TYPE A

A timber of medium weight, between 650 kg / m^3 and 750 kg / m^3 when air-dried.
This heavier timber has two important advantages compared with a lighter timber:

1. It will hold fastenings such as nails and bolts well and in a wooden boat the strength is mainly dependent on the fastenings.
2. Heavier timber is usually more rot resistant than lighter timber and this is important in parts of the boat that are difficult to change such as frames, keel and the stem.

Through experience , boatbuilders have been able to determine which local timber is suitable for these items and it is safest to follow their advice. The more known timbers of type A are oak, iroko, kapur, afromosia, opepe, gurjun and teak, but there are many other species that might be known locally as suitable.

TYPE B

A timber of relatively light weight of between 500 kg / m^3 to 600 kg / m^3 when air-dried.
The timber is mainly used for planking and deck, and the most important quality is low movement in service, that it does not swell or shrink much with changing humidity.
Known timber suitable for this is mahogany, Douglas fir and European redwood, but there are many other species.

QUANTITY OF TIMBER FOR THE BOATS

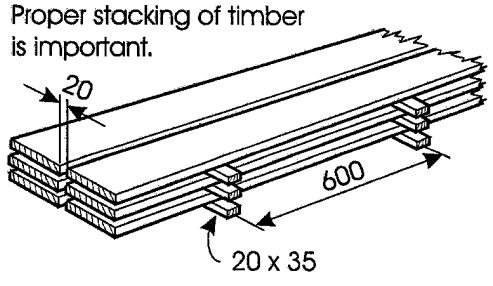
Below is given a list of sawn timber required for the various planked boats. Timber for the buiding jig is given on page 25.
The quantity includes a wastage factor of 25 %. The wastage factor could be lower or higher dependent on the quality and the length of timber available. Longer lengths of timber gives less wastage. However an advantage of the cross-planked bottom is the utilization of short lengths of timber.

TYPE OF TIMBER	DIMENSION FROM SAWMILL		TOTAL LENGTH OF TIMBER IN METRES			
	MM	INCH	5.2 M BOAT	6.3 M BOAT	7.4 M BOAT	8.5 M BOAT
A	25 x 150	1 x 6	7	9	10	12
	38 x 150	1 ½ x 6	32	39	45	52
	38 x 200	1 ½ x 8	15	18	21	25
	50 x 150	2 x 6	18	22	20	22
	75 x 150	3 x 6	4.0	4.0	6.5	7.6
	100 x 250	4 x 10	1.4	1.4	1.4	1.4
A m^3			0.54	0.65	0.76	0.86
B	20 x 150	¾ x 6	63	76	90	103
	25 x 150	1 x 6	58	70	82	94
	25 x 200	1 x 8	34	41	48	55
B m^3			0.58	0.70	0.82	0.95
Total volume A + B m^3			1.12	1.35	1.59	1.81

AIR DRYING OF TIMBER

After sawing, the timber must be stored under a roof protected against sun and rain. The drying time depends on the season. During the dry season a 25 mm plank will dry in 3 months, but it will take 9 months during the rainy season.

Proper stacking of timber is important.



PLANKED BOAT 5.2 M - TIMBER

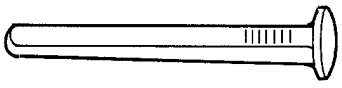
FOR THE OTHER BOATS MULTIPLY THE LENGTHS WITH THE FACTOR F :
6.3 M BOAT. F = 1.2. 7.4 M BOAT : F = 1.4. 8.5 M BOAT: F = 1.6.
NOTE: The keel for the 7.4 m and the 8.5 m boat is 68 x 68 sawn from 75 x 150

TYPE OF TIMBER	DIMENSION FROM SAWMILL mm	TOTAL LENGTH m	SAWING INTO SMALLER SECTIONS mm	TOTAL LENGTH m	PLANED DIMENSION mm	ITEM NUMBER
A	25 x 150	3	25 | 75 | 75	6	20 x 68	1
		4	25 | 50 | 50 | 50	12	20 x 44	2
	38 x 150	8	38 | 150	8	32 x 143	3
		14	38 | 75 | 75	28	32 x 68	4
		10	38 | 50 | 50 | 50	30	32 x 44	5
	38 x 200	14	38 | 200	14	32 x 193	6
		1	38 | 100 | 100	2	32 x 93	7
	50 x 150	7	50 | 150	7	44 x 143	8
		5	50 | 75 | 75	10	44 x 68	9
		6	50 | 50 | 50 | 50	12	44 x 44	10
	75 x 150	2.5	75 | 150	2.5	68 x 143	11
		1.3	75 | 75 | 75	2.6	68 x 68	12
	100 x 250	1.4	100 x 250	1.4	93 x 240	13
B	20 x 150	57	20 | 150	57	15 x 143	14
		2	20 | 75 | 75	4	15 x 68	15
		4	20 | 50 | 50 | 50	12	15 x 44	16
	25 x 150	58	25 | 150	58	20 x 143	17
	25 x 200	29	25 | 200	29	20 x 193	18
		5	25 | 100 | 100	10	20 x 93	19

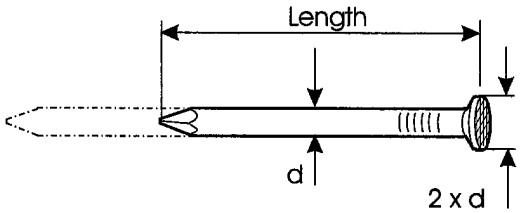
ALL FASTENINGS MUST BE HOT DIPPED GALVANIZED

Hot dipped galvanized fastenings have a dull grey and rough surface because of a thick zinc-coating. Electroplated fastenings which are also sold as " galvanized " have a shiny, smooth and silvery surface. The zinc coating is very thin and gives no protection in salt water.

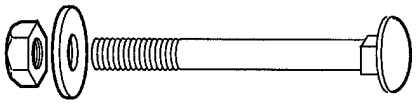
Always specify " hot dipped galvanized" not just "galvanized".



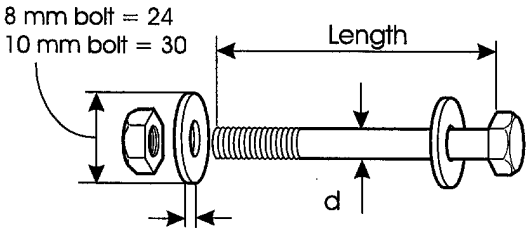
BOAT NAIL



ROUND WIRE NAIL

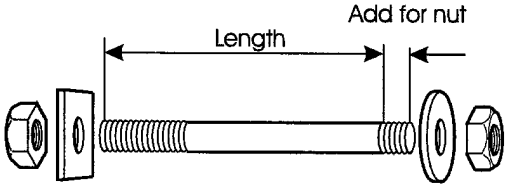


CUP - SQUARE COACH BOLT



Minimum 2.5 mm for 8mm bolt
3 mm for 10 mm bolt

HEXAGONAL HEAD BOLT



If round washers are not available use square washers of same thickness and width as round washers.

THREADED BOLT

NAILS

If specially made boatnails are available they are the best choice. Boatnails are square in section and are thick in relation to the length.
In most developing countries these nails cannot be bought locally. Round wirenails are however widely available. Used for house construction they are thin in relation to the length. When used for boat building they must be cut down in length before galvanizing, or a special order made from the nail factory.
Tests have shown that round wire nails are as strong as square nails provided the diameter is equivalent.
It is important that the head of the nail is large, about twice the diameter of the nail.

For the boats in this publication three sizes of nails are required. Predrilling must be done for all nails.

DIAMETER	LENGTH	PREDRILL
4 mm (8 SWG)	50 mm (2 in.)	3.5 mm
5 mm (6 SWG)	75 mm (3 in.)	4.0 mm
5 mm (6 SWG)	100 mm (4 in)	4.0 mm

The nailhead should be countersunk about 2-3 mm for the 4 mm nail and 4 mm for the larger nails and it will in harder wood be necessary to predrill for this before drilling the main hole. The nailhead should be covered with mastic to assist against corrosion.

