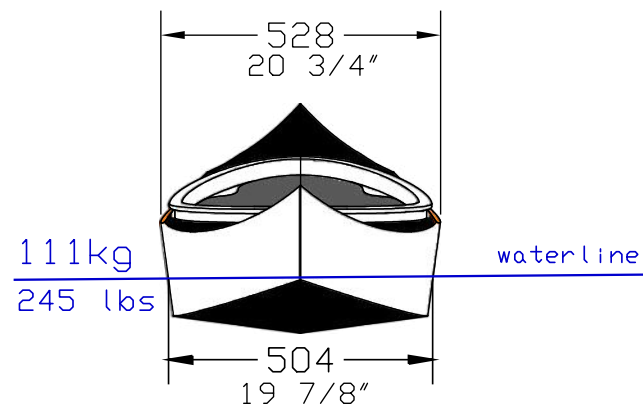
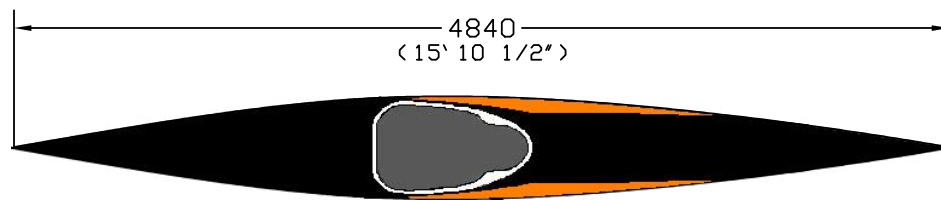
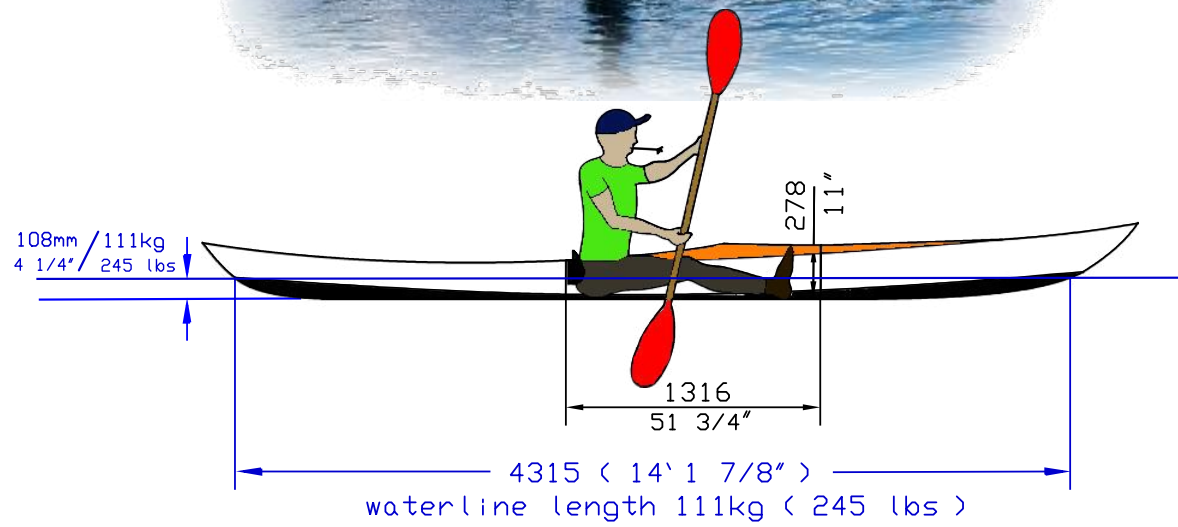


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LICENCE

Plans contain two parts, building guide and printable 1:1 cardboard templates.

Plans of the free are free! Build the free – be free!

Free plans doesn't mean that boat is not good - I call it performance expedition kayak.

Hydrostatics :

Design displacement : 111 kg (245 lbs)

Draft :108mm (4 1/4")

Waterline Beam : 504mm (19 7/8")

Waterline length : 4315mm (14' 1 7/8")

Block coefficient :0,48

Prismatic coefficient : 0,54

Wetted surface : 1,8 m2 (19,76 ft2)

Free

Length 4840 (15' 10 1/2")

Beam 528 (20 3/4")

This boat is designed for day- and weekend trips. Longer trips are also possible if packing light. Design displacement is 111 kg /245 lbs(including boats weight). I tried to design a kayak which is fast to build and good to paddle. This is actually fourth evolution of it and I really like how it performs. If you never paddled a kayak before, this may feel a bit tippy at first.

This boat can be built quickly and cheap. Flat decks makes it easy to fasten hatches directly to decks, but there are still option for recess hatches. Cockpit ring can be built quickly from 4mm ply, but its more nicely done from extra 9mm sheet.

On conditions where boat wants to turn against wind, just lean boat constantly against wind to balance the situation. If you like rudder steering, there are removable rudder and steering designs at the end of plans. I have tested that they work, but it is of course possible that they might jam – so test rudder carefully!

Check ply sheet dimensions! I have observed that all sheets are not actually 1220*2440. That is why register lines on ply sheet 1 and 2 are divided differently.

Search from web for foamed plastic. I use it as seat, backrest padding - Or bought cheap camping matt and glue it to several layers when needed.

Learn to use epoxy correctly. Read manufacturer instructions or search on web, how to make wet to wet coatings and how to dewax cured epoxy. And remember to use safety equipment while handling epoxy!

Build and use this boat with your own risk. It is very small home built boat and could be damaged by faulty gluing or material failure. Make sure that you are aware of proper and safe use of all materials – read manufacturer's directions.

Learn to use the boat in safe waters and conditions. First keep land close until you get used the boat. Use life jackets and learn their proper use. Don't allow children to play with boat without supervision.

More informations of my boats :

www.kaamosboats.com

My other boat plans :

<http://www.duckworksbbbs.com/plans/korhonen/index.htm>

Plans, hardware and great stories can be found in:

<http://www.duckworksbbbs.com/>

Send photos of your building and paddling adventures!
korhonen.perttu@gmail.com

Go paddling and have fun!

(Even plans are free, I still own copyrights)

Perttu

Material list

List is made according standart lumber sizes found where I live. Standarts can vary between countries.
If lumber size shown on list cant be found in your local store, it has to be cut from another size of lumber.

Plywood 1220 * 2440 (4' x 8') Exterior Marine

Thickness

4mm (, 1/8")

9mm (3/8") (optional for cockpit ring alternative 2)

Number

3

half sheet 1220*1220
(4'x4')

Lumber

metric (imperial)

	Use	Longest parts	Length
19x19mm (3/4 x 3/4)	gunwale stringers, framing	4880 (16')	15000mm (49')
19*45mm (3/4 x 1 3/4)	bulkheads , framing	550mm (22")	2000mm (9')
19*64mm (3/4 x 2 1/2)	bulkheads, footbrace, temp. Frames	700mm (28")	6250mm (21')
25*32mm (1 x 1 1/4)	footbrace	330mm (13")	330mm (13")
32*64mm (1 1/4 x 2 1/2)	footbrace	330mm (13")	350 (13")

Other materials :

Glass tape 50mm wide – 60 meters (ca. 160g/m2)
2" 197" (ca. 6oz approx)

Glass cloth for laminating backrest – one peace...
(or glass tape)

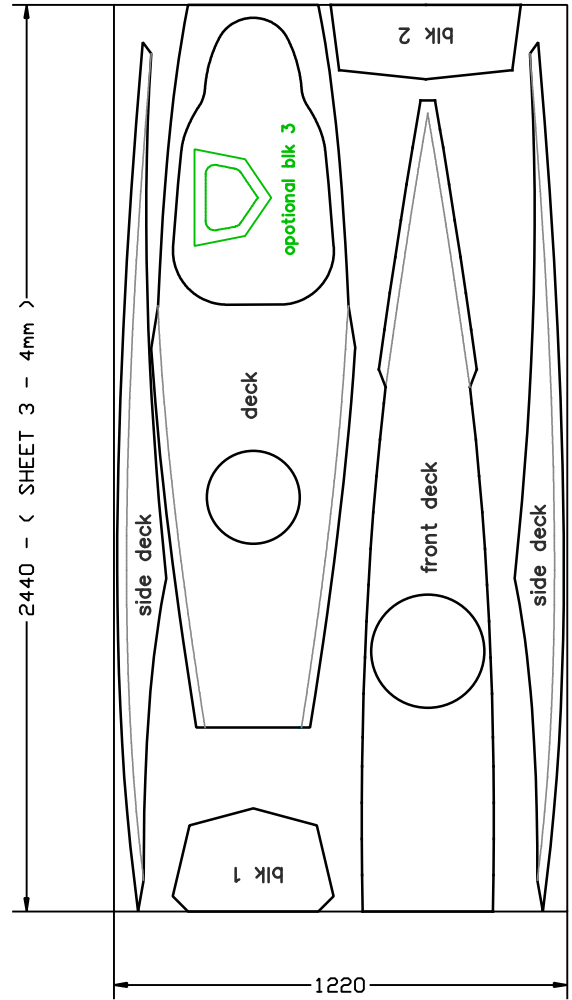
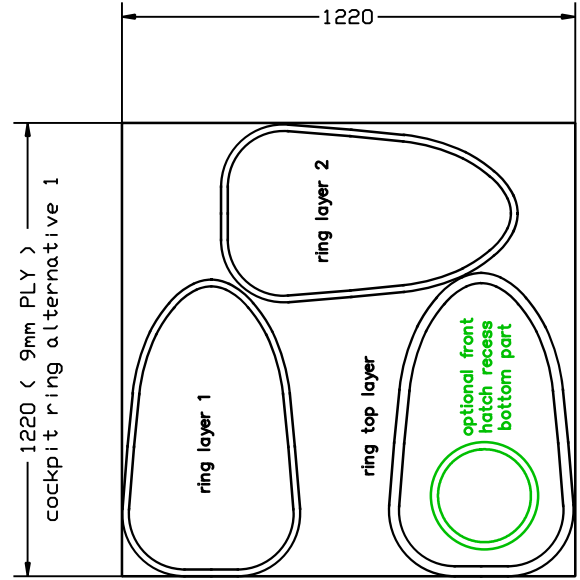
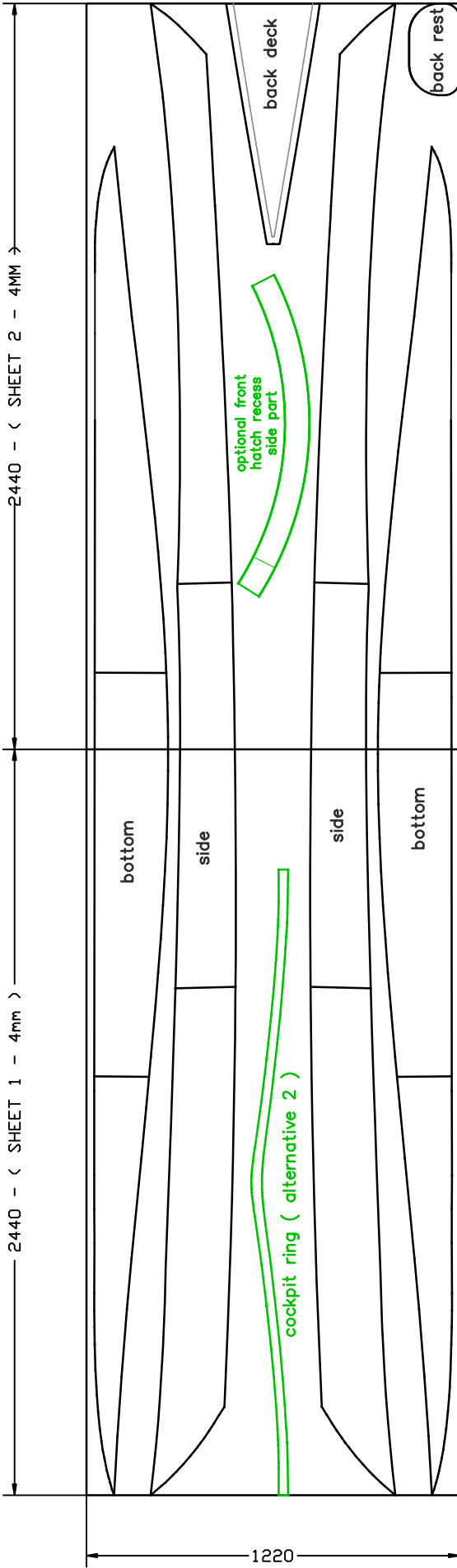
Camping matt for seat, backrest, knee supports - one roll

saddles 2
ladderlocks 2
20mm strap 3 meters (10')
clamcleat 1
3mm rope for footbraces 2 meters (7')
+ 6mm threaded rod + knots
+ some stainless screws

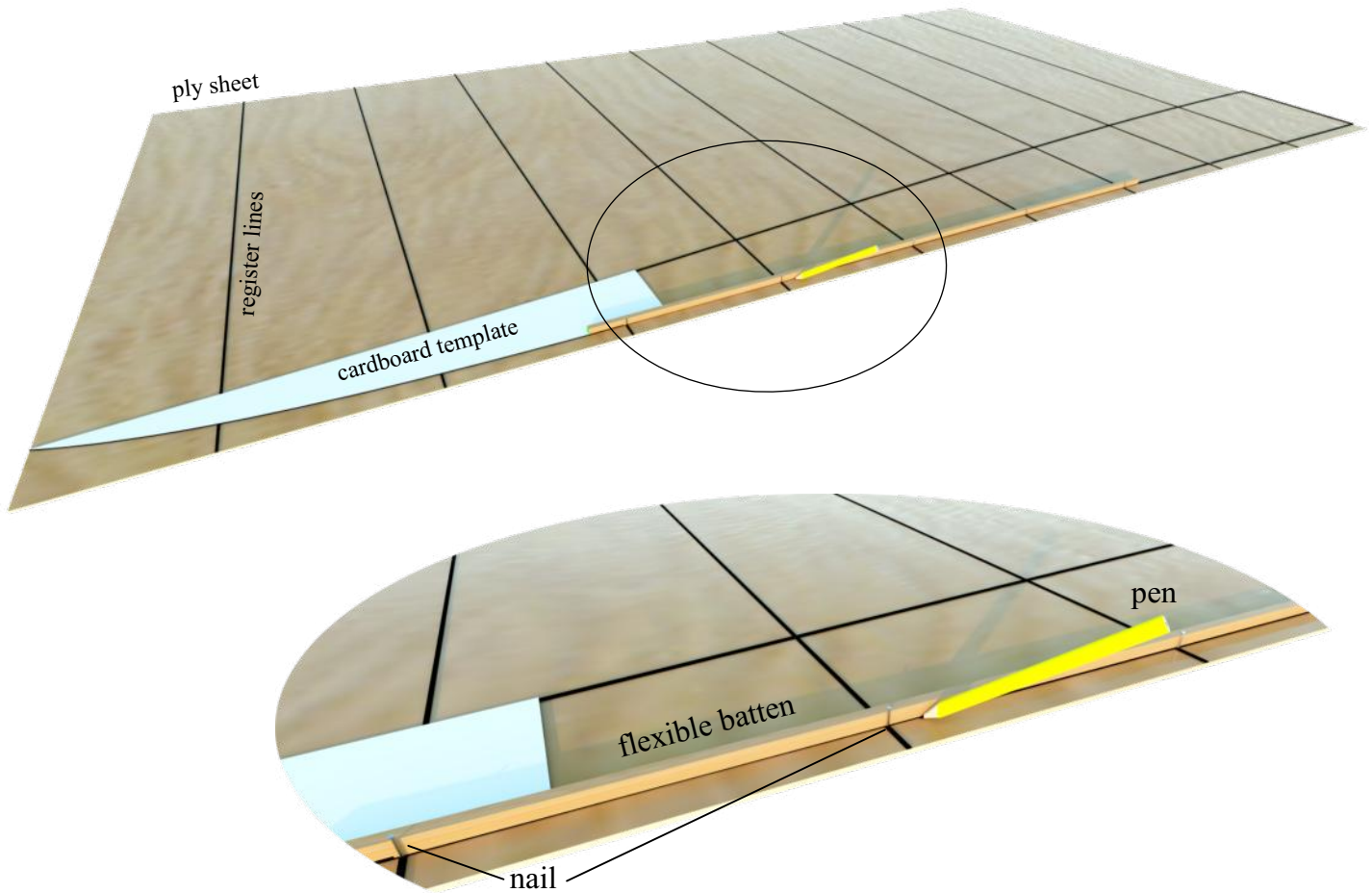
Glue Epoxy + microballoons or urethane glue and polyester resin for glassing
polymer glue for fastening hatches, paddings etc.

2 kayak hatches

(rudder fittings are not included in material list)



Drawing of curved Lines



Draw register lines to ply

Mark dimensions to register lines positions□

Hit nails to marks

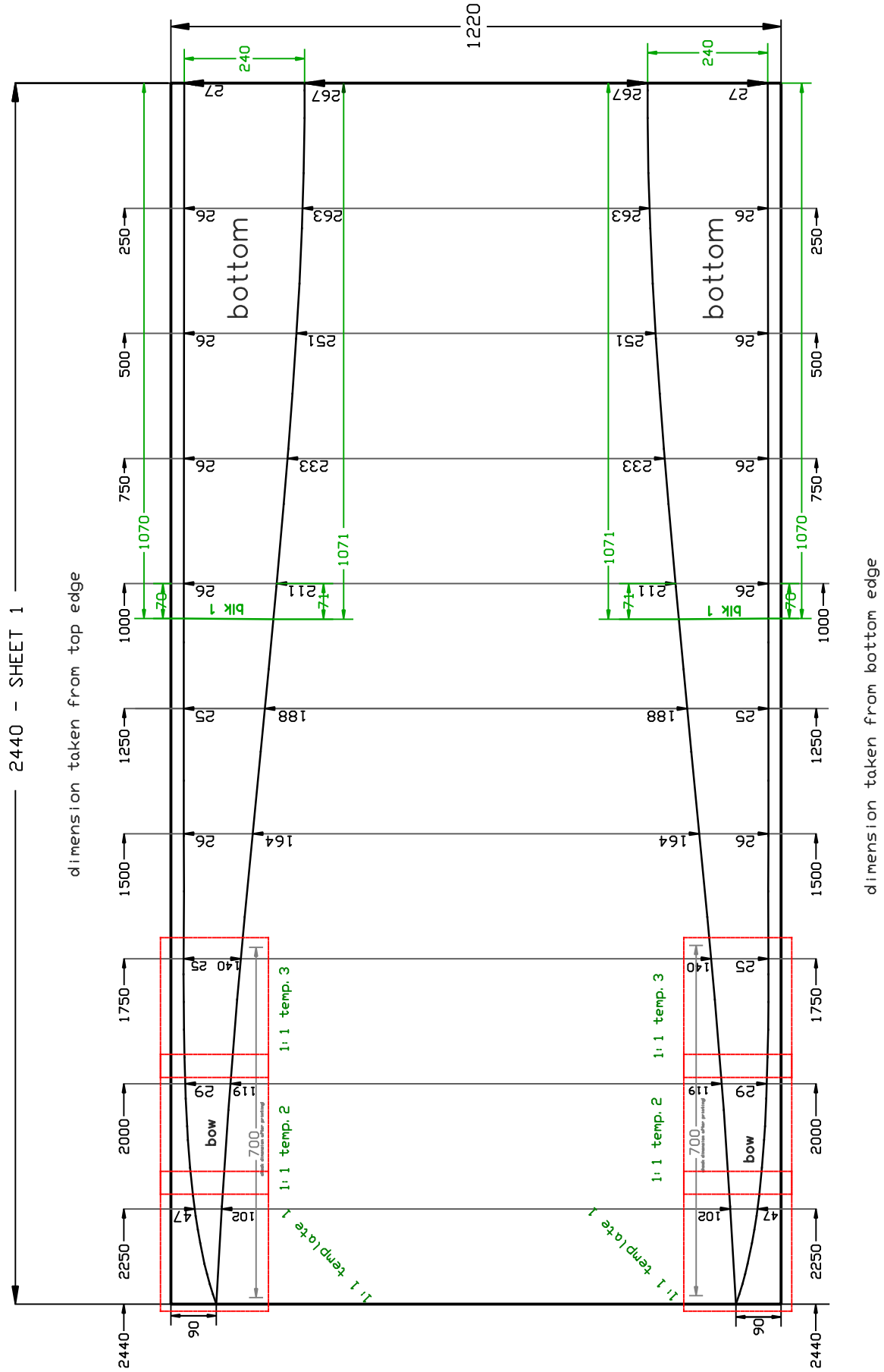
Push flexible batten to nails

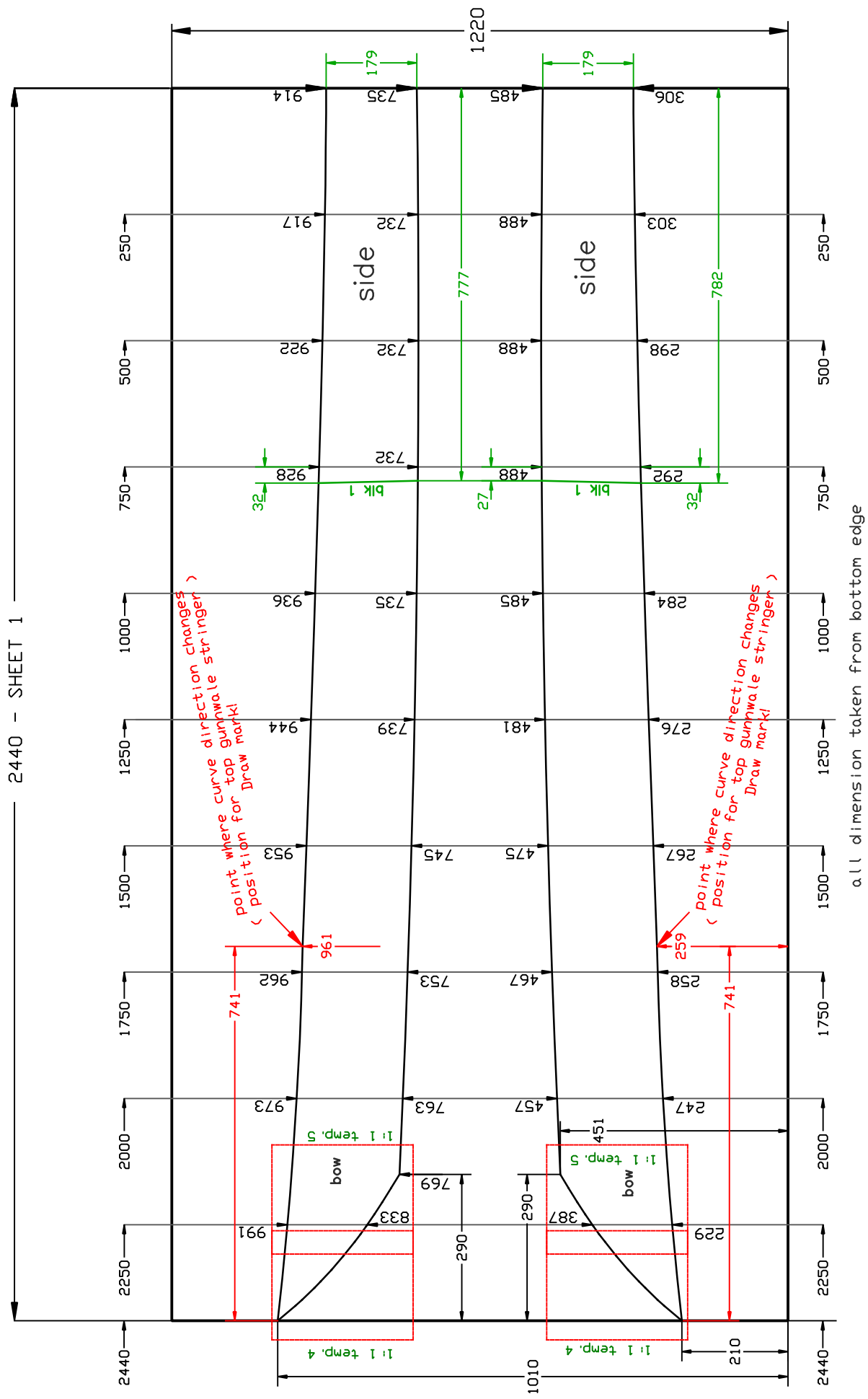
Draw curve according batten

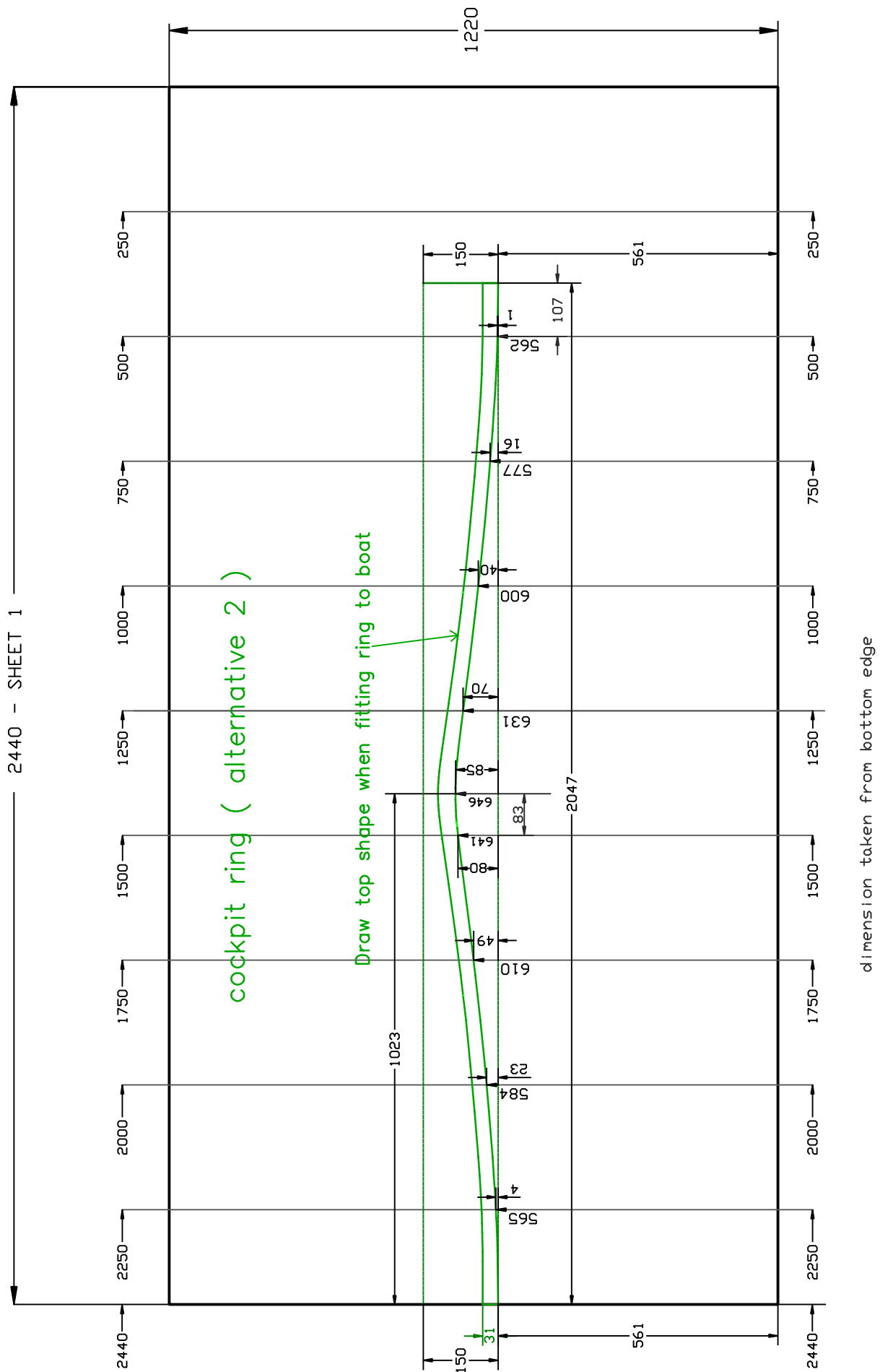
Use 1:1 cardboard templates where possible

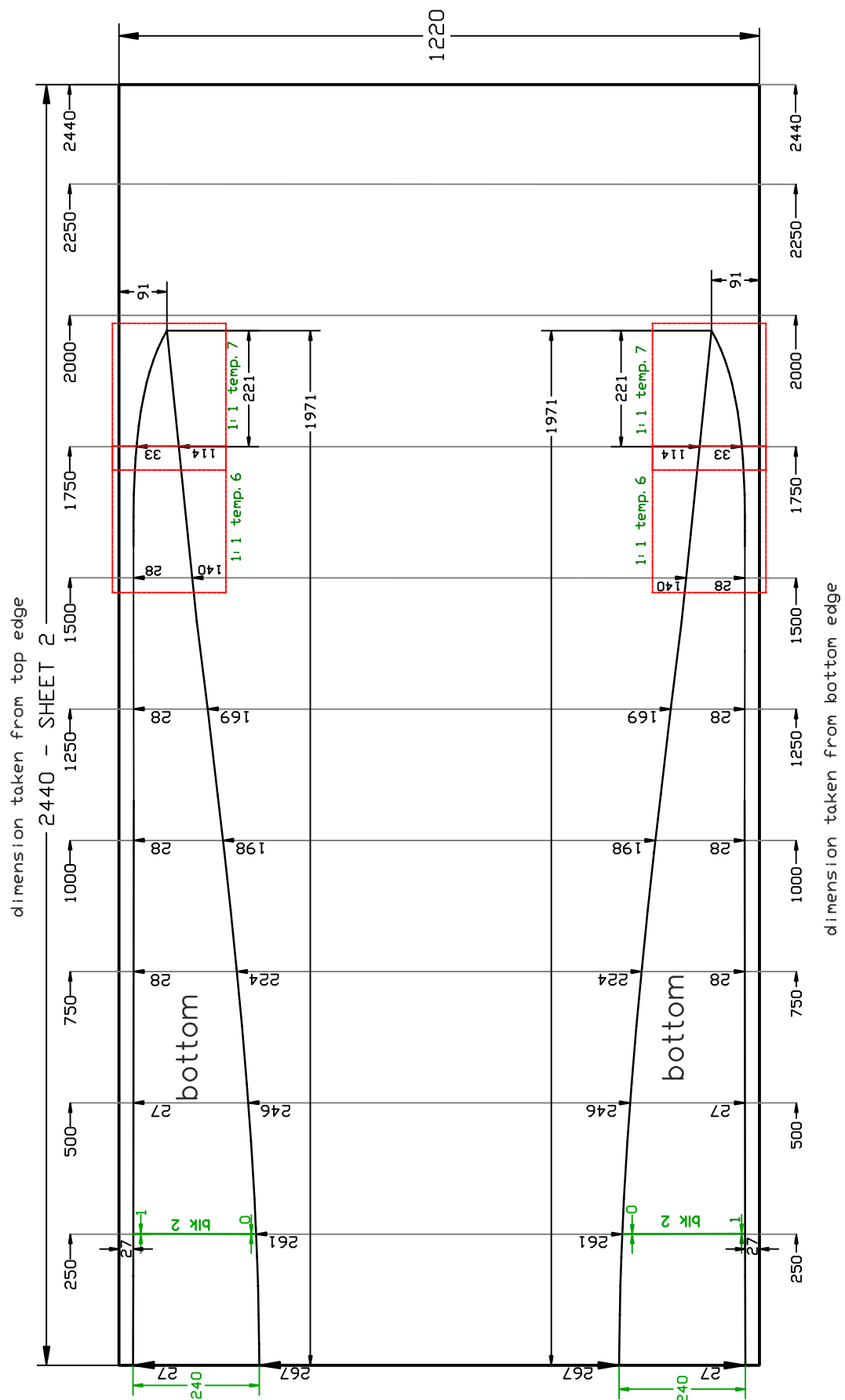
On side panels, curve direction changes (on gunwale). Don't try to push batten over those marks - move batten and draw one side at a time.