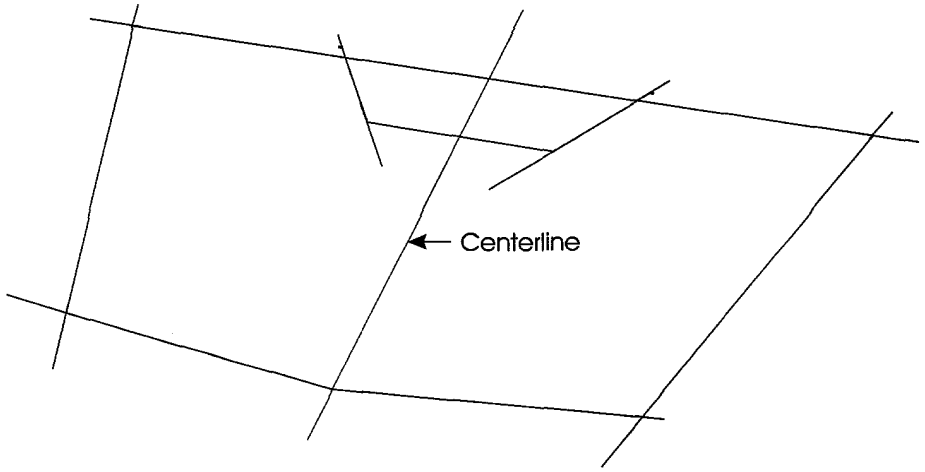
BOLTS

Coach bolts also called carriage bolts or more correctly cup-square coach bolts are used in boat building but they are increasingly being seen as "specials" and often only made with an electroplated finish.
Ordinary hexagonal head steelbolts are easier to buy hot dipped galvanized. For timber construction they must be fitted with large washers.
Most bolts for the boats in this publication are 8 mm and normally not available in lengths above 120 mm. Longer bolts must be made from a hot dipped galvanized rod and threaded in both ends. The zinc-coating on the nut will provide some protection also for the bare threads, but in addition the threaded part should be smeared with bitumastic compound before inserting the bolt.
Rods threaded all along should not be used since the bearing area against the wood is reduced.

ITEM		QUANTITY			
		5.2 m	6.3 m	7.4 m	8.5 m
Hexagonal head bolt, hot dipped galvanized, with nut. Alternative: Cup - square coach bolt, hot dipped galvanized, with nut.					
	8 x 80	31	45	51	57
	8 x 100	8	19	20	21
	8 x 120	14	16	18	20
	8 x 140	9	11	13	15
	8 x 150	2	2	2	2
	8 x 170	10	12	14	16
	10 x 80	2	2	2	2
	10 x 100	2	2	2	2
	10 x 120	3	4	5	6
	10 x 170	1	1	1	1
Rod, hot dipped galvanized of 8 mm and 10 mm will be required if the sizes given above is not available.					
Washer, large size, round or square, hot dipped galvanized. The quantity must be increased if bolts are to be made from rod.	For bolt 8	140	220	260	280
	For bolt 10	18	20	22	24
Nut, hot dipped galvanized Quantity depend on the number of bolts that have to be made from rod.					
Nails, hot dipped galvanized, either boat nails or round wire nails cut down in length or specially ordered from local nail factory.					
Diameter =4 mm (8 SWG) x 50 About 170 nails / kg		8 kg	10 kg	12 kg	13 kg
Diameter = 5 mm (6 SWG) x 75		0.5 kg	0.5 kg	0.5 kg	0.5 kg
Diameter = 5 mm (6 SWG) x 100		0.5 kg	0.5 kg	0.5 kg	0.5 kg
Bitumastic compound (Roofing compound, Hydroseal etc.)		5 kg	5 kg	6 kg	7 kg
Nylon fly screen, 1 m wide		1 m	1 m	1.5 m	2 m
Caulking cotton, quantity depends on what is available in trade.					
Filler		1 kg	1.5 kg	2 kg	2 kg
Wood primer		5 kg	6 kg	7 kg	7 kg
Paint		6 kg	7 kg	8 kg	8 kg
Antifouling paint		1 kg	1 kg	1.5 kg	1.5 kg
Paint thinner		2 L	2 L	2 L	3 l
Buoyancy material, polyurethan, polystyrene, plastic container etc.		0.1 cub.m	0.1 cub.m	0.1 cub.m	0.1 cub.m
Sailing rudder fitting, emergency sail see drawing.					

22 TRANSOM

1



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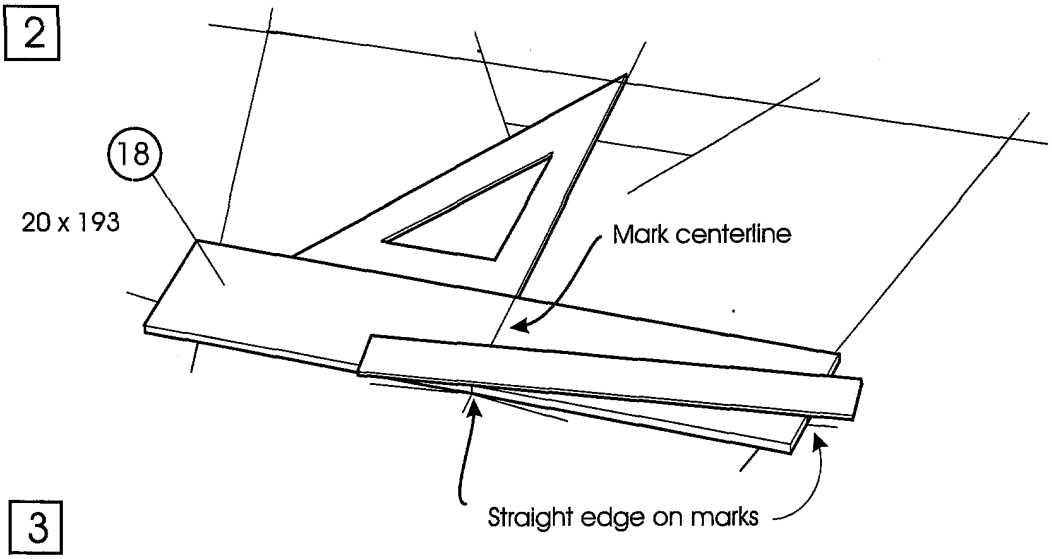

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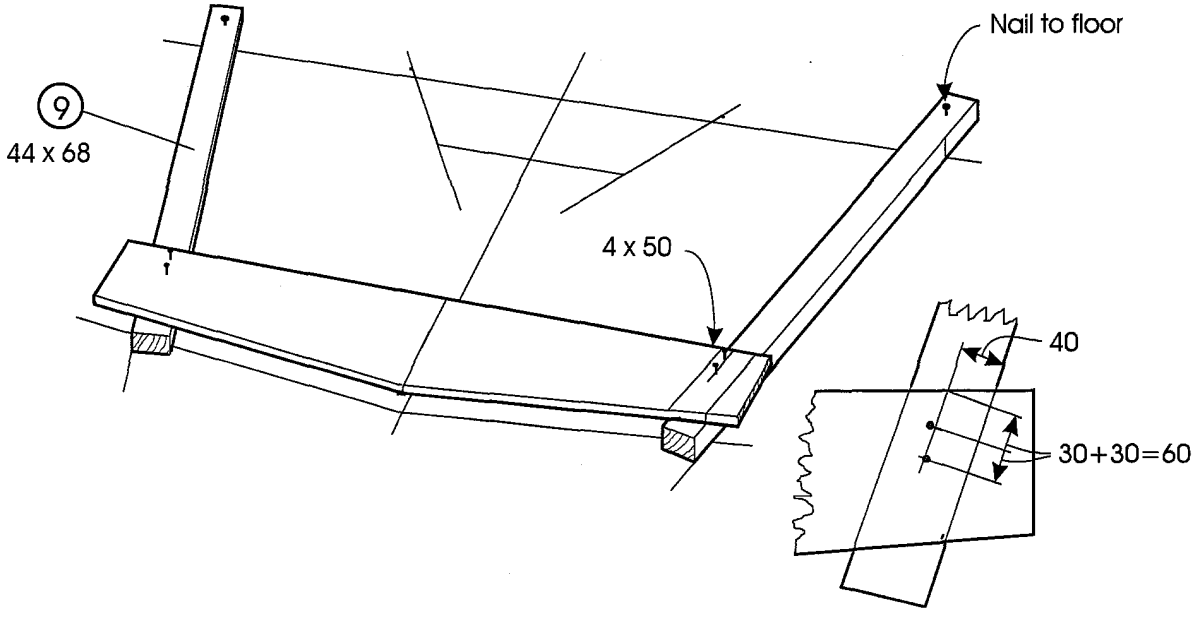