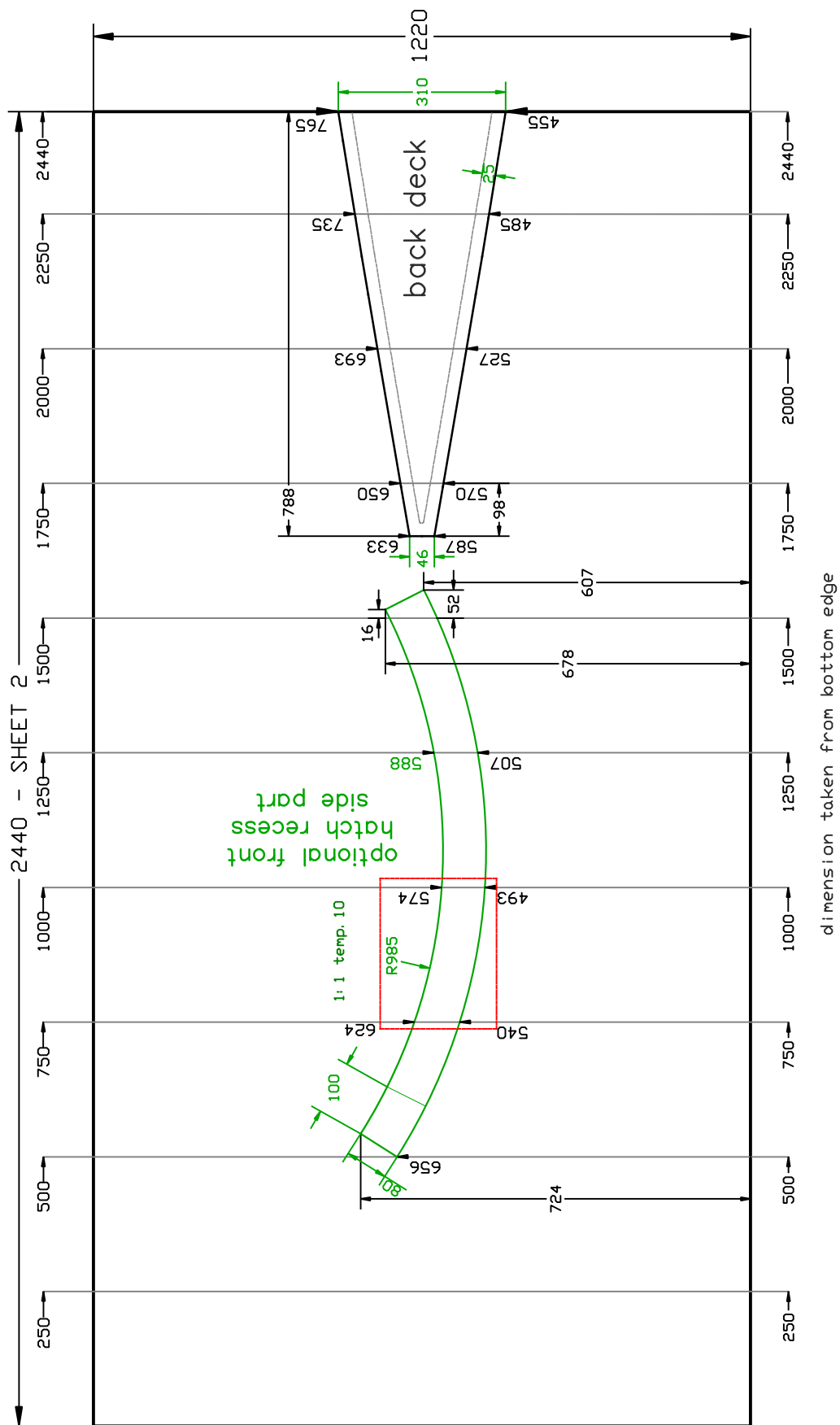
Drawings to ply sheets

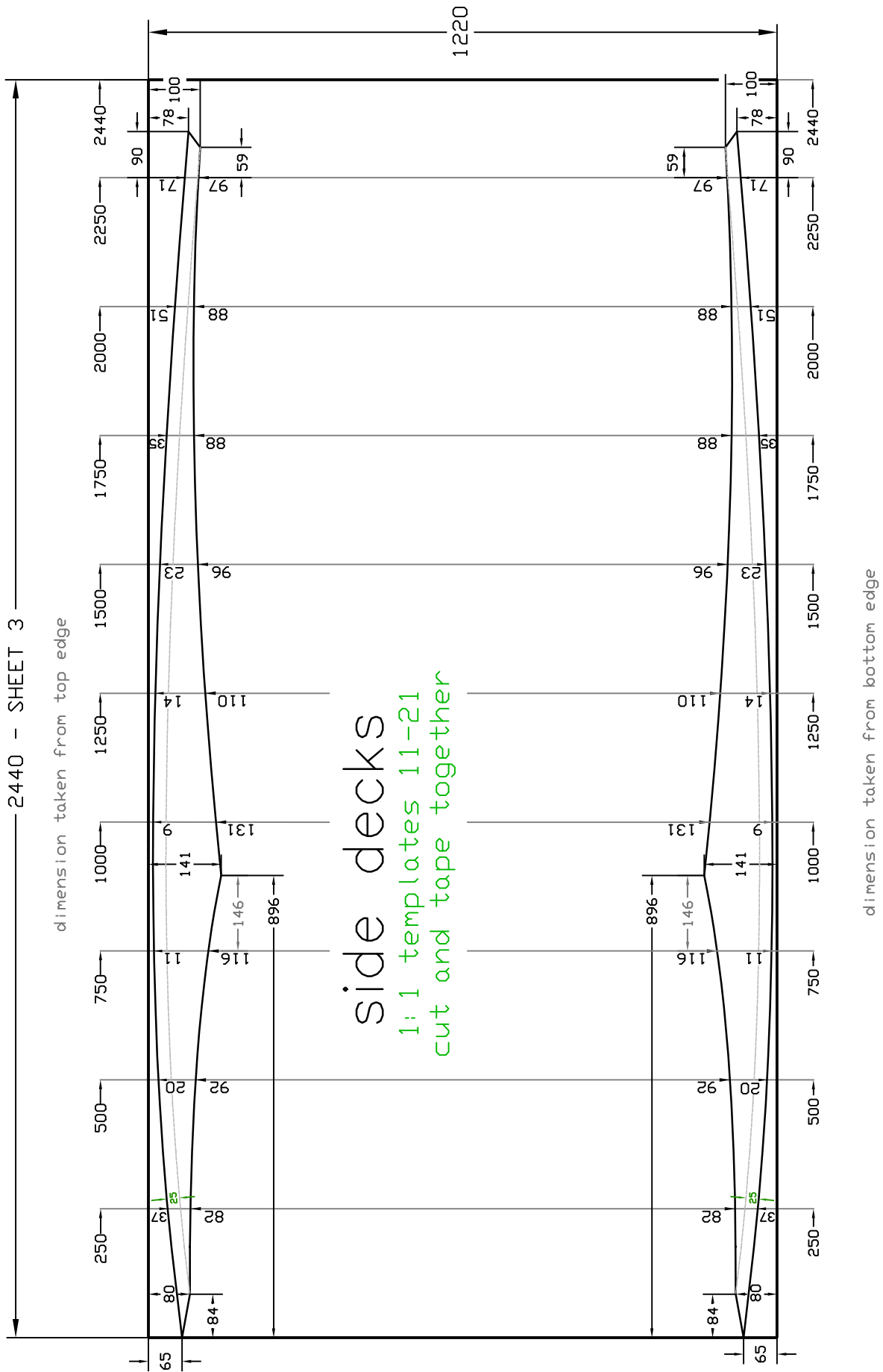


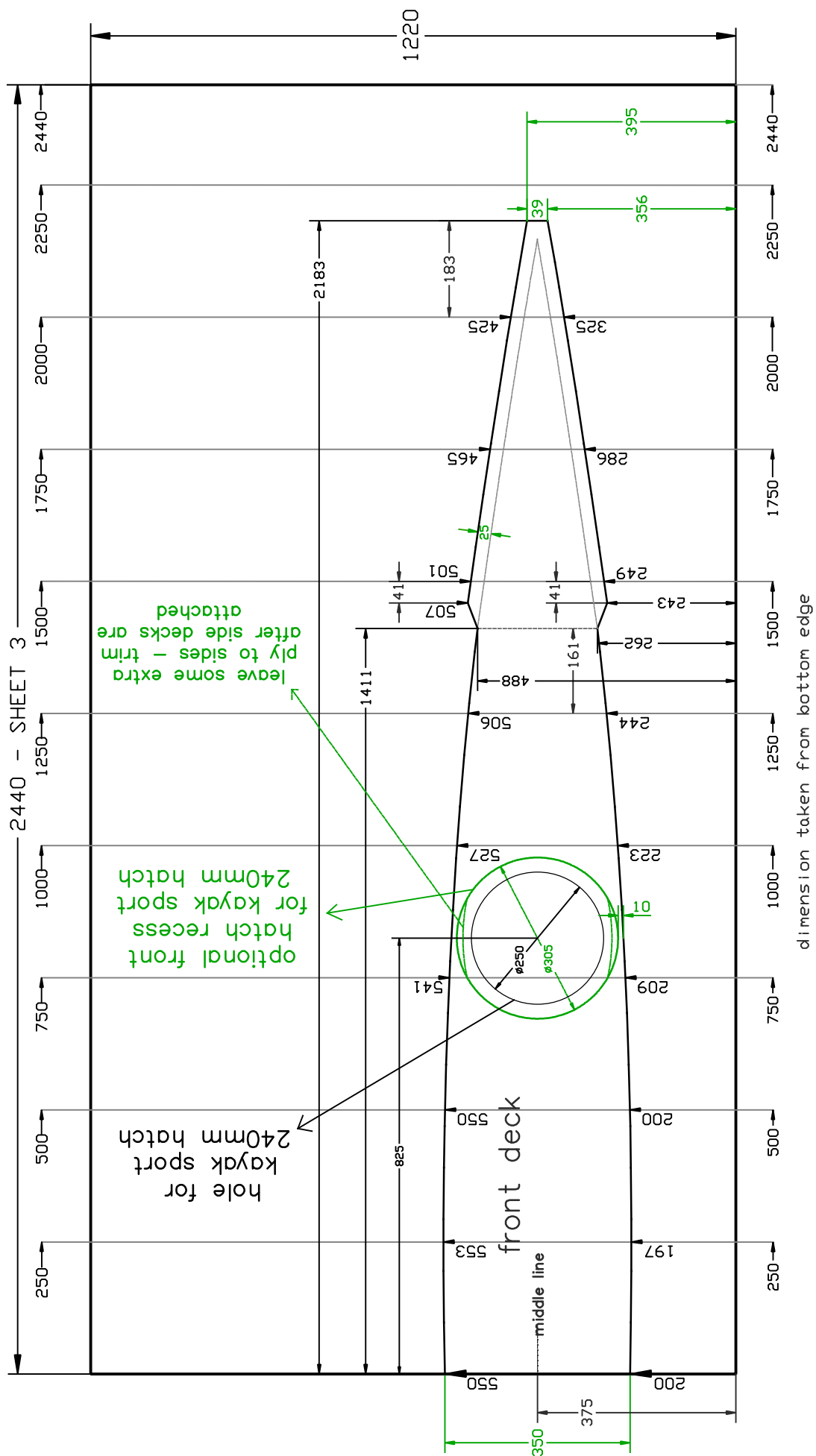




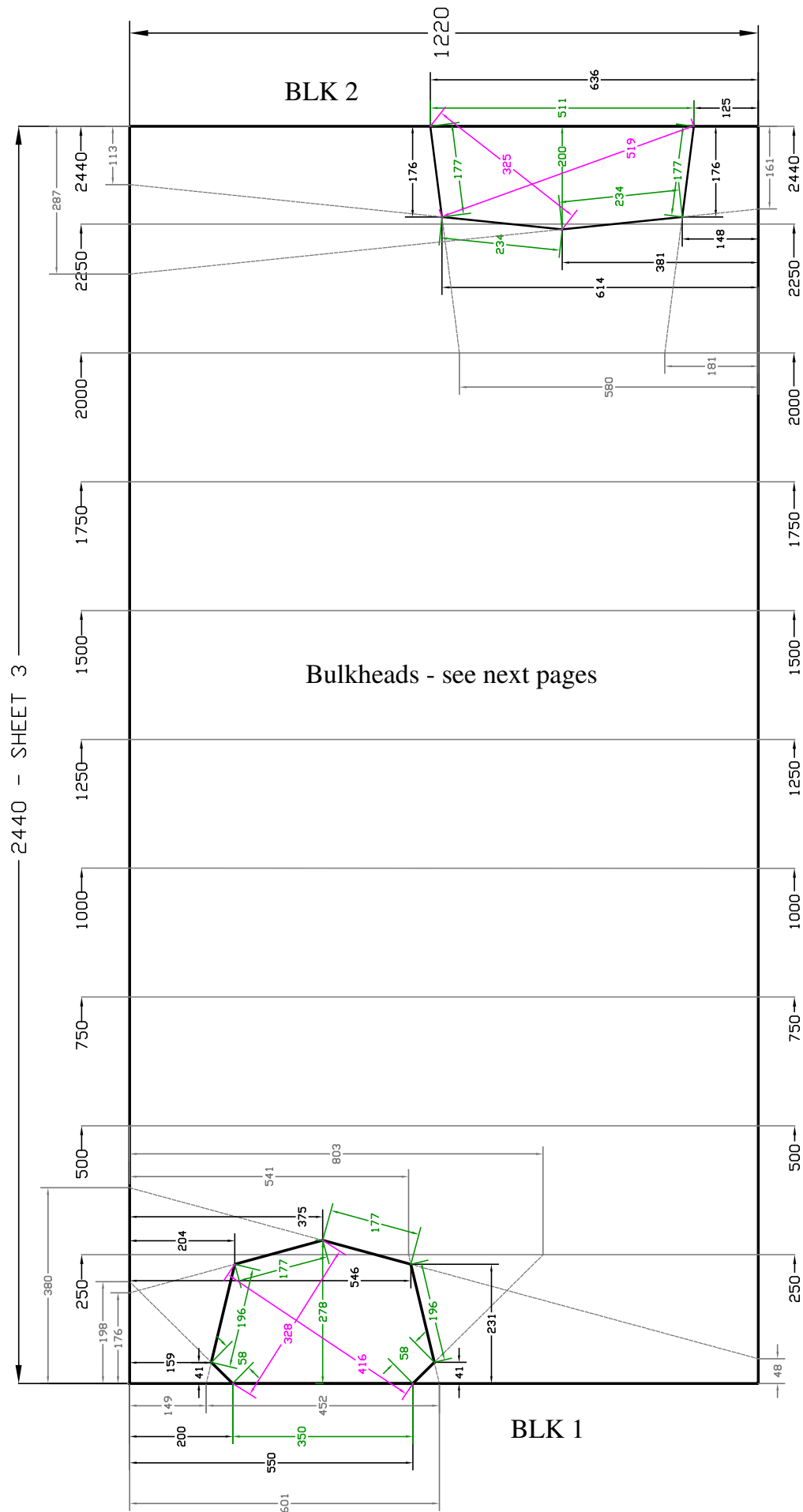




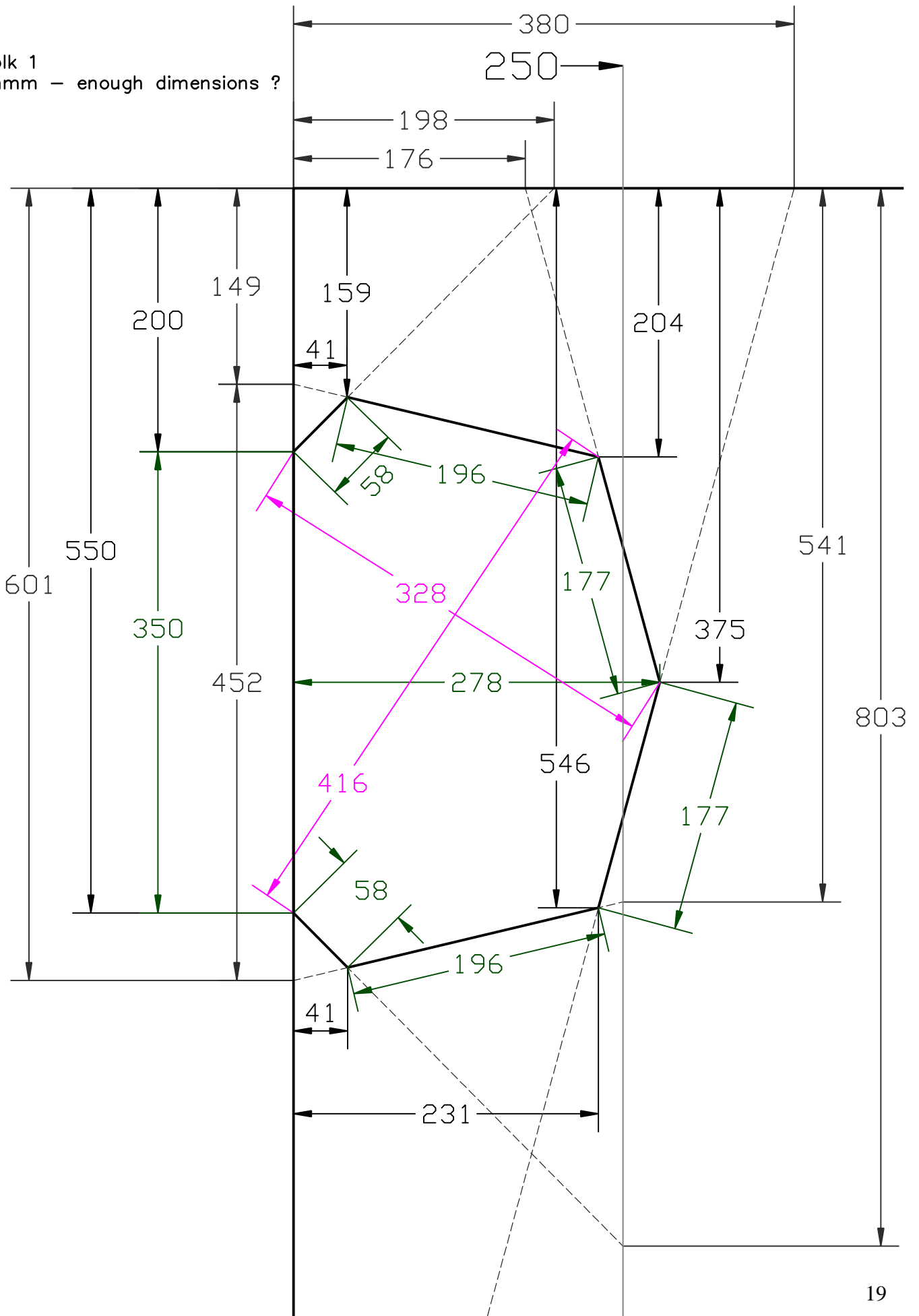


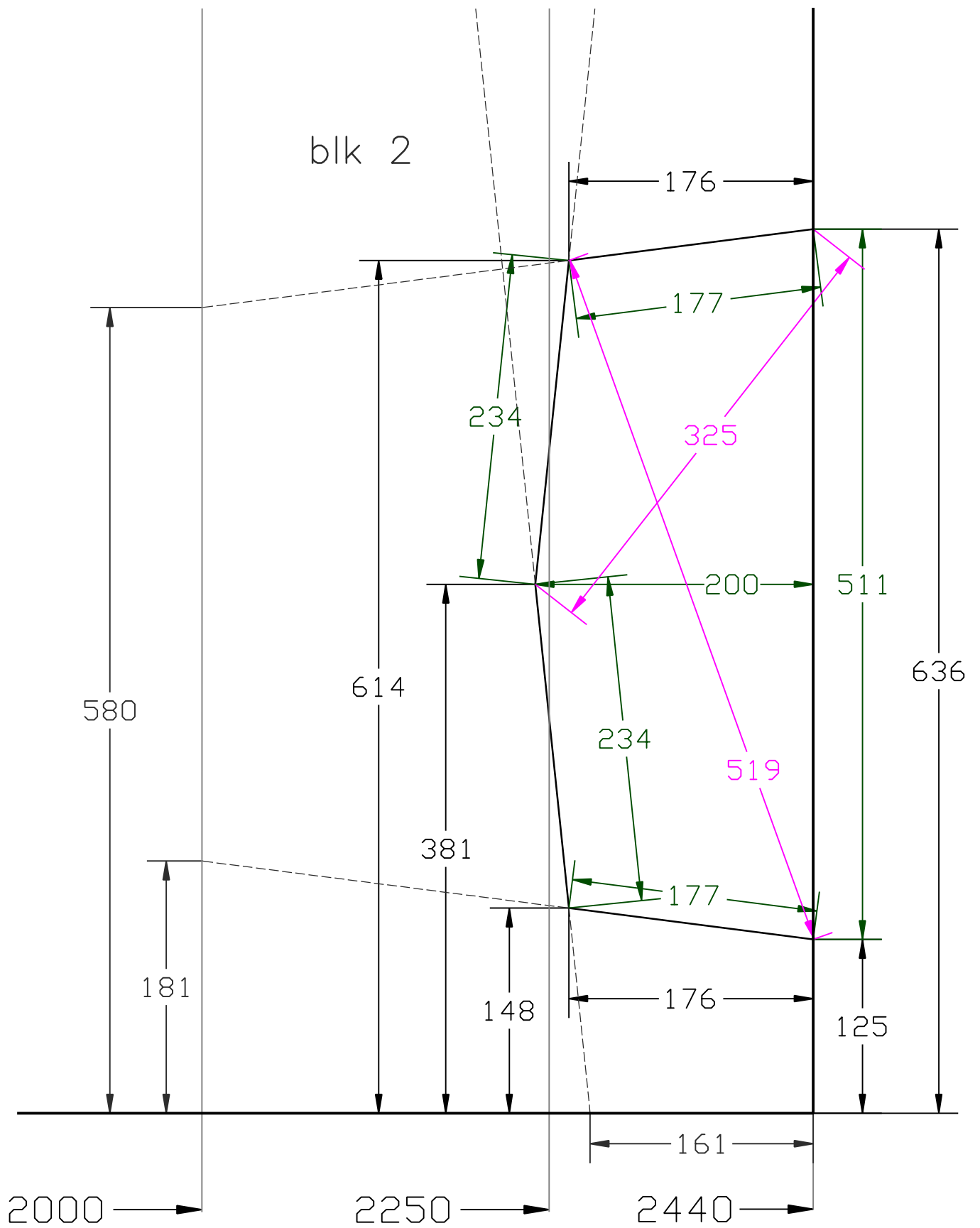


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blk 1
hmm – enough dimensions ?



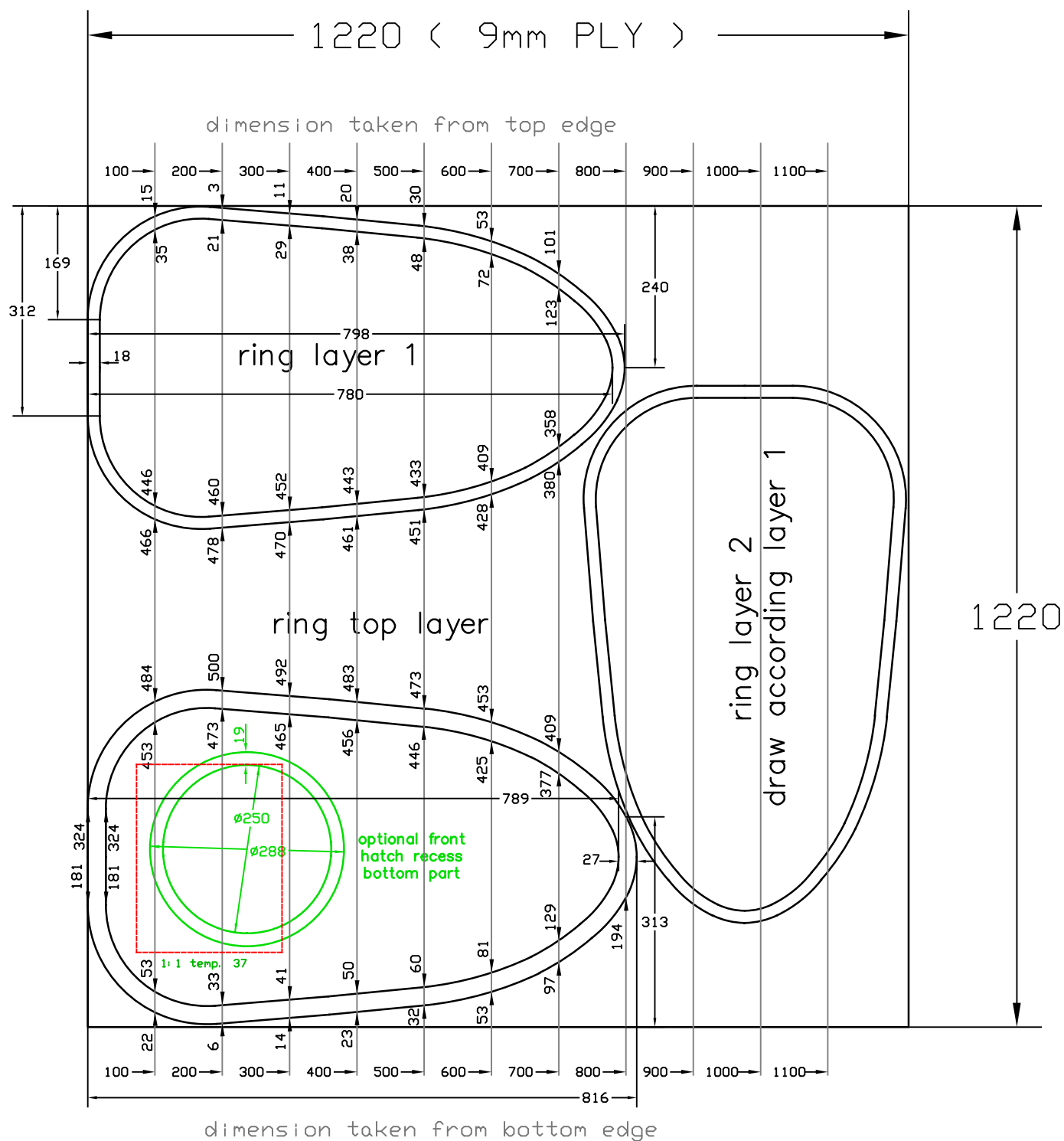


cockpit ring alternative 1

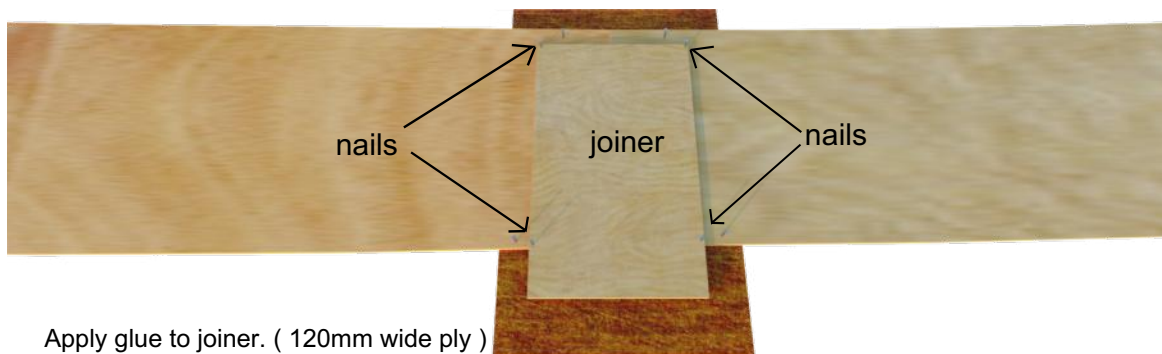
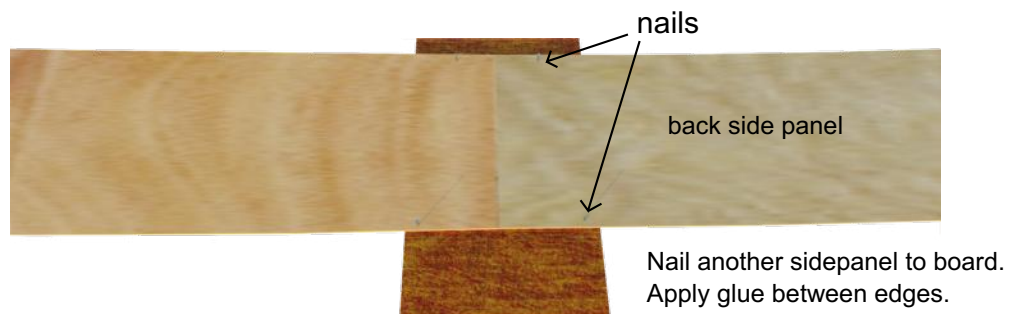
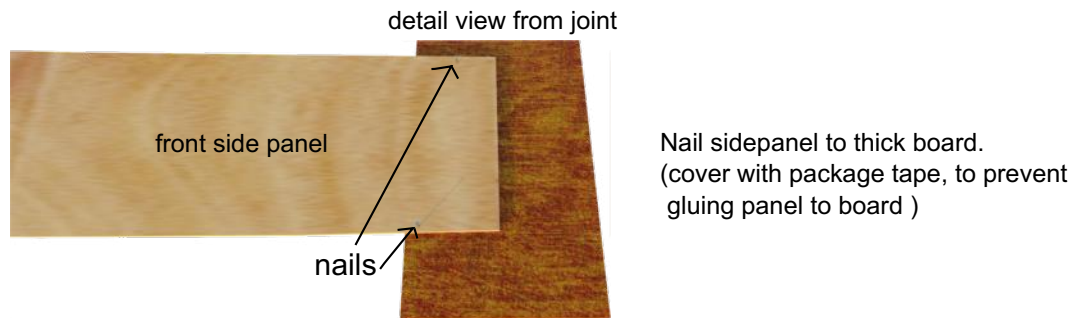
Ring is ca.10mm larger than opening in deck.

Trim deck to match ring after gluing.

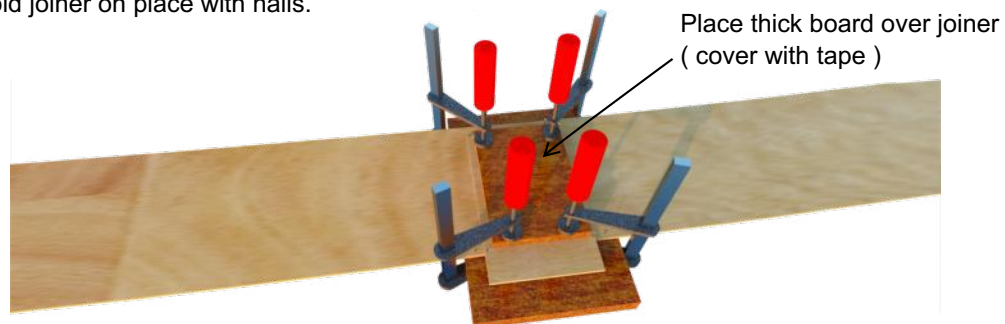
Use templates 21-25 to draw ring.



Joining side- and bottom panels



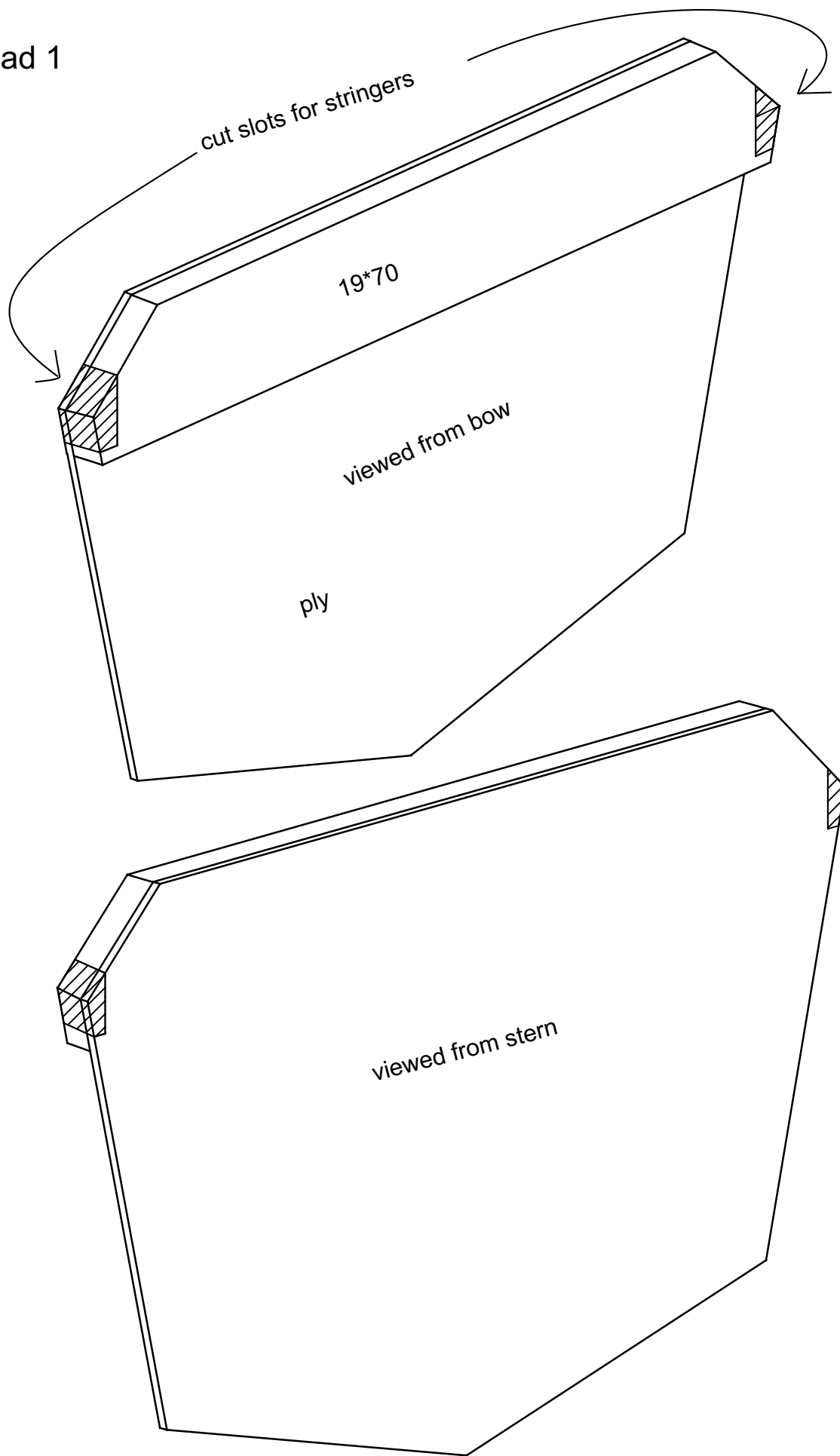
Apply glue to joiner. (120mm wide ply)
Place joiner to seam and hit nails to corners.
(on side panel, leave 19mm gap for gunwale stringers.
On bottom panels - let joiner go over panels on both edges)
Hold joiner on place with nails.

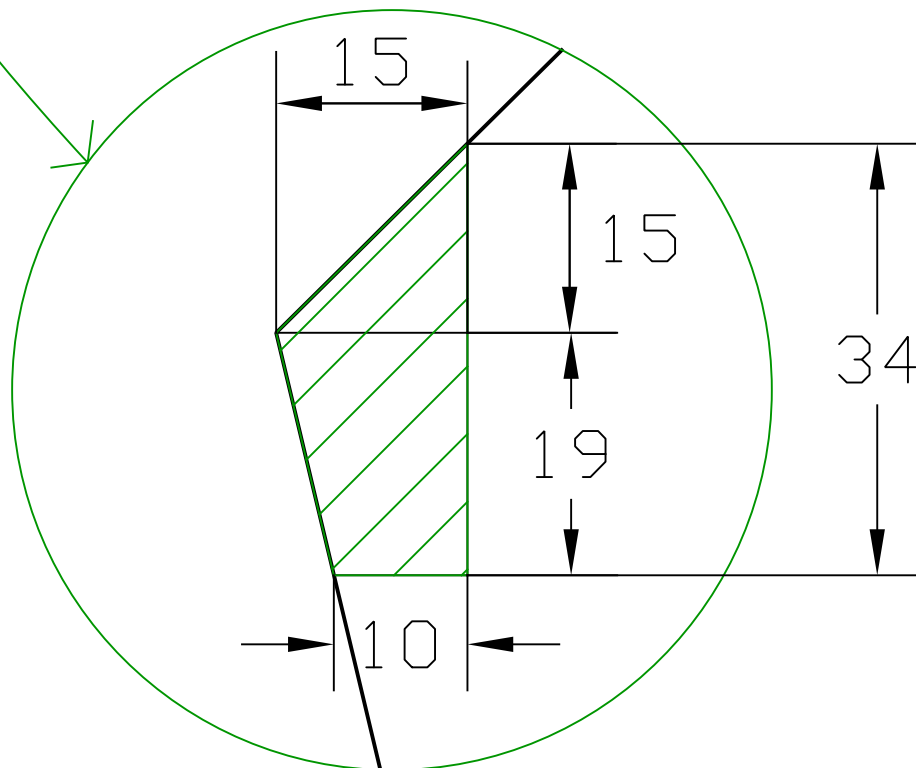
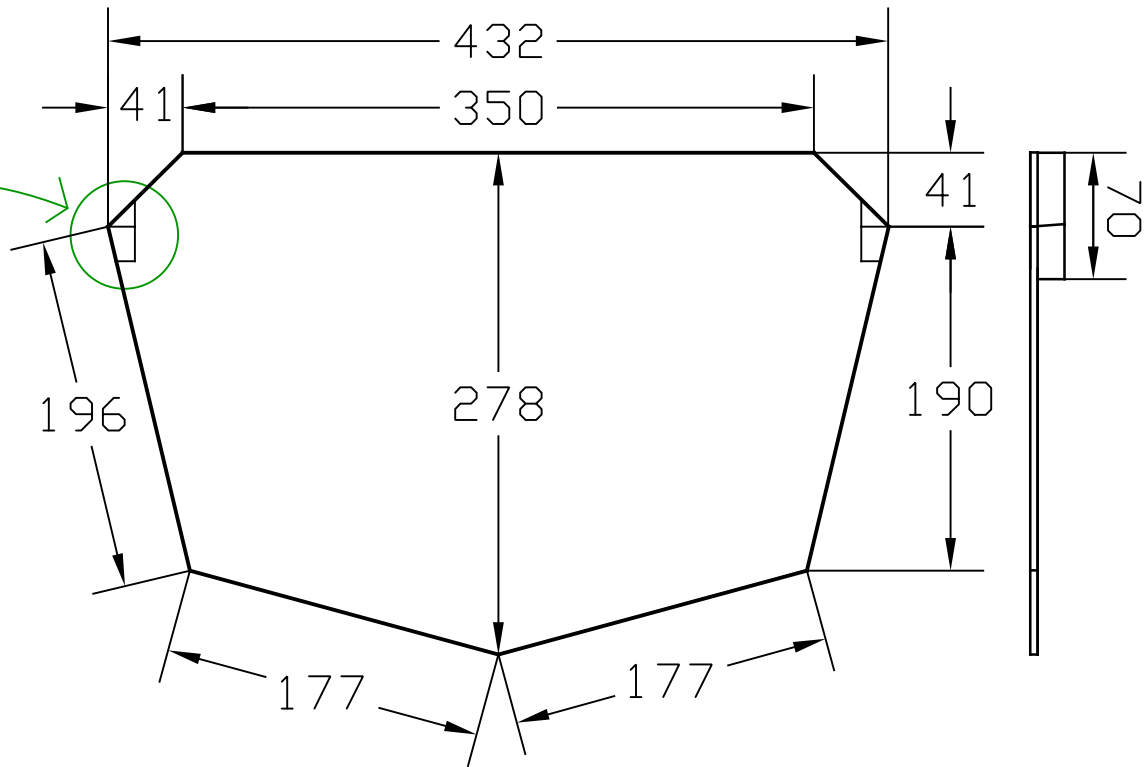
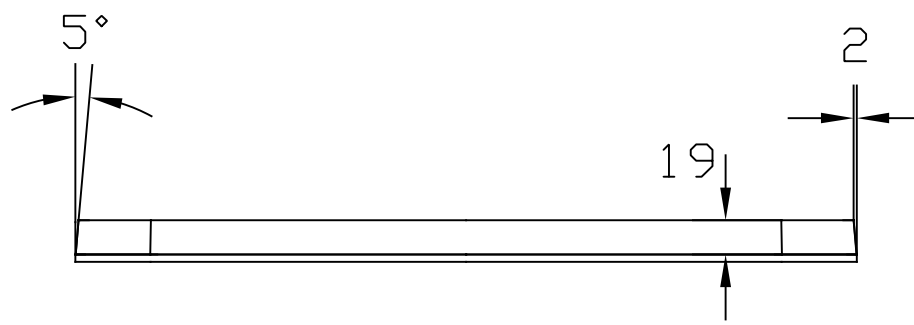


Clamp and let glue cure.
After glue is cured - cut joiner according
panels and plane joiners bottom edge close to zero.