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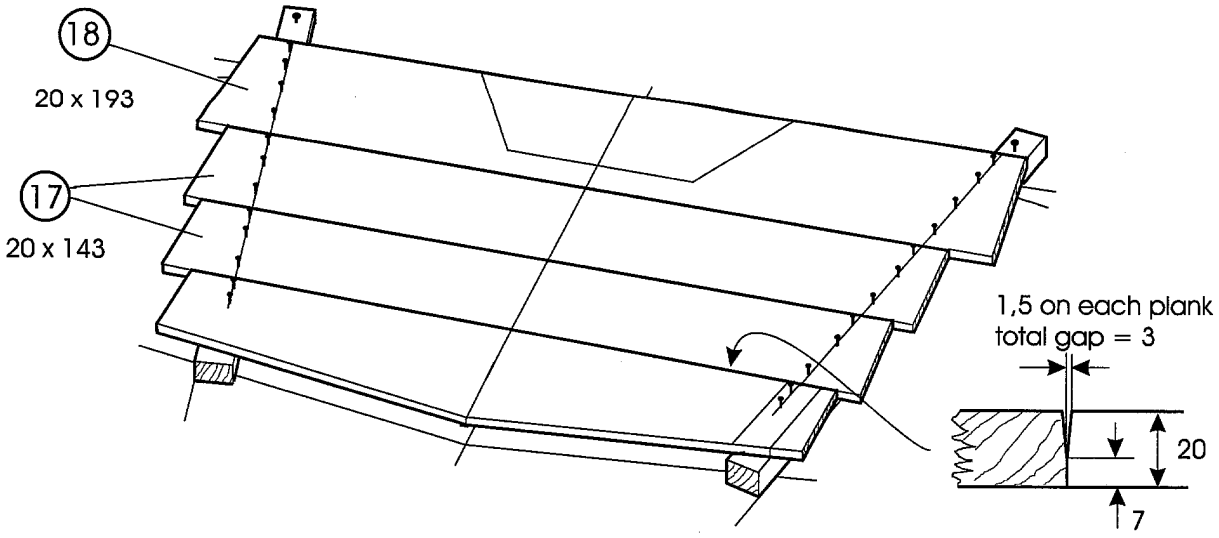
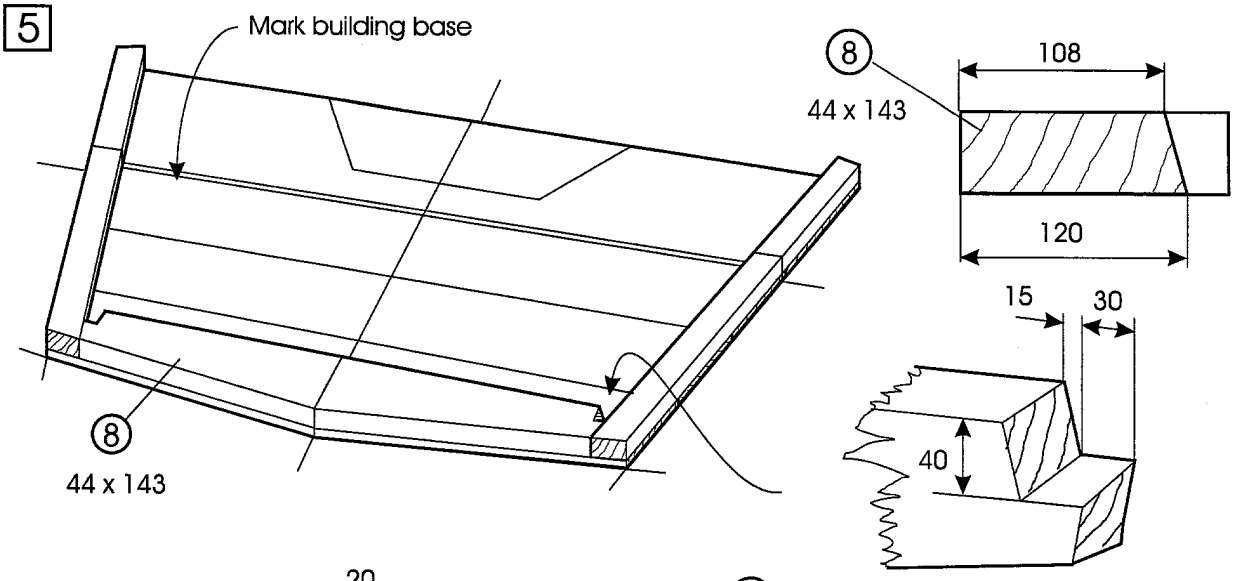
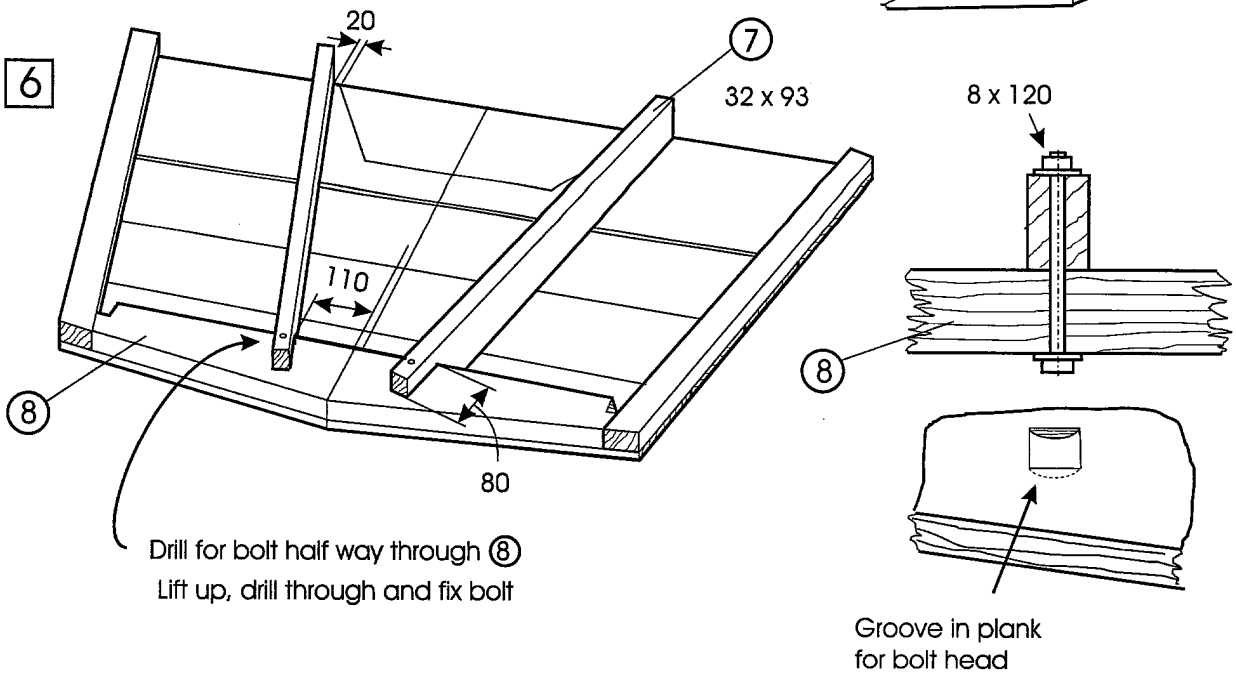