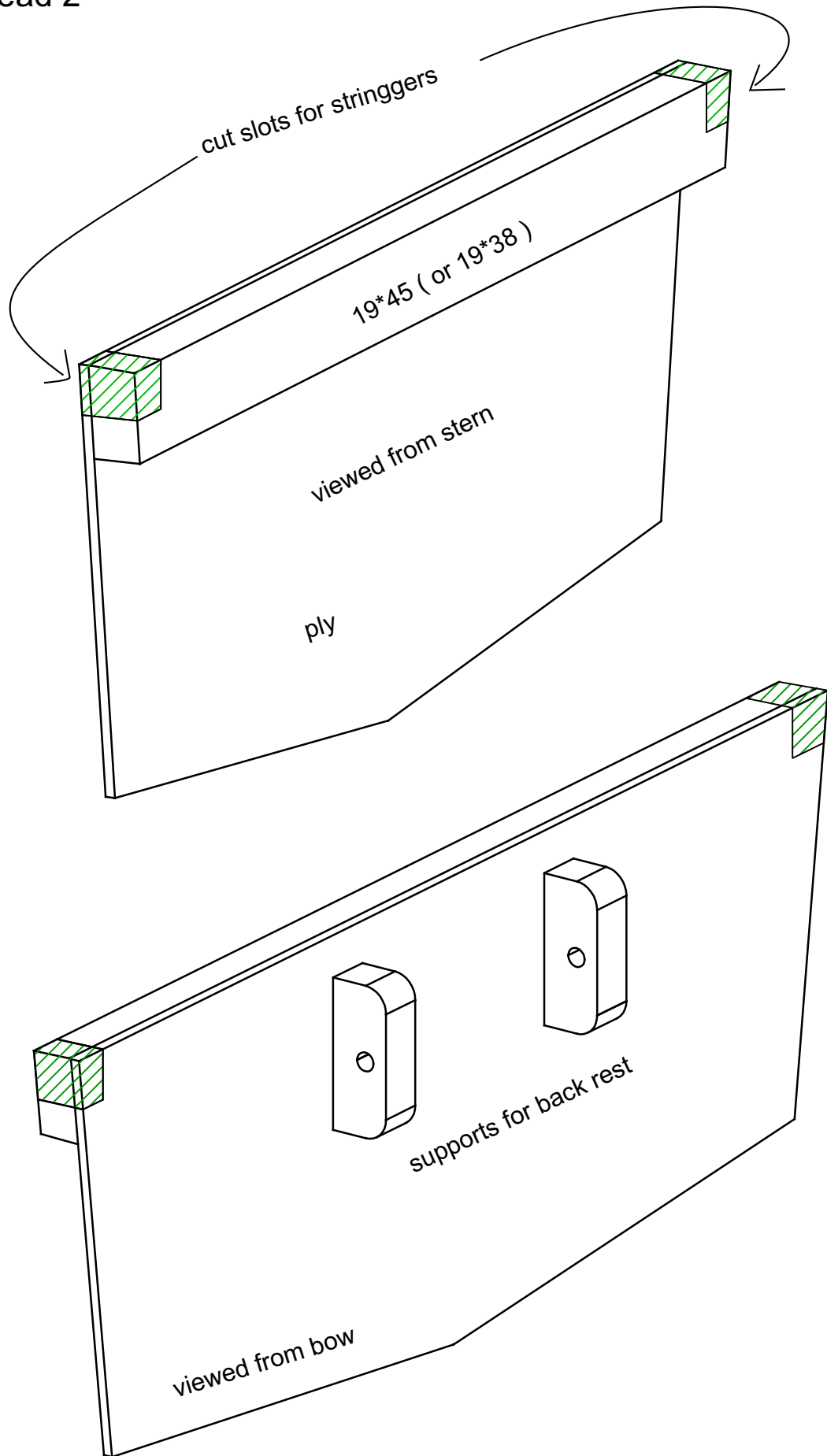


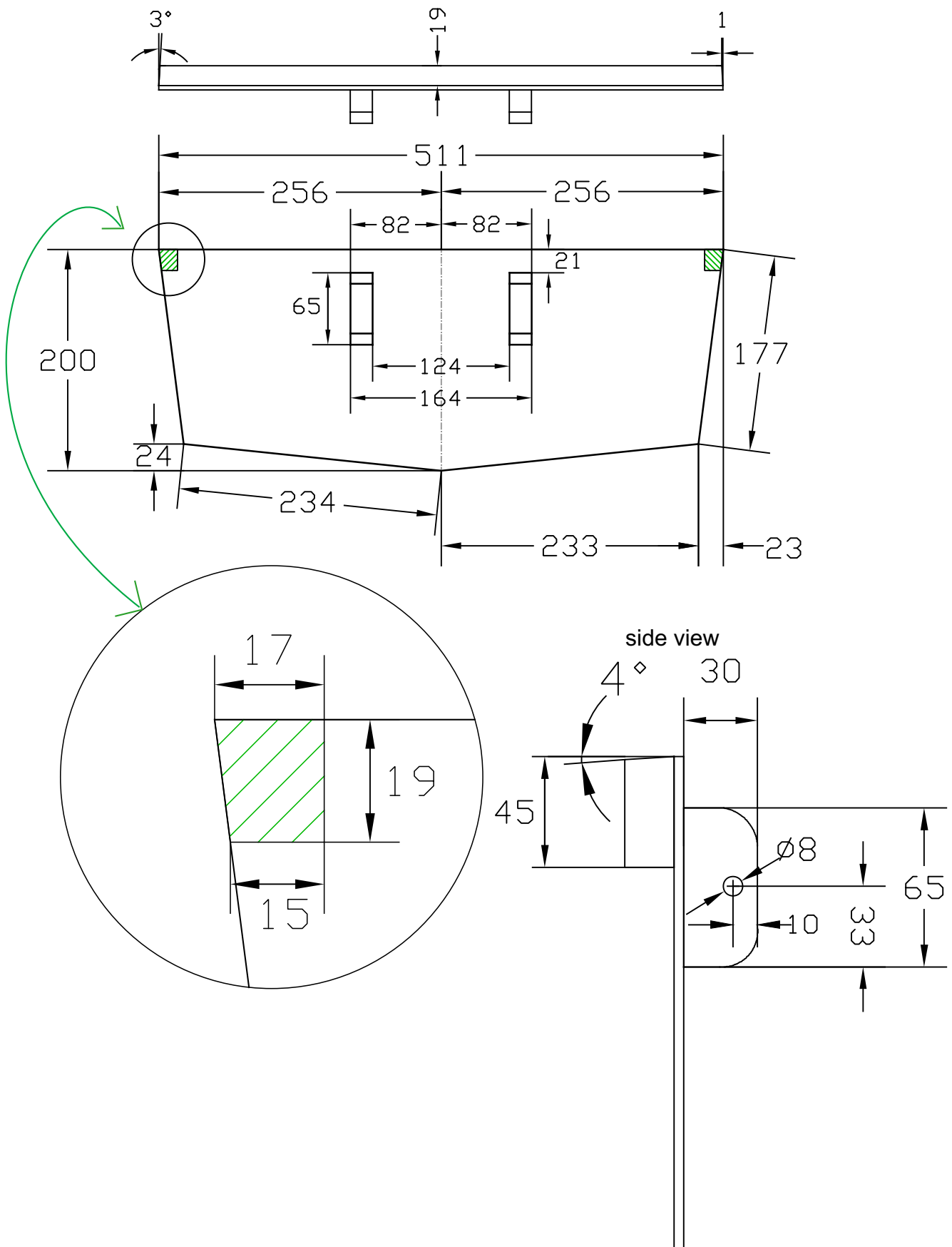
Bulkhead 1





Bulkhead 2

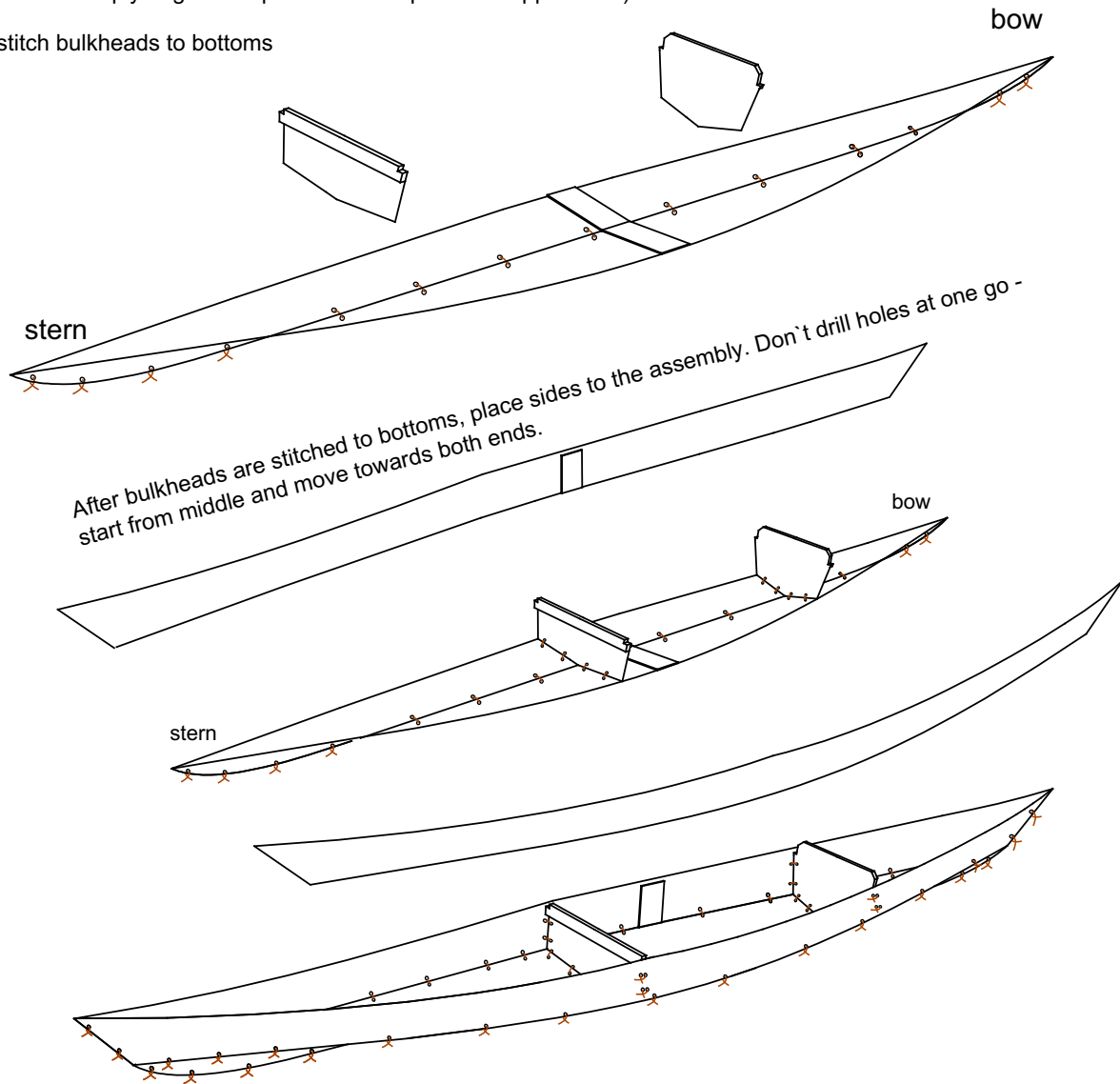




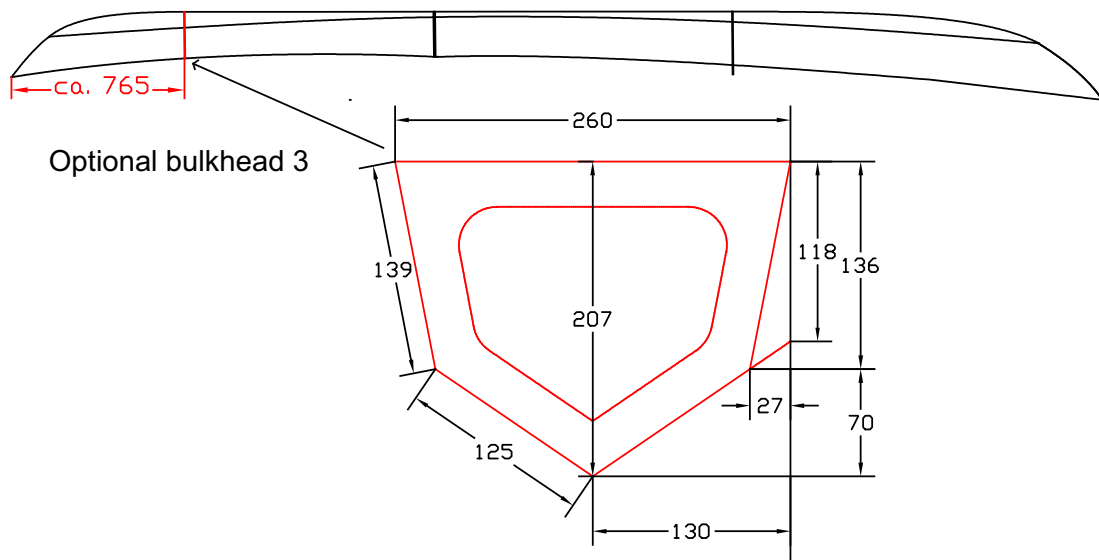
Assembly

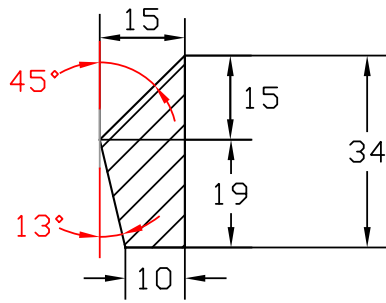
First stitch bottom parts together
(drill holes near ply edge - use plastic cable zip ties or copper wire)

Next stitch bulkheads to bottoms



Turn boat around. Check that rocker looks smooth. (Small error is ok.) Near stern is biggest possibility that rocker don't want to go straight. If so : make BLK3 to guide boat to right shape. If you have been accurate with panels there should not be need for blk3.

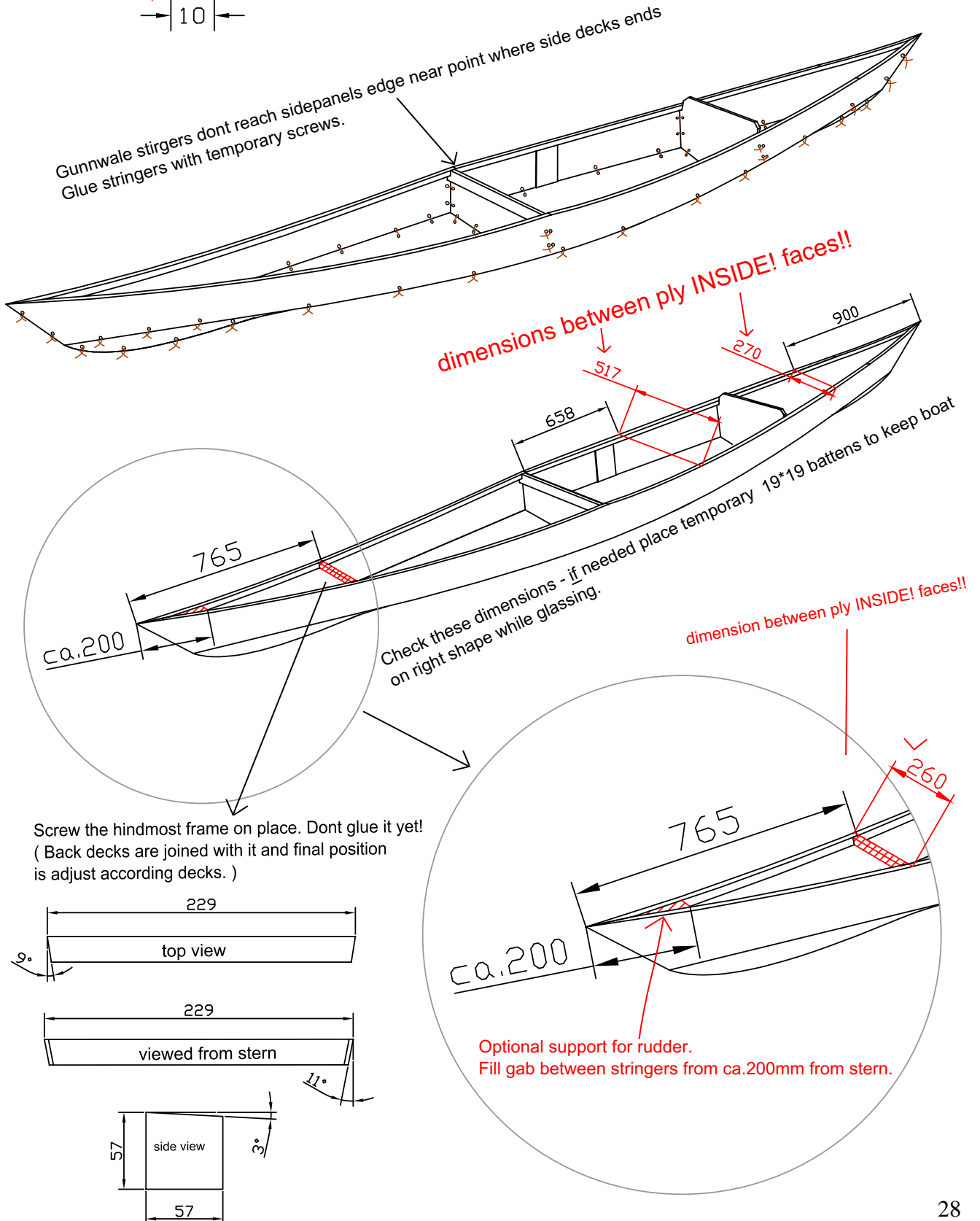




Gunwale stringers :

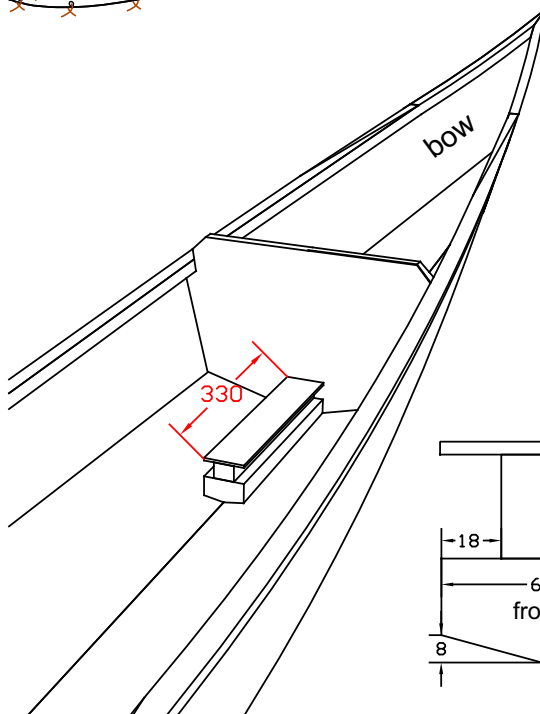
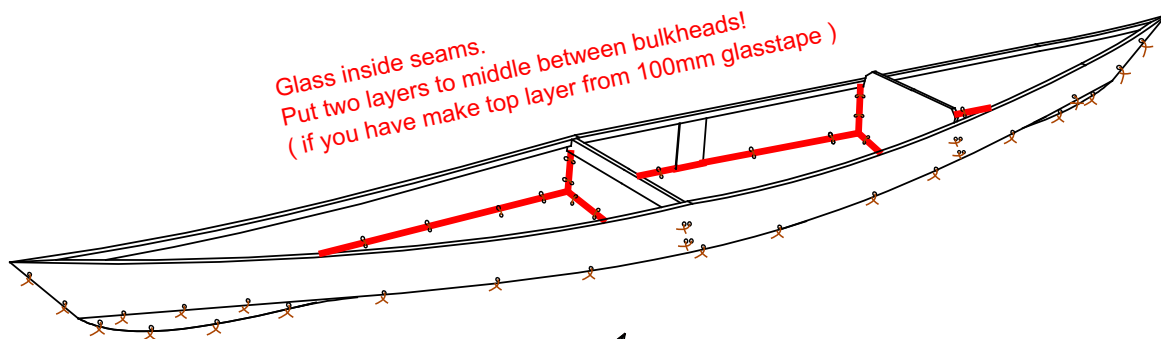
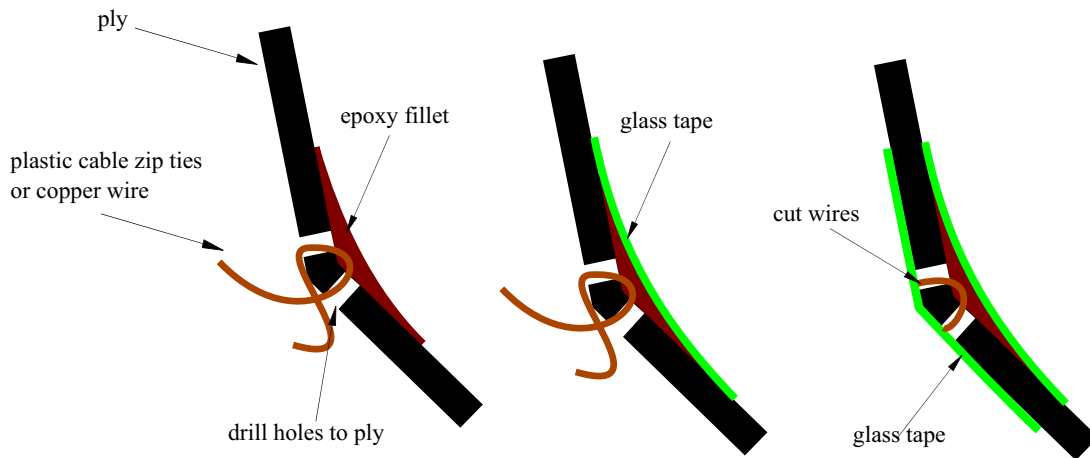
Top part goes only to side decks positions
(can be glued later) Length ca.2230. (to middle)

Lower stringers lengths are ca 4880. Taper both ends
from inside face, so they fit near both ends.



Assembly sequence

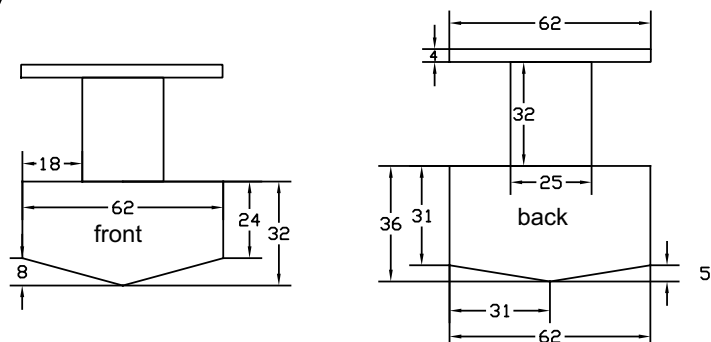
1. tighten stitches and check that parts fit nicely - ensure that bulkheads are not twisted.
2. apply epoxy fillet to inside seams - let fillet harden a bit, so that it doesnt stick to finger.
(apply fillet also to bulkheads seams)
3. place glass tape over epoxy fillet and spread epoxy over tape - Let cure
4. remove stitches, putty outside seams and sand after putty is cured.
5. glass outside seams



Support for footbraces

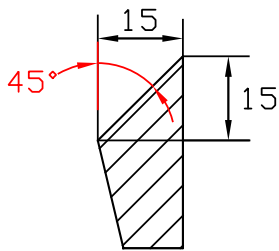
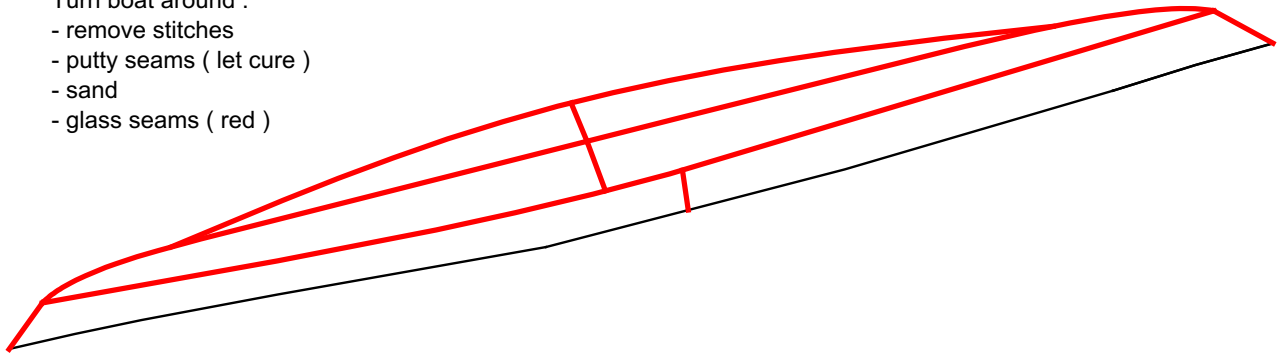
Use these dimensions as guide and modify bottom shape according your boat.

Fasten with temporary screws thru bottom.