18
20 x 193
17
20 x 143
1,5 on each plank
total gap = 3
20
7

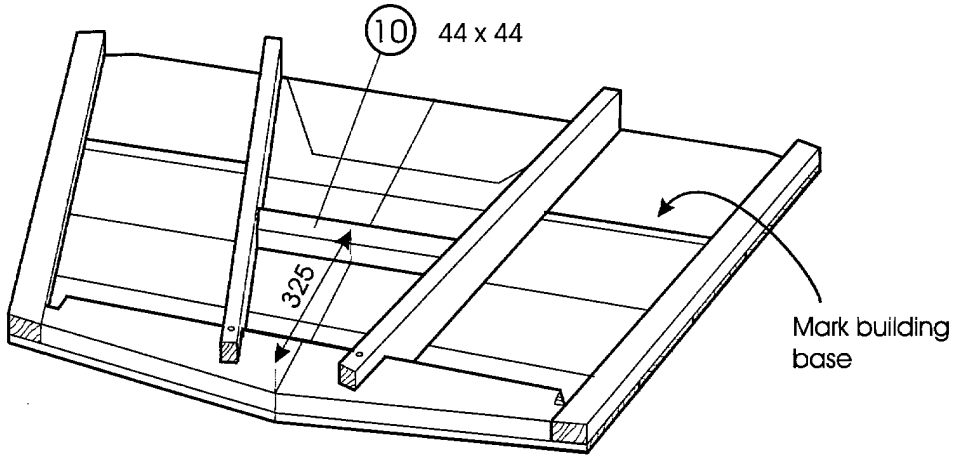
5


Mark building base
8
44 x 143
108
120
15
30
40
8
44 x 143

6


20
7
32 x 93
8 x 120
110
8
80
8
Drill for bolt half way through 8
Lift up, drill through and fix bolt
Groove in plank
for bolt head

7



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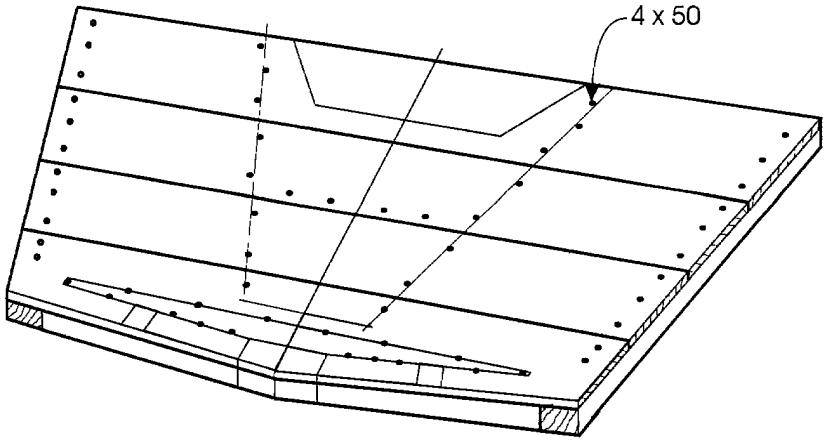
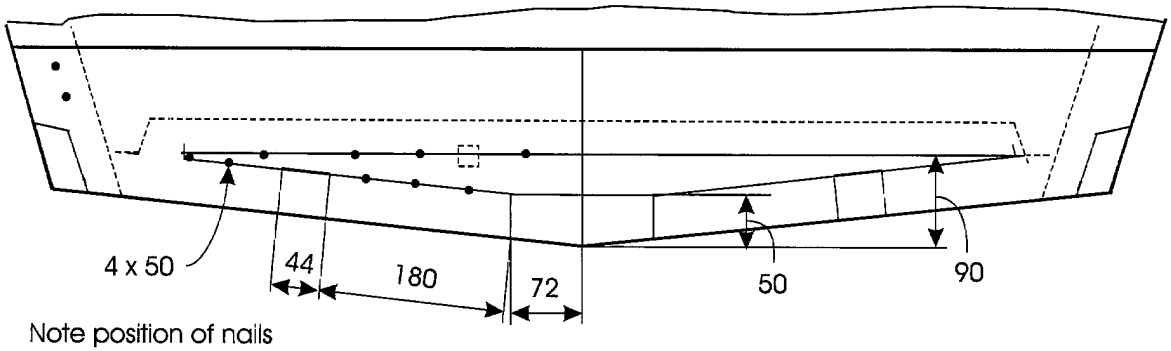
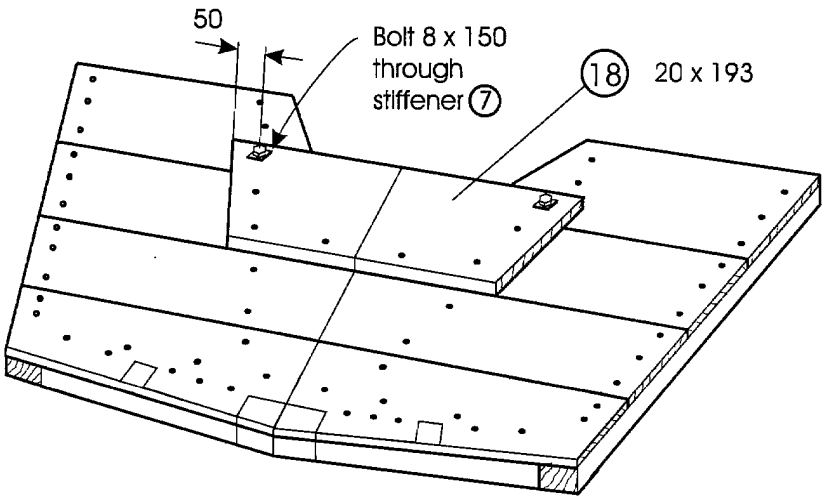




Note position of nails

9



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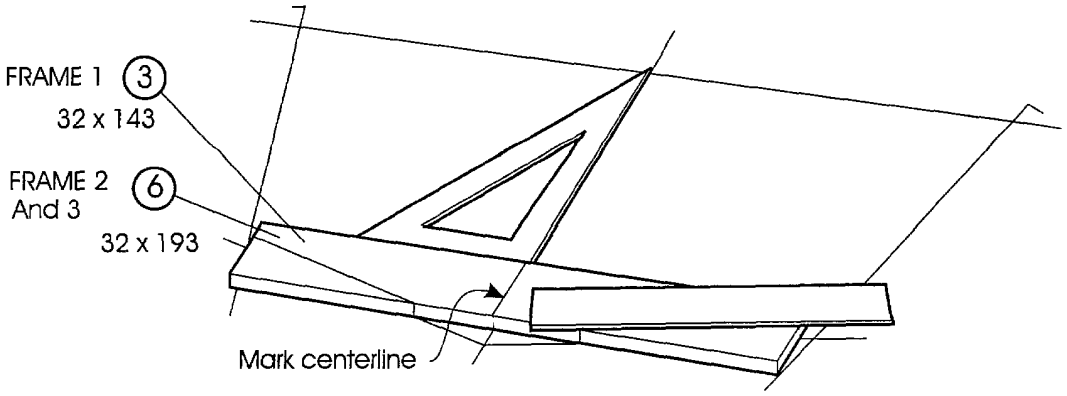
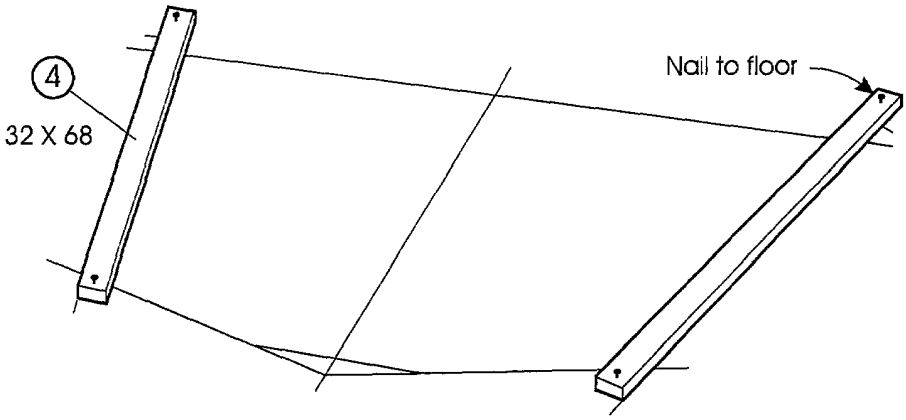
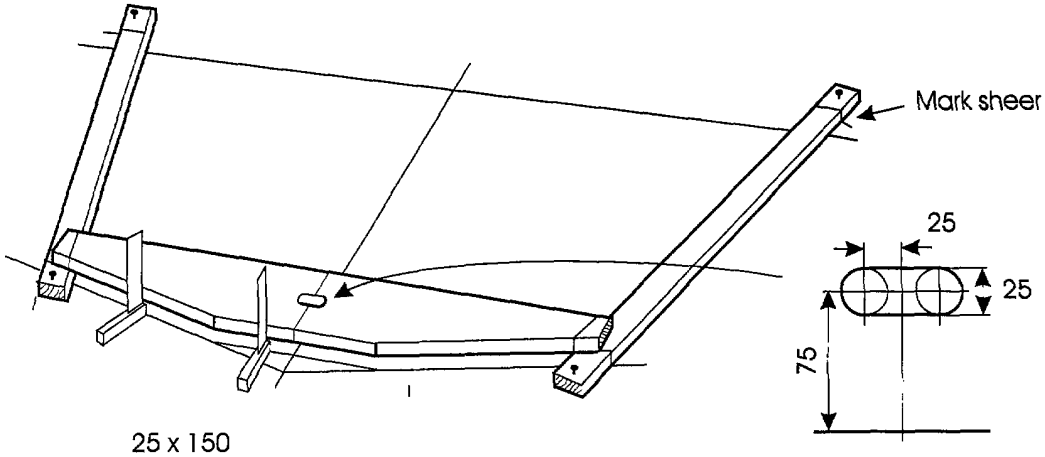

FRAME 1 (3)
32 x 143
FRAME 2
And 3 (6)
32 x 193
Mark centerline

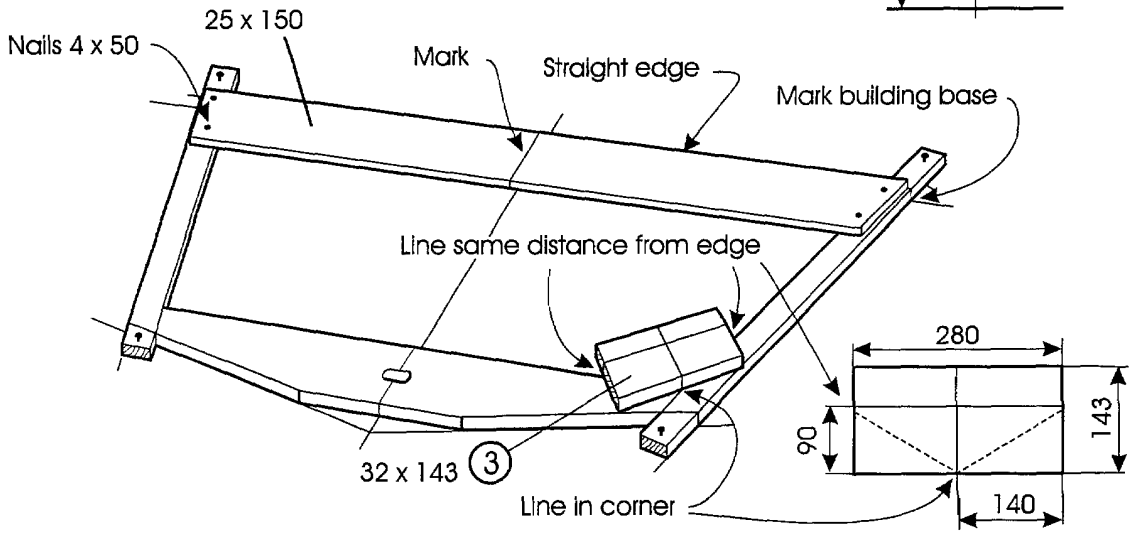
2


(4)
32 X 68
Nail to floor

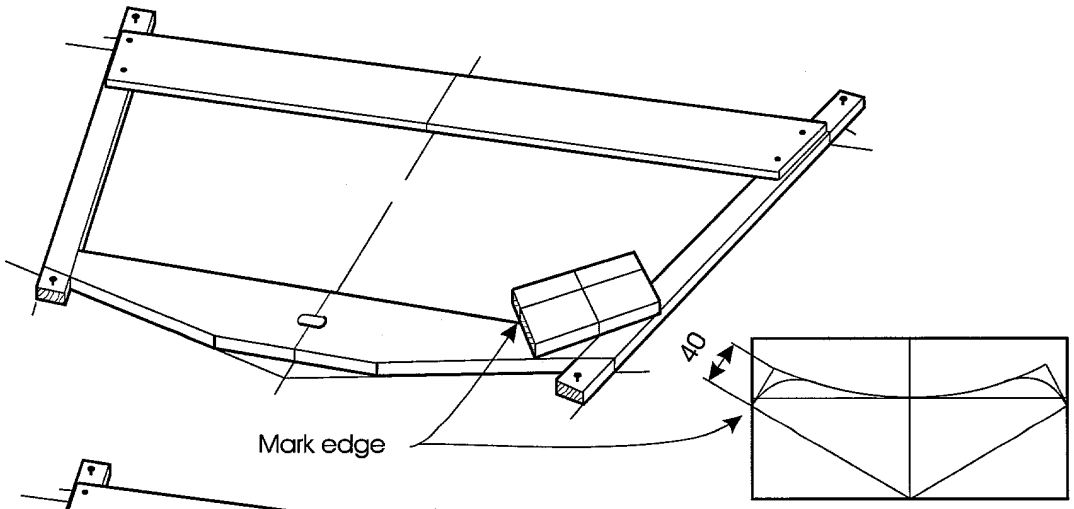
3


Mark sheer
25
25
75

4


Nails 4 x 50
25 x 150
Mark
Straight edge
Mark building base
Line same distance from edge
280
90
143
140
32 x 143 (3)
Line in corner

5



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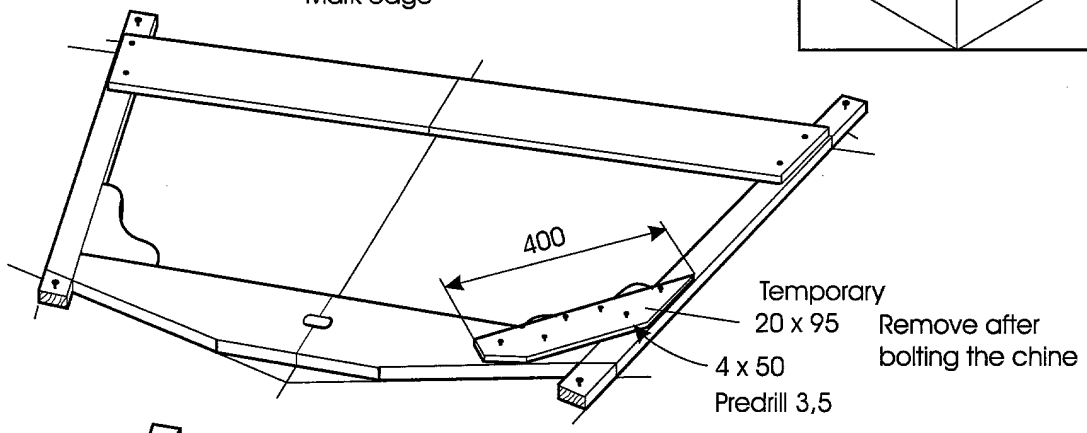