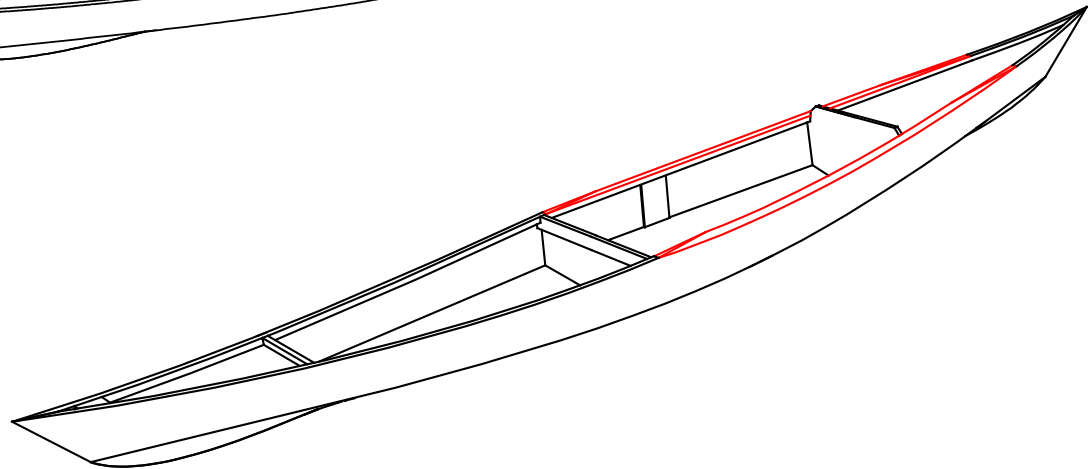
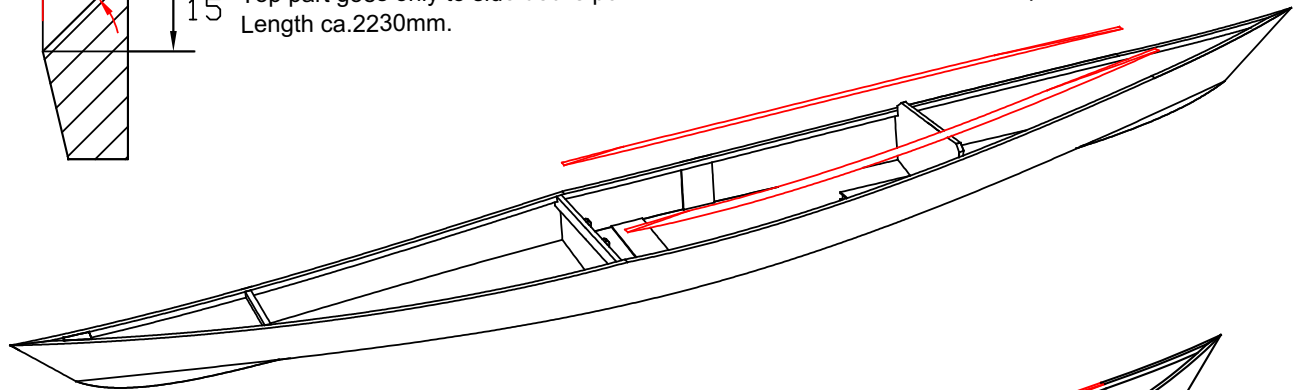
Turn boat around :

- remove stitches
- putty seams (let cure)
- sand
- glass seams (red)

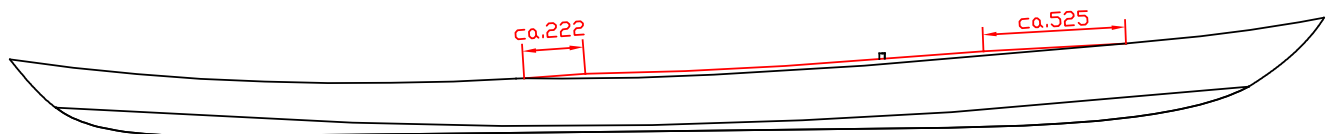


Gunwale top stringers :

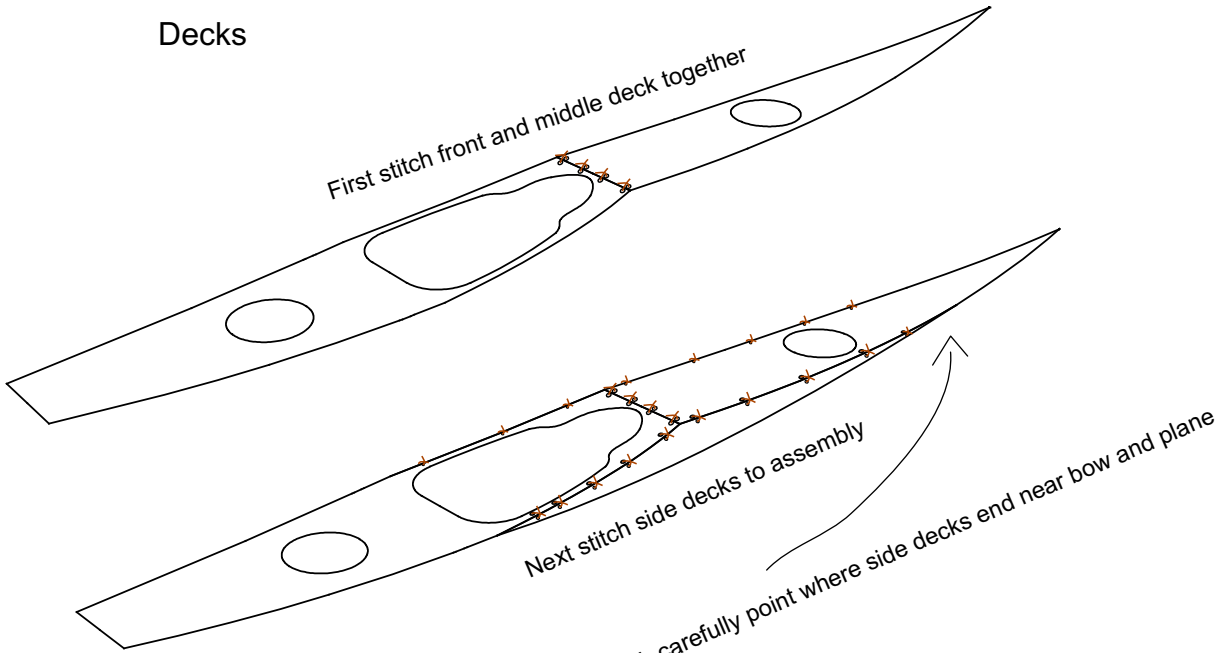
Top part goes only to side decks positions. Between marks drawn on side panels.
Length ca.2230mm.



Plane stringers to zero ca 222mm from back
and ca.525mm on front.



Decks



Lift decks to boat. Check how stringers fit against decks. Check cars
smooth. That point easily mirrors if there is even small tight bend.
plane stringers where needed. use so many screws as needed, s
#64 or from 1

Lift decks away and plane stringers where needed.
Use temporary stringers - use so many as needed.
Use temporary stringers - use so many as needed.
Use temporary stringers - use so many as needed.

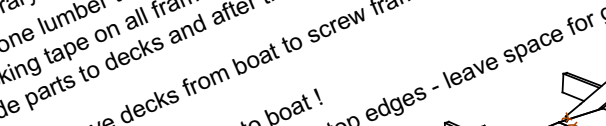
[illegible]

- push decks away and plane
- saw decks temporary to stringers - use
- saw boats shape under decks.
- fasten temporary frames over decks from 19*45 or 16*64
- first screw one lumber to deck as cross frame.
- (use packing tape on all frames to prevent accidentally bonding)
- screw side parts to decks and after that screw side parts to cross frames.
- screw side parts from boat to screw frames to decks. Don't screw
- and, remove decks from boat to screw frames over decks for glas
- and back to boat !
- in decks top edges - leave space for glas

boats 3

en temporary frames
st screw one lumber to deck a
(use packing tape on all frames to pro
screw side parts to decks and after that screw

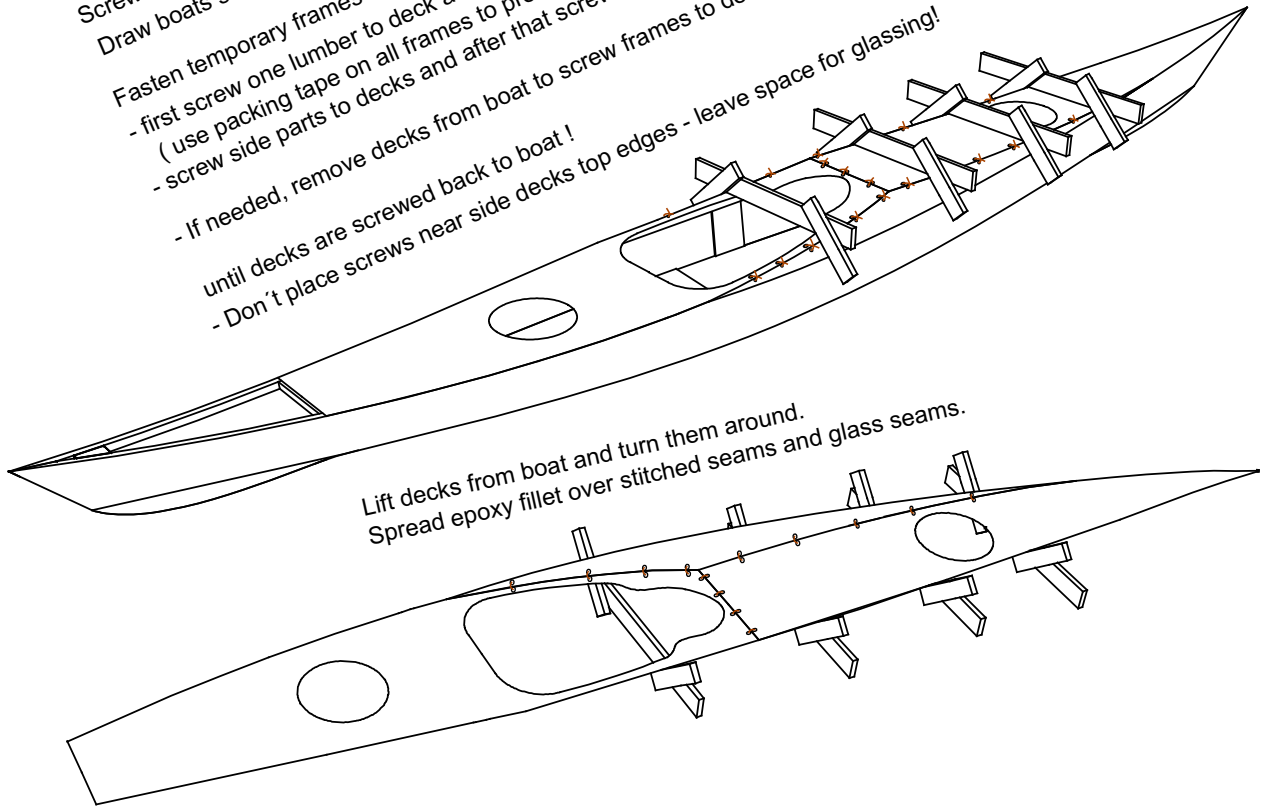
- If needed, remove decks from boat to screw frames to de
until decks are screwed back to boat !
- Don't place screws near side decks top edges - leave space for glassing!



The diagram shows a side view of a boat hull. The side decks are shown being removed from the main hull structure. Temporary frames are attached to the hull using screws. Arrows indicate the removal of the side decks. A note at the bottom right says: '- Don't place screws near side decks top edges - leave space for glassing!'. A small circular inset shows a detail of a screw being driven into the hull.

needed, remove decks from boat!
Decks are screwed back to boat!
Screws near side decks!

- Don't place screws

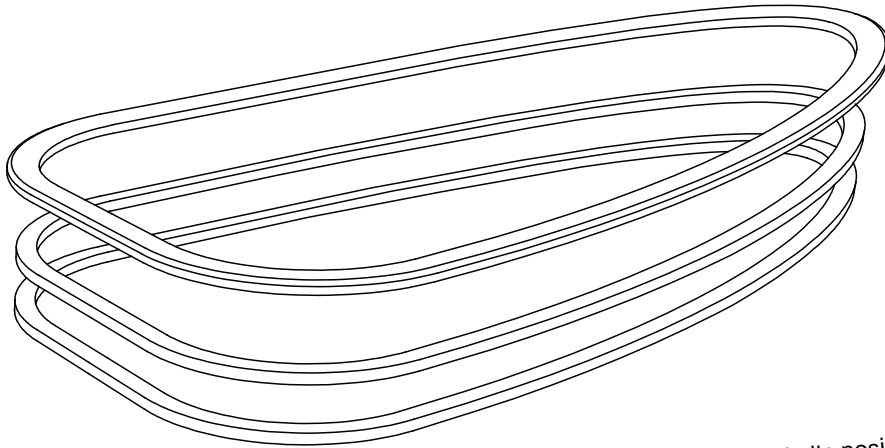


Lift decks from boat and turn them around.
Spread epoxy fillet over stitched seams and glass seams.

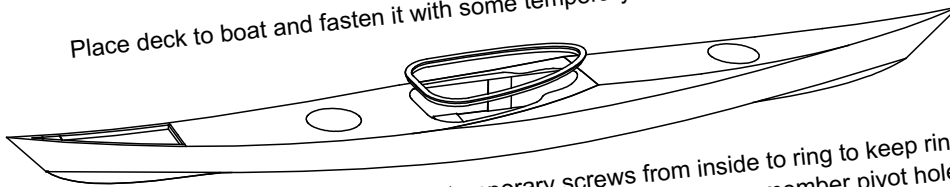
Cockpit ring

Cockpit ring is made from 3 layers of 9mm ply. (See also option of ring made from 4mm ply)

Two bottom layers are similar, and top layer is bit larger from outside. You can save ply by making just bottom ring from one piece and glue middle layer from left over piece and route or saw them according bottom ring.



Place deck to boat and fasten it with some temporary screws (on cockpits position).

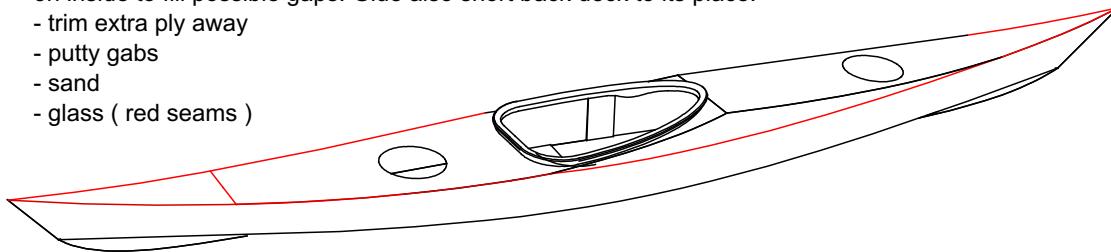


Glue cockpit ring to decks. Use some temporary screws from inside to ring to keep ring on correct position (or just use some long screws from ring thru ply - remember pivot holes)
Use clamps (or temp screws) for pressing ring towards deck.
Remove decks, sand, epoxy coat and paint inside faces.
I just epoxy front and back storages (don't even finish them much) and paint only cockpit position.



Glue deck assembly to boat. Use temporary screws thru decks to stringers. Use thickened epoxy as putty on inside to fill possible gaps. Glue also short back deck to its place.

- trim extra ply away
- putty gabs
- sand
- glass (red seams)



Finishing

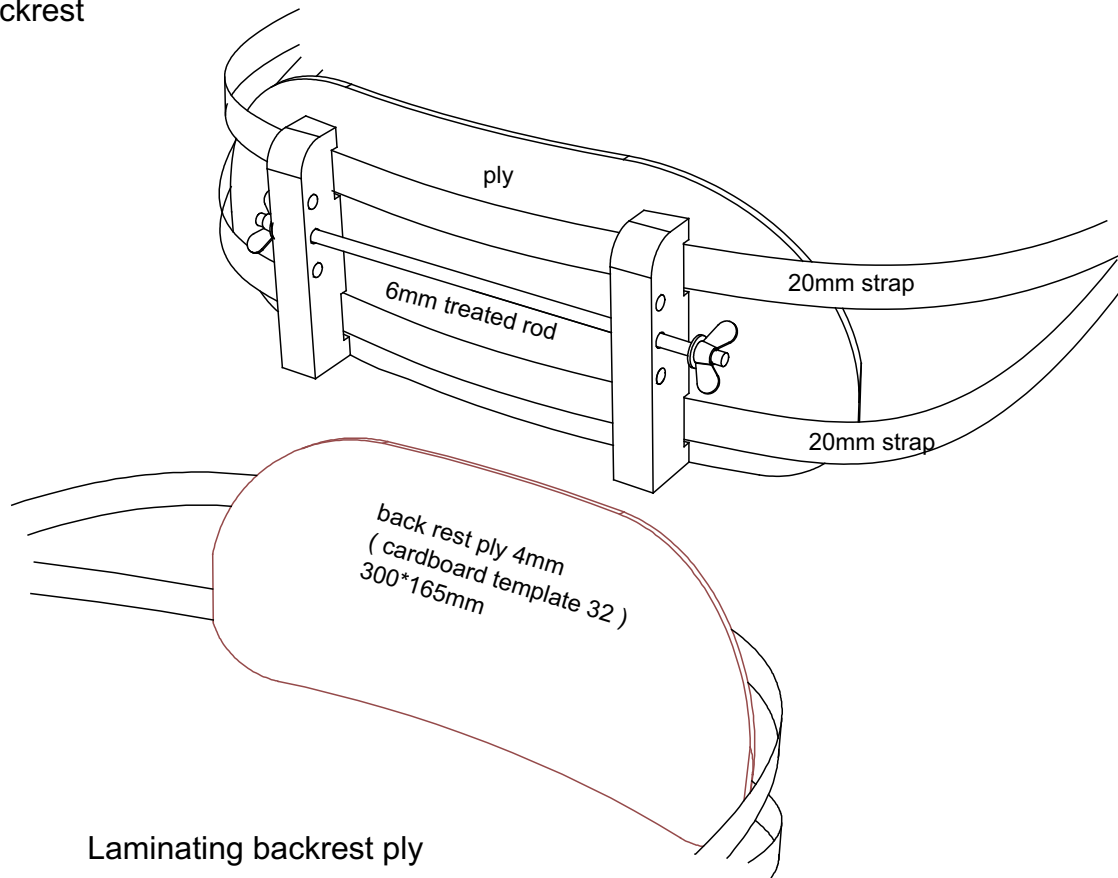
Sand glassed seams gently, then apply putty, sand ..do epoxy coating, sand....and finally do the painting. Remember to dewax and sand epoxy before painting. The way I usually do epoxy coating is not official, but it's easy and epoxy-saving method. Pour epoxy to ply face - spread it with rubber scraper - only so thin layer that surface veneer gets temporarily wet. It will soak epoxy, but let it be so.

Wipe out all leftover epoxy and let it dry over night. The ply surface has now soaked the epoxy and surface is easy to sand smooth with sandpaper - not with sander! Apply another coat same way as described. This method won't give thick epoxy coat, but you can get even base for painting - with minimal sanding - even thin layer of epoxy is better than just paint.

If you want more durable epoxy coat, apply epoxy with wet to wet method.

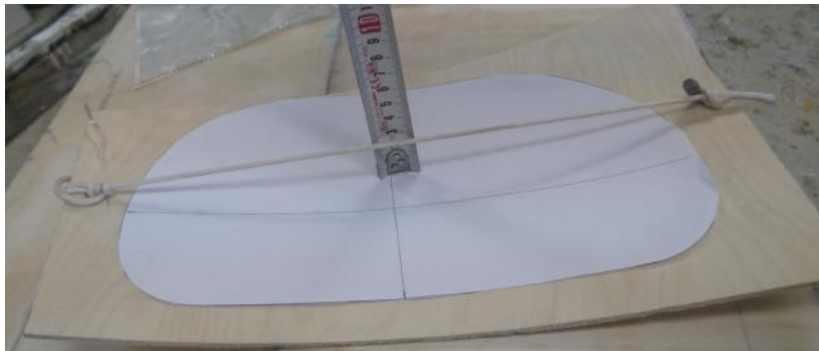
I have the habit to sand thick epoxy coats through wood, because the surface is uneven after epoxy is cured.