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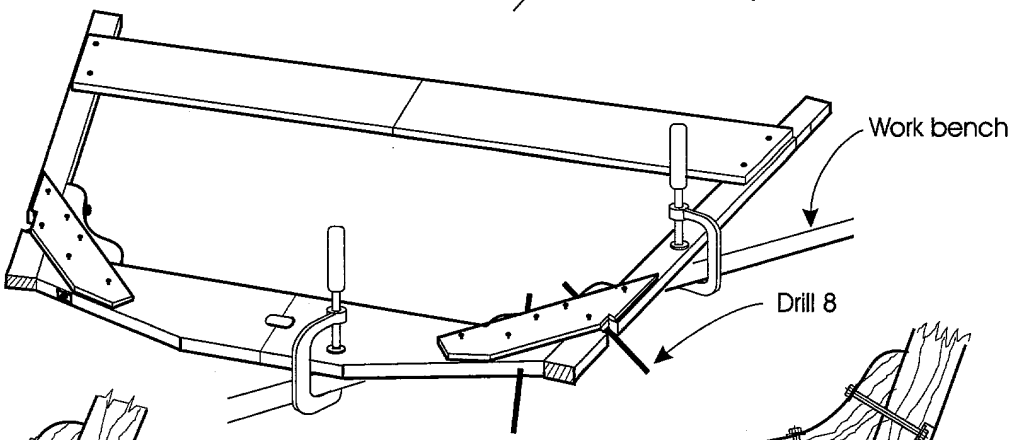
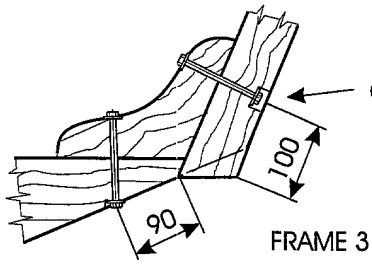
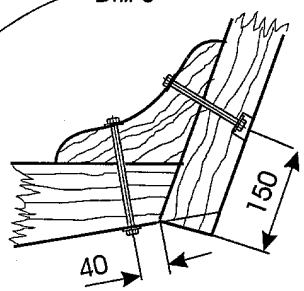


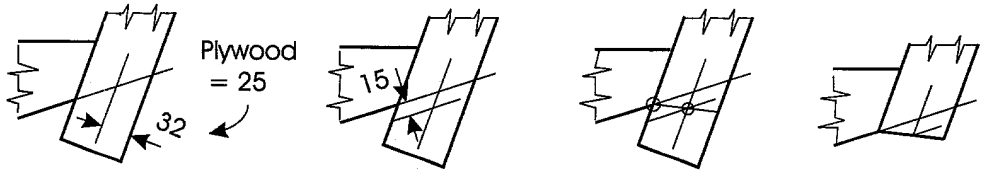


FRAME 3



FRAME 1 and 2

CUTTING THE SIDE FRAME



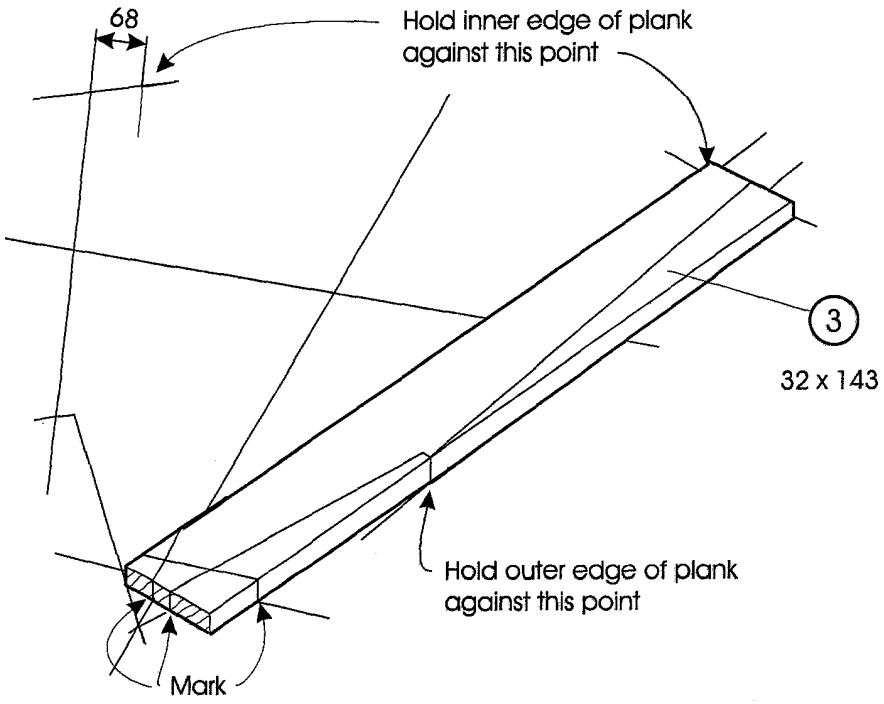
1. Mark a line the width of the chine

2. Mark a line below bottom line.

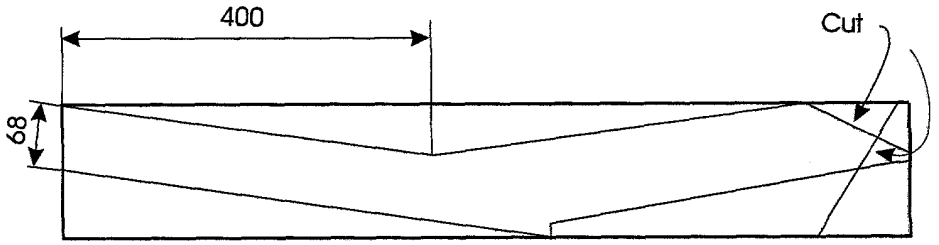
3. Draw a line through the two points

4. Cut off the frame along the line

1



Make a second copy



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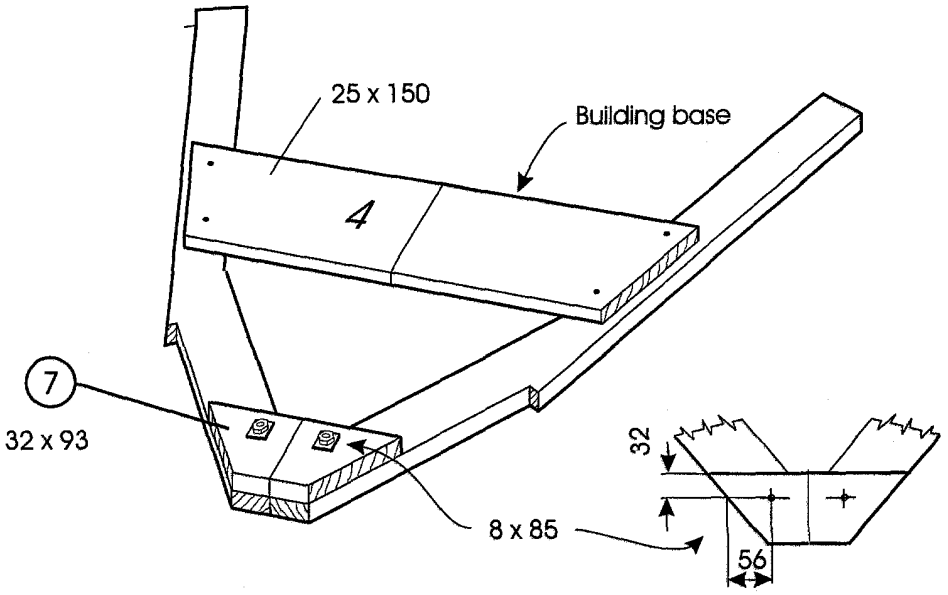
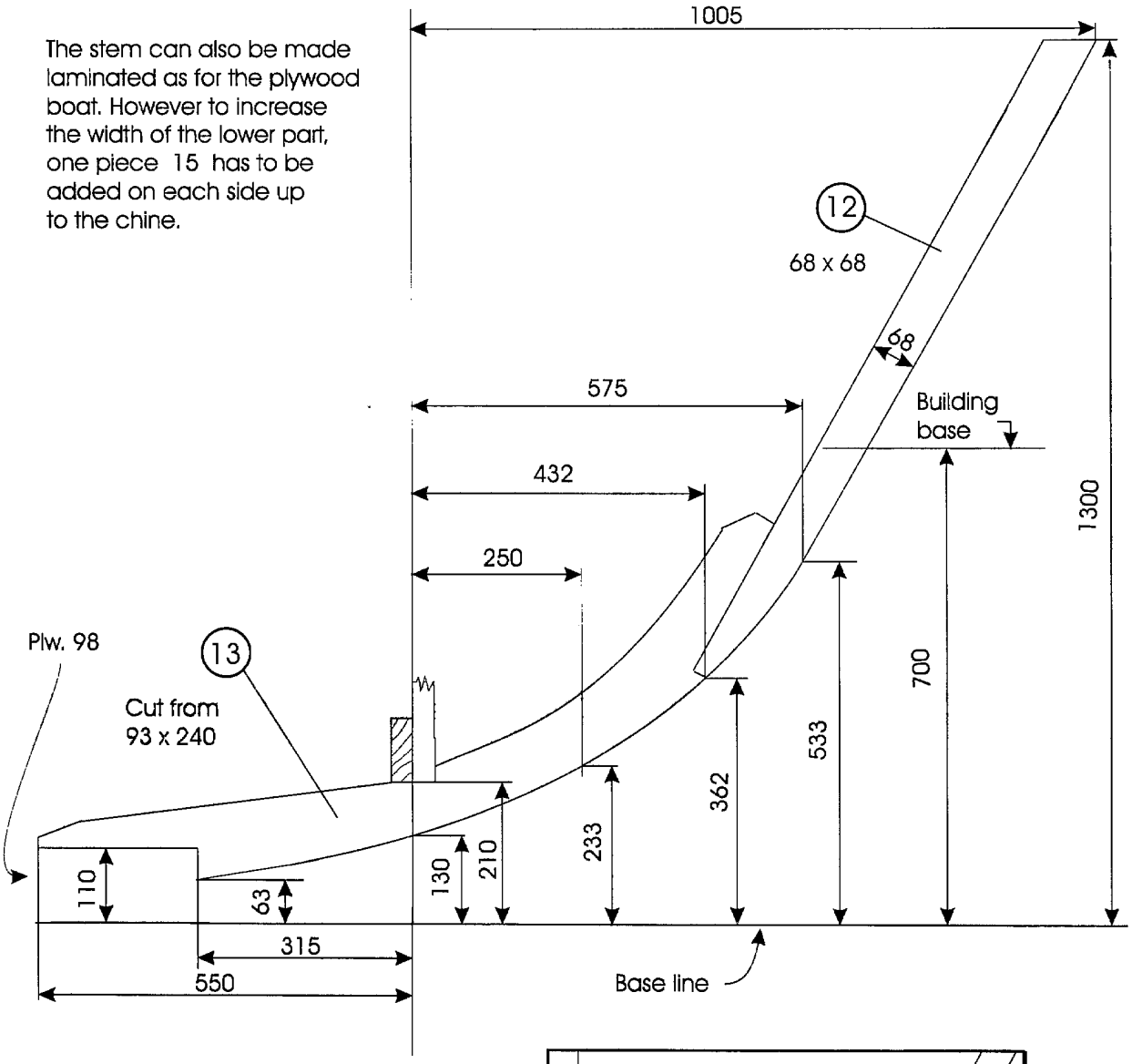
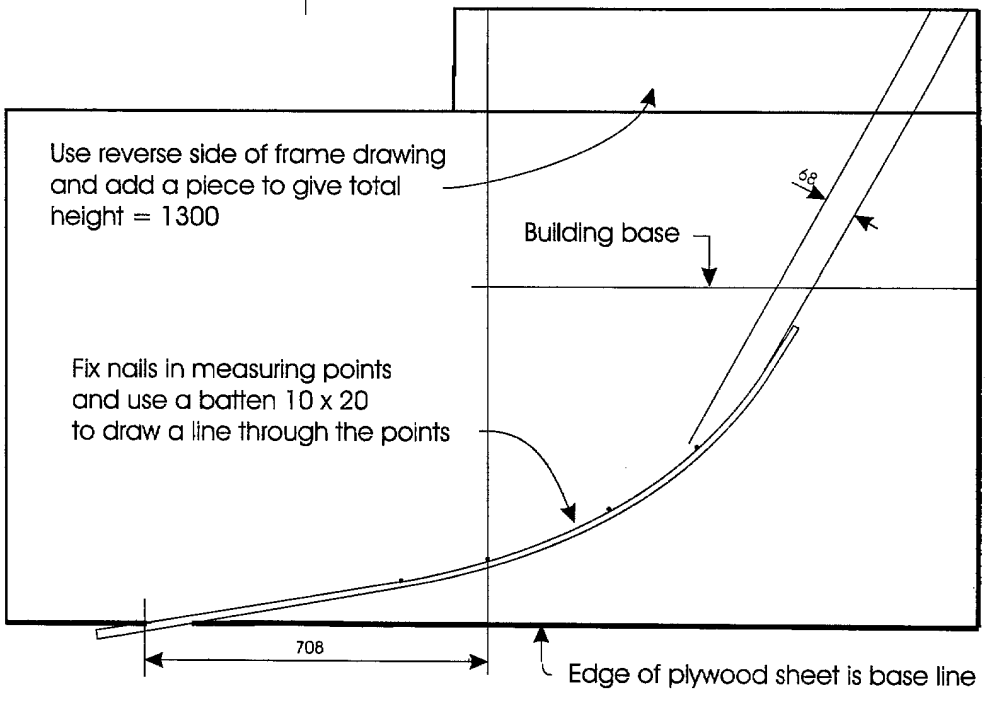


The stem can also be made laminated as for the plywood boat. However to increase the width of the lower part, one piece 15 has to be added on each side up to the chine.