Backrest



Laminating backrest ply

Cut ply a bit larger than backrest. Tension ply with rope. Right amount is a bit guess - it depends from glass thickness etc. and after glassing lamination opens a bit, so make it a bit more curved than needed. (Less curved backrest is probably better choice.)
I made ca.30mm tension and I think it was a bit too little.



Glass inside face - let cure and cut ply to shape.



side view

Technical drawing showing the side view of a mechanical part. The part has a curved outer profile and a stepped internal structure. Key dimensions and features are indicated:

- Overall height: 120
- Top step height: 10
- Distance from top step to first hole center: 52
- First hole diameter: $\phi 7$ (indicated with a \oplus symbol)
- Distance between hole centers: 20
- Second hole diameter: $\phi 7$ (indicated with a \ominus symbol)
- Distance from second hole center to bottom step: 25
- Bottom step height: 10
- Distance from bottom step to the right edge: 5

ladder lock - sewed to short strap from saddle.
On other side ladder lock comes to lower strap.

saddle

glue padding to knee supports

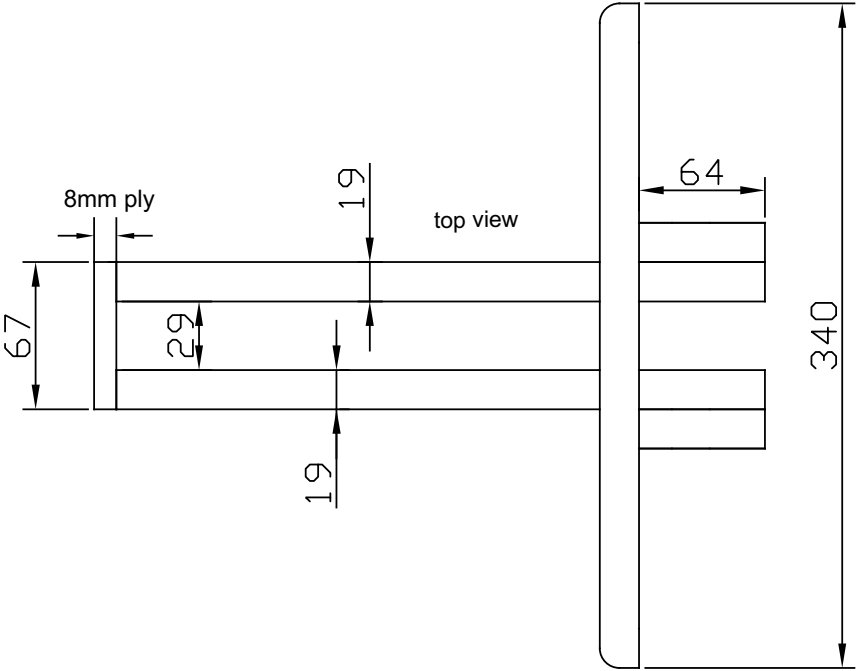
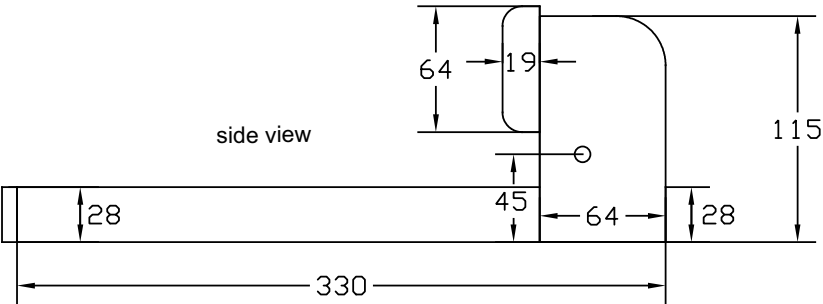
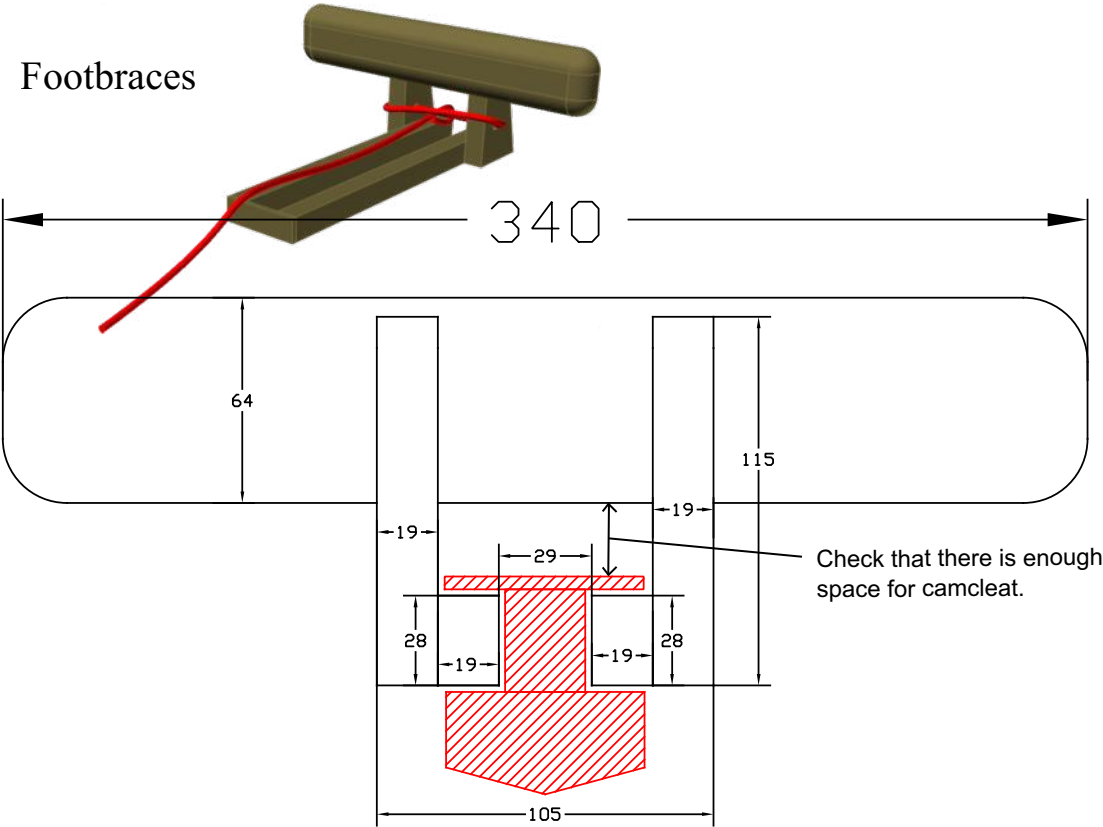
Sew loops to starps round saddle.
Fasten saddle "far enough" from backrest.

glue padding to back rest

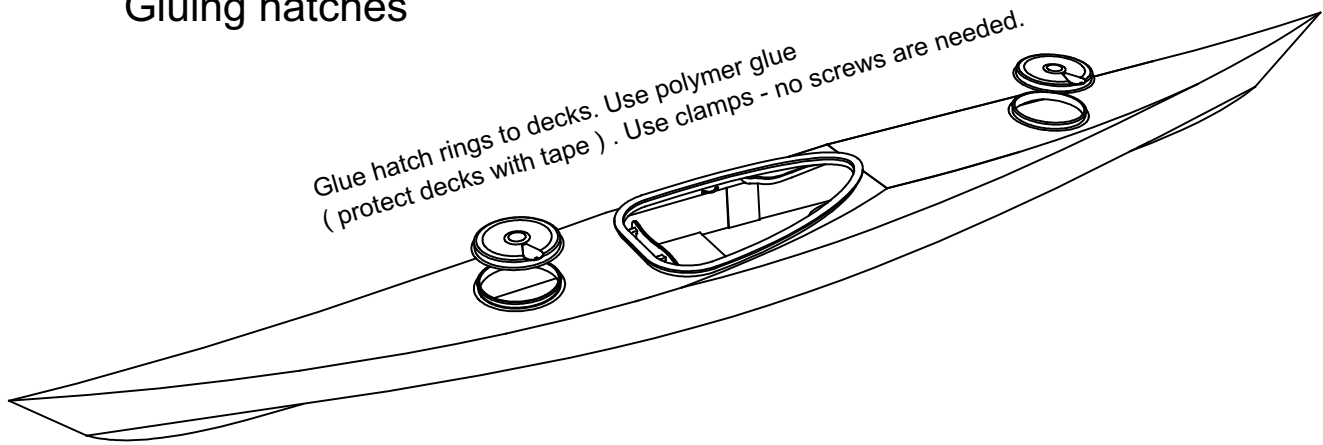
seat : piece of camping matt etc.

fasten clamleat for footbraces

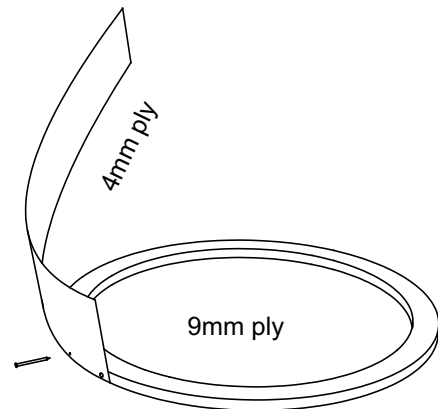
Footbraces



Gluing hatches

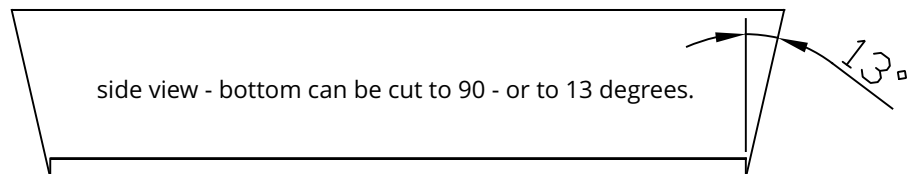
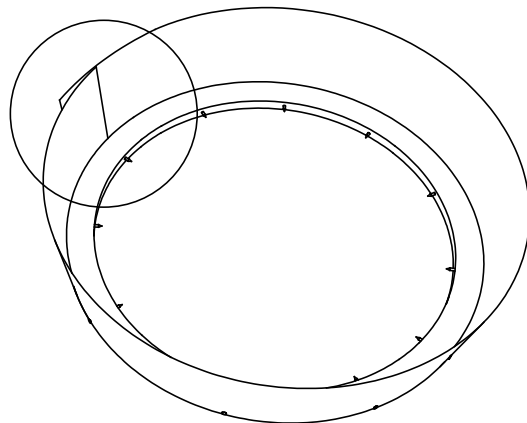
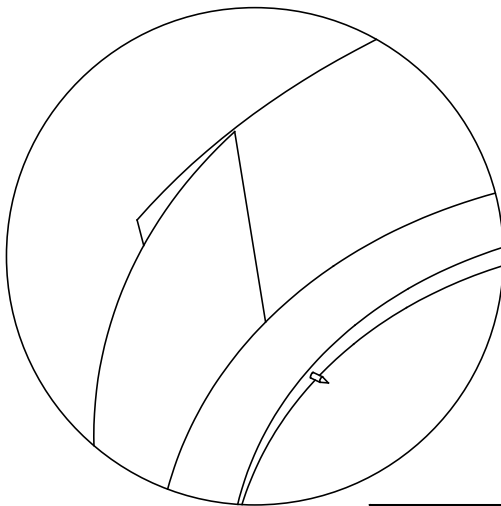


Optional hatch recess (for kayak sport - KS round hatch 24)



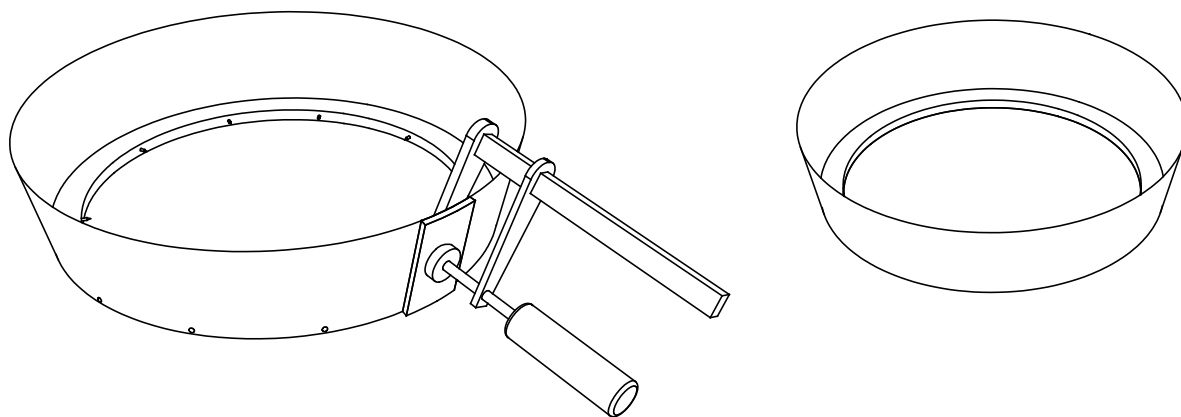
Drill pilot holes thru both parts with a bit smaller drill than nails diameter are. Apply glue, drill holes and hit nails as you proceed.
Use thin nails that come thru 9mm ply ring.

When you reach 360 degrees -
mark edge position and cut side part.

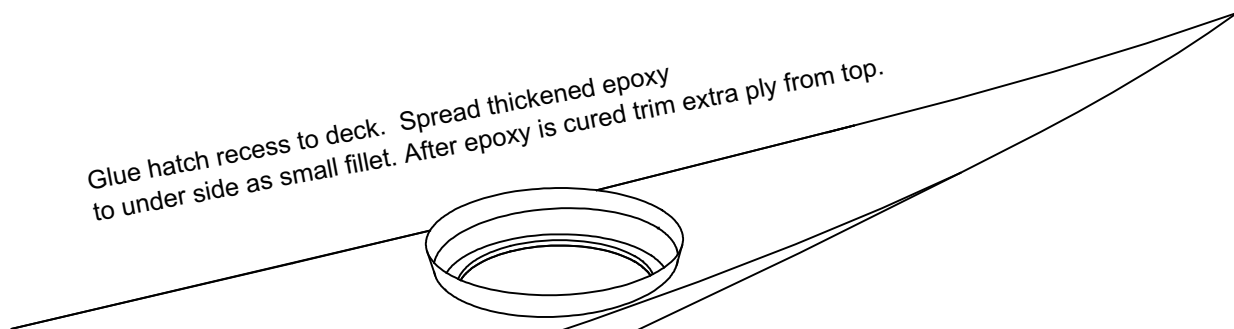


Join side with clip of plywood.

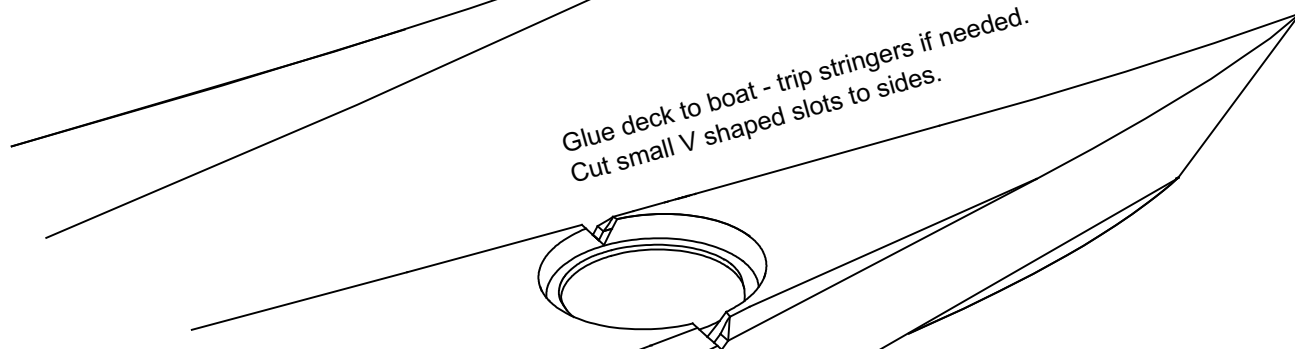
After glue has cured - remove nails and sand joiner as thin as you dear.



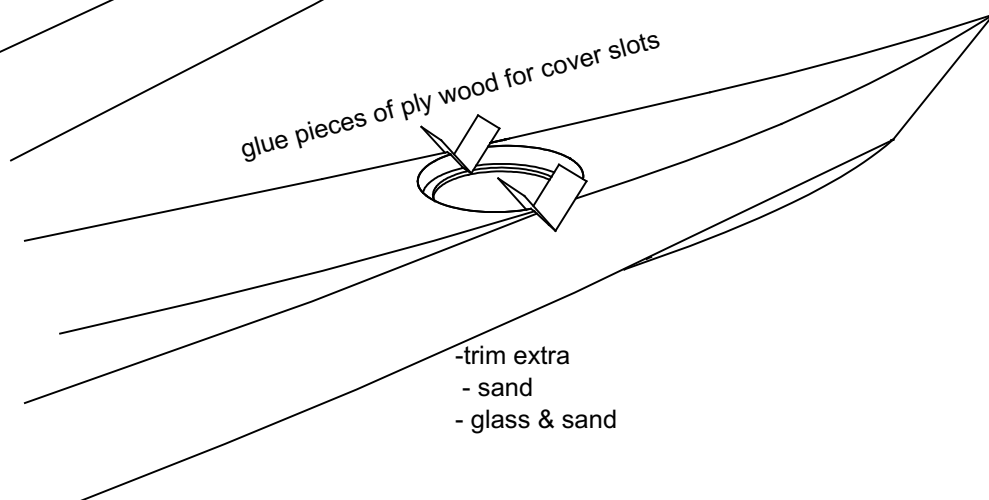
Glue hatch recess to deck. Spread thickened epoxy to under side as small fillet. After epoxy is cured trim extra ply from top.



Glue deck to boat - trip stringers if needed. Cut small V shaped slots to sides.



glue pieces of ply wood for cover slots



- trim extra
- sand
- glass & sand

Cockpit ring alternative 2

Cut ring first a bit larger than shown on plans.

Fasten small blocks to deck with screws. Cover blocks with package tape!

Fasten cockpit ring first from back with temporary screws to BLK2s top frame. Push ring towards deck and screw it to temporary blocks on deck. Mark position where ring will be cut to final length.

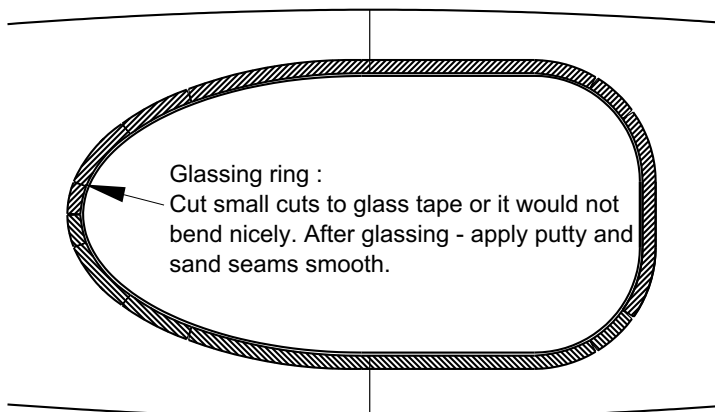
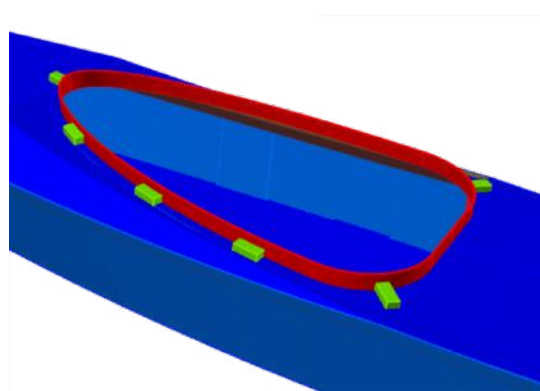
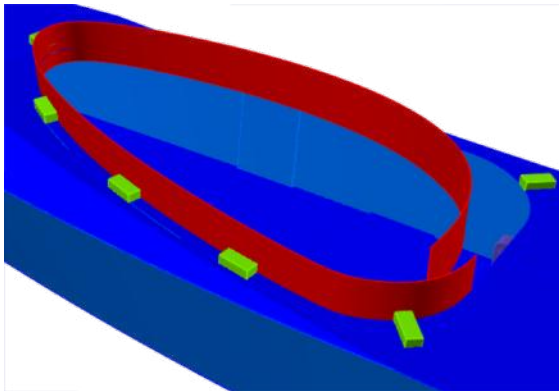
Draw rings top shape : place a piece of ca. 9mm thin piece of wood under pencil.