1



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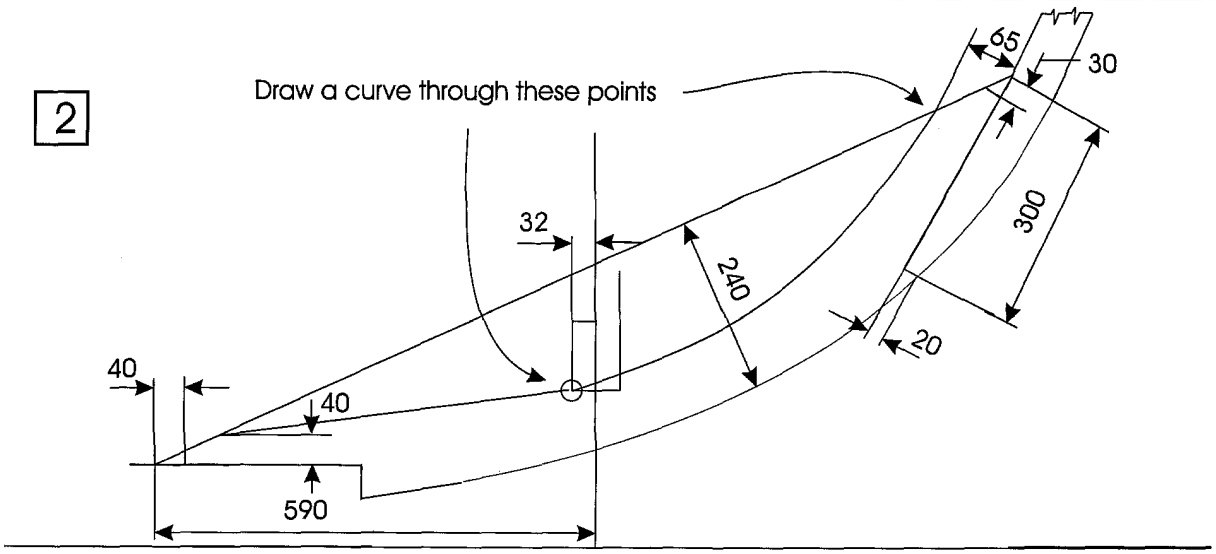
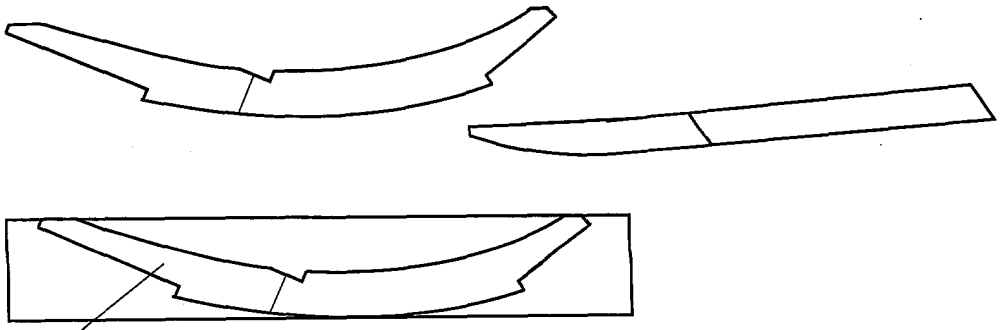


Make pattern from plywood 4 - 6 mm

3



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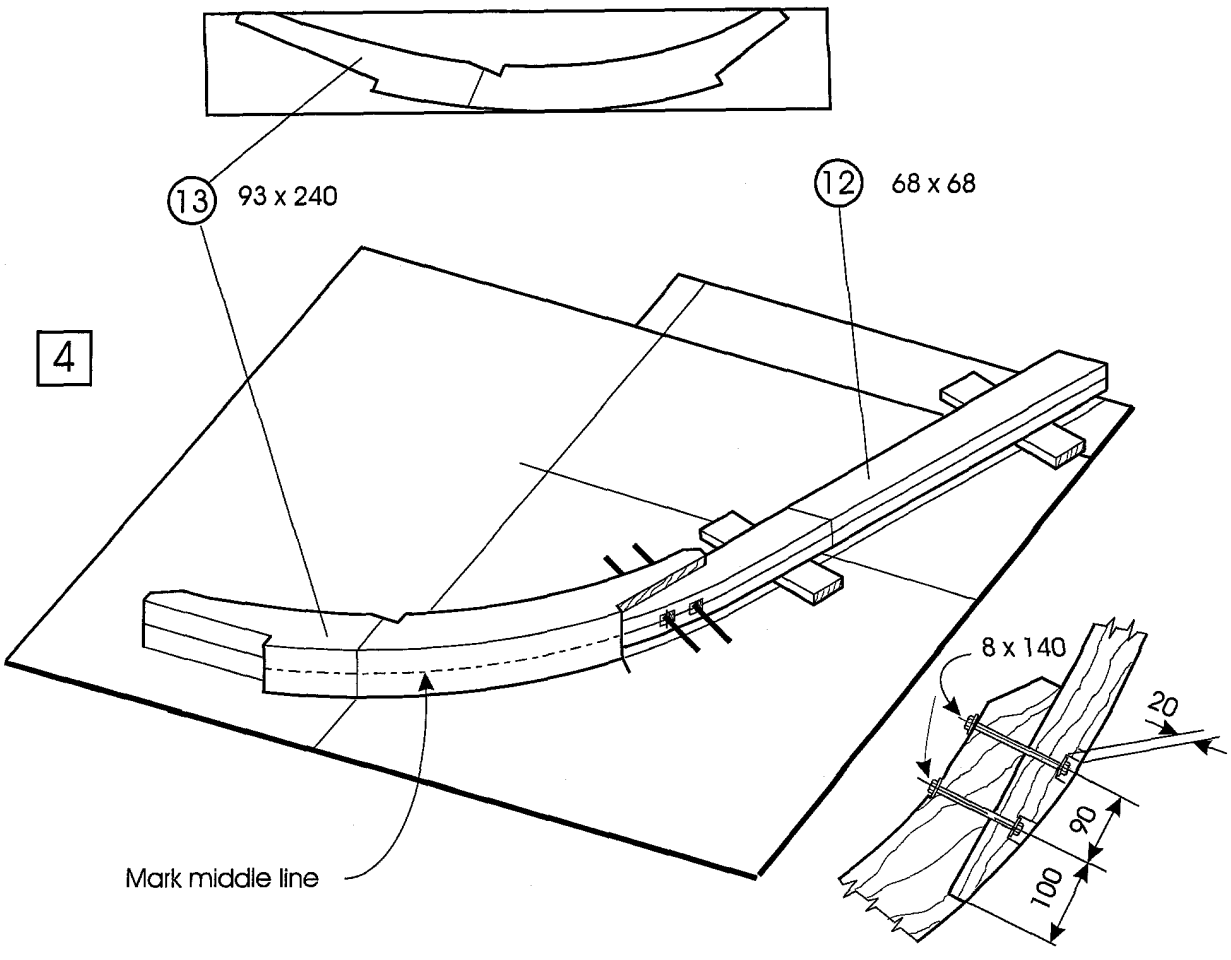
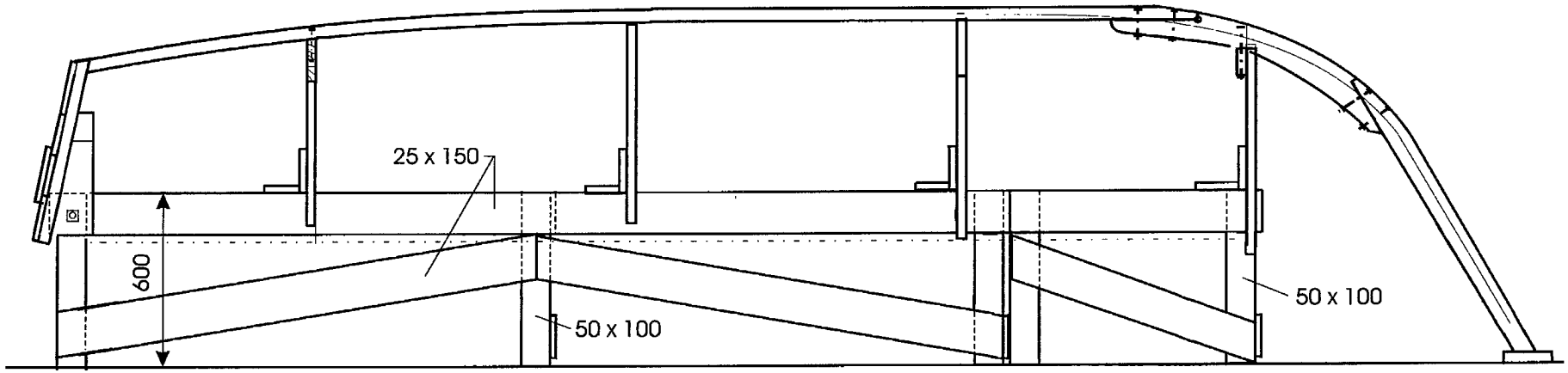