Remove ring - cut top edge and fasten it again to same position.

Glue ring to deck. Use epoxy fillet between temp blocks. DONT GLUE ring to BKL2 yet!!

Remove deck - trim ring bottom edge according deck. Putty - sand small radius to join and glass seam.

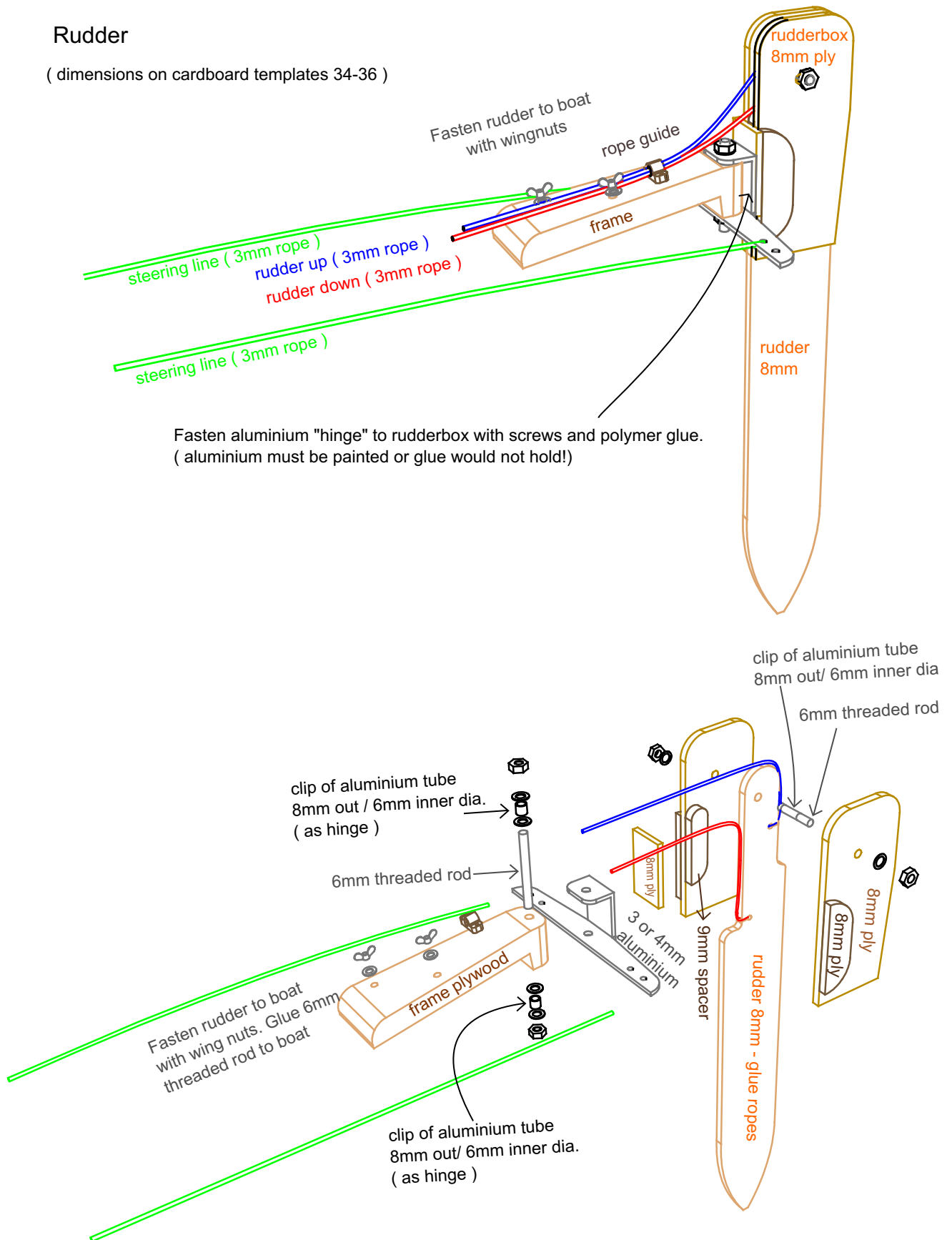
Glue decks to boat . Remove temporary blocks and make final fillet around ring. Glass outside seams.



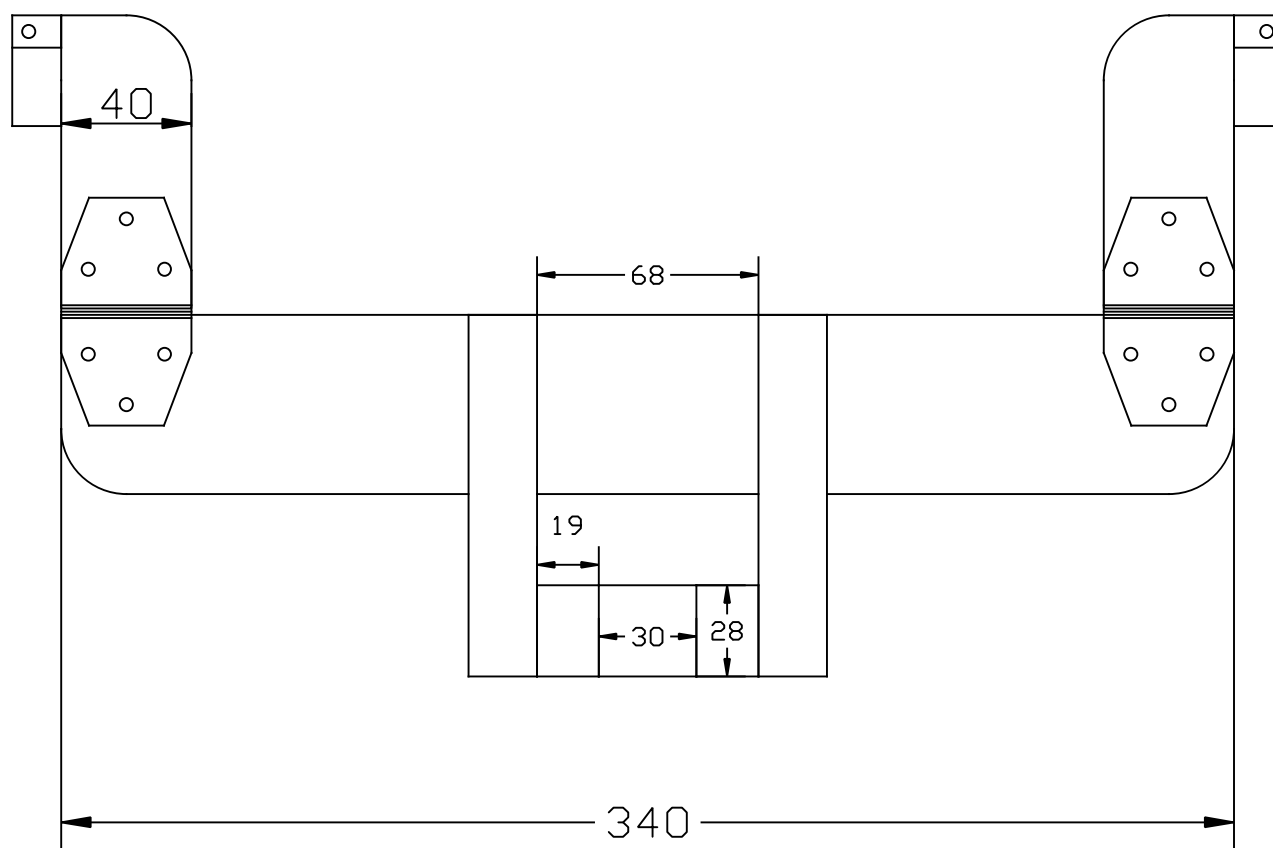
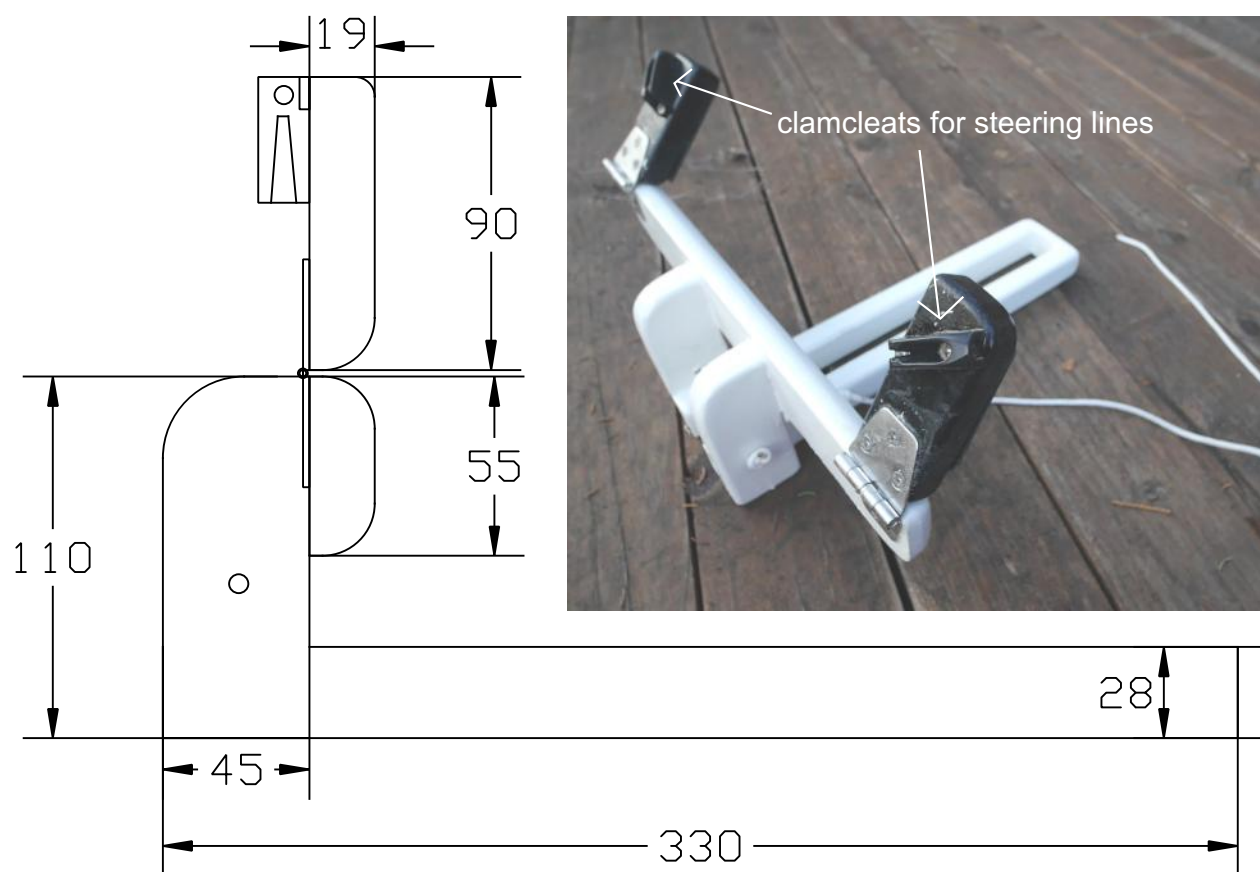
Finish ring with rubber U moulding .
(used on car body parts etc.)

Rudder

(dimensions on cardboard templates 34-36)



Footbraces with steering pedals

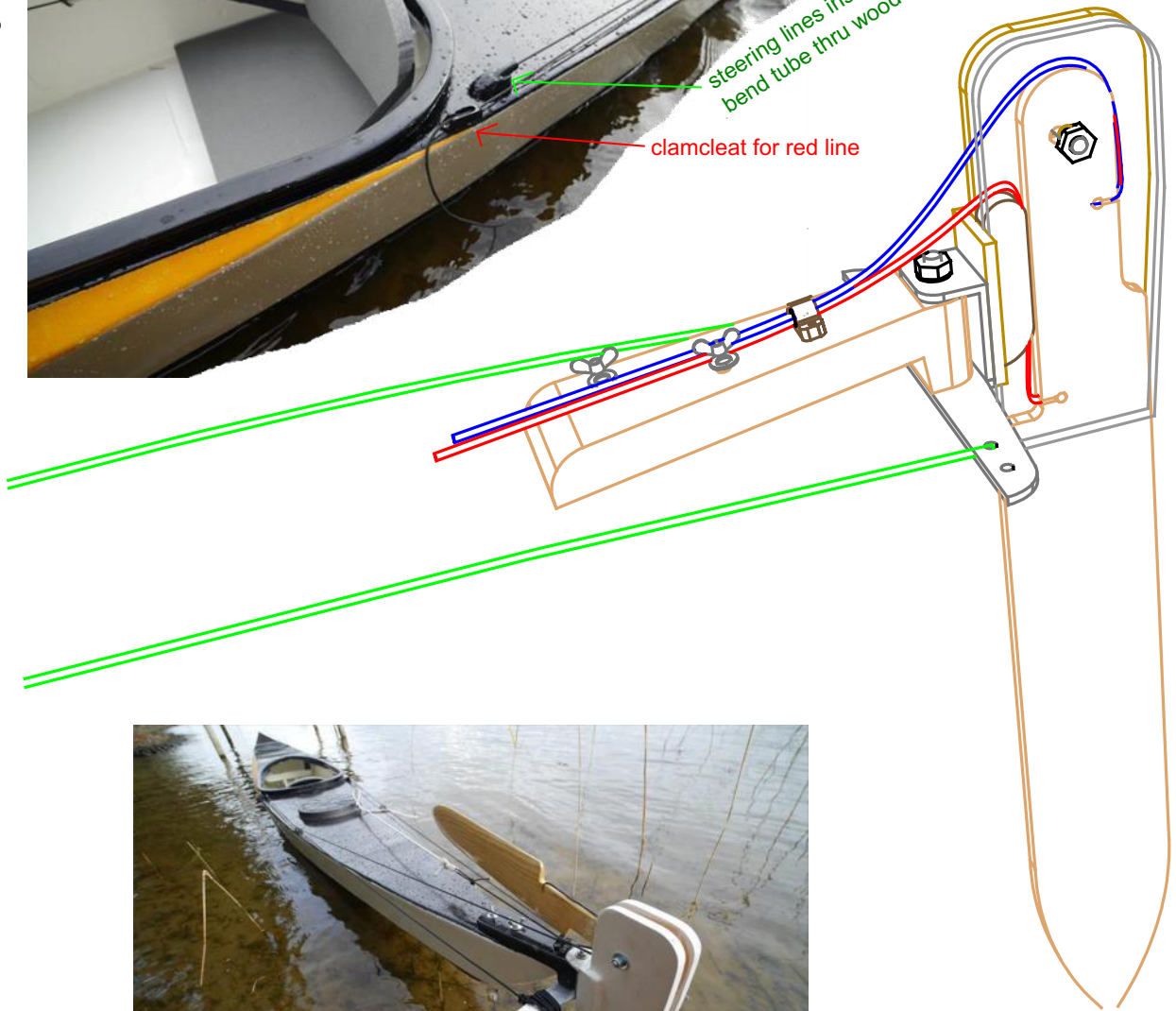


small loops off flexible rope
on steering line



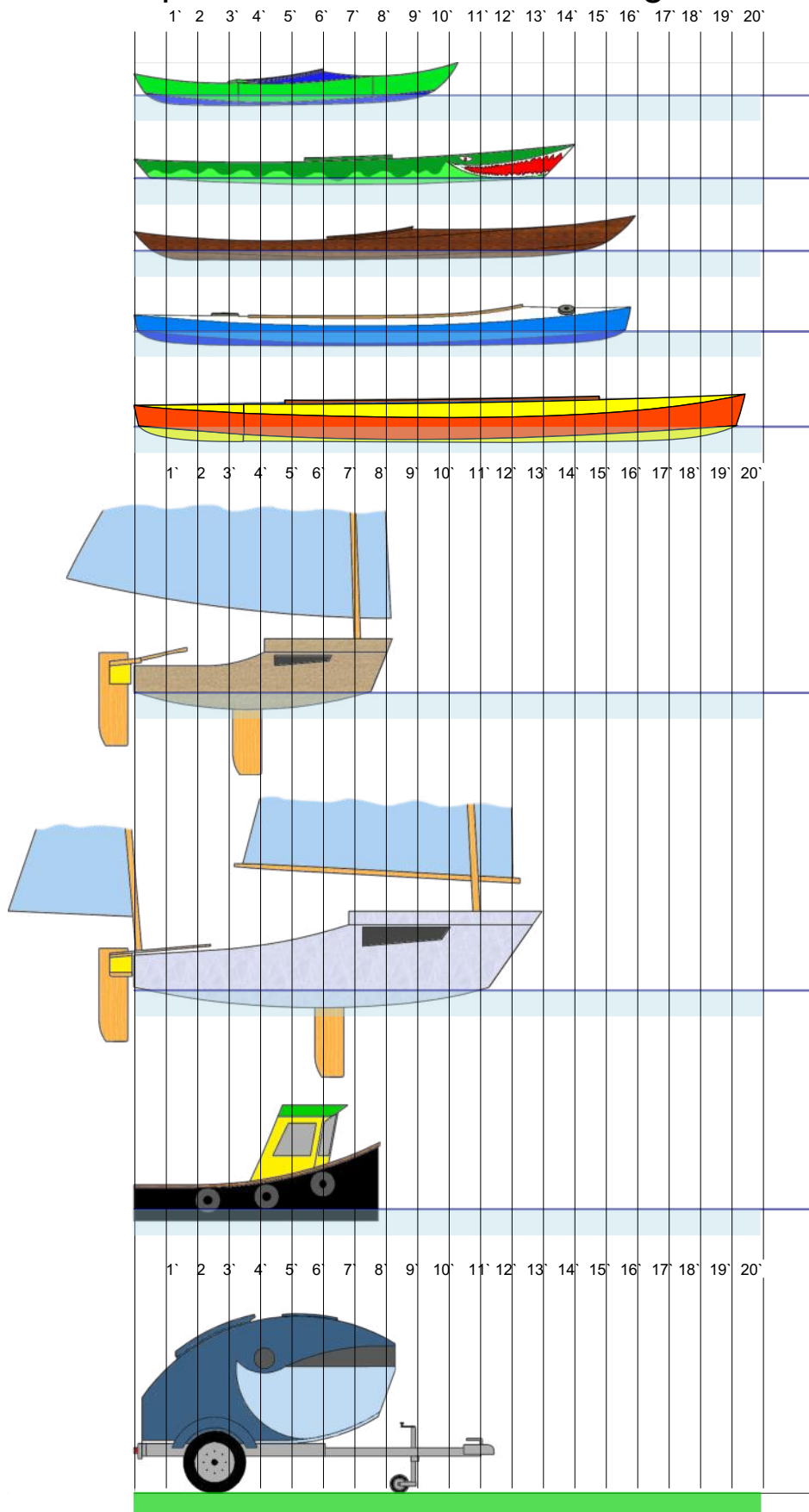
steering lines inside cockpit
bend tube thru wooden block

clamcleat for red line





<http://kaamosboats.com/catalog.htm>



<https://www.duckworksbbbs.com/category-s/219.htm>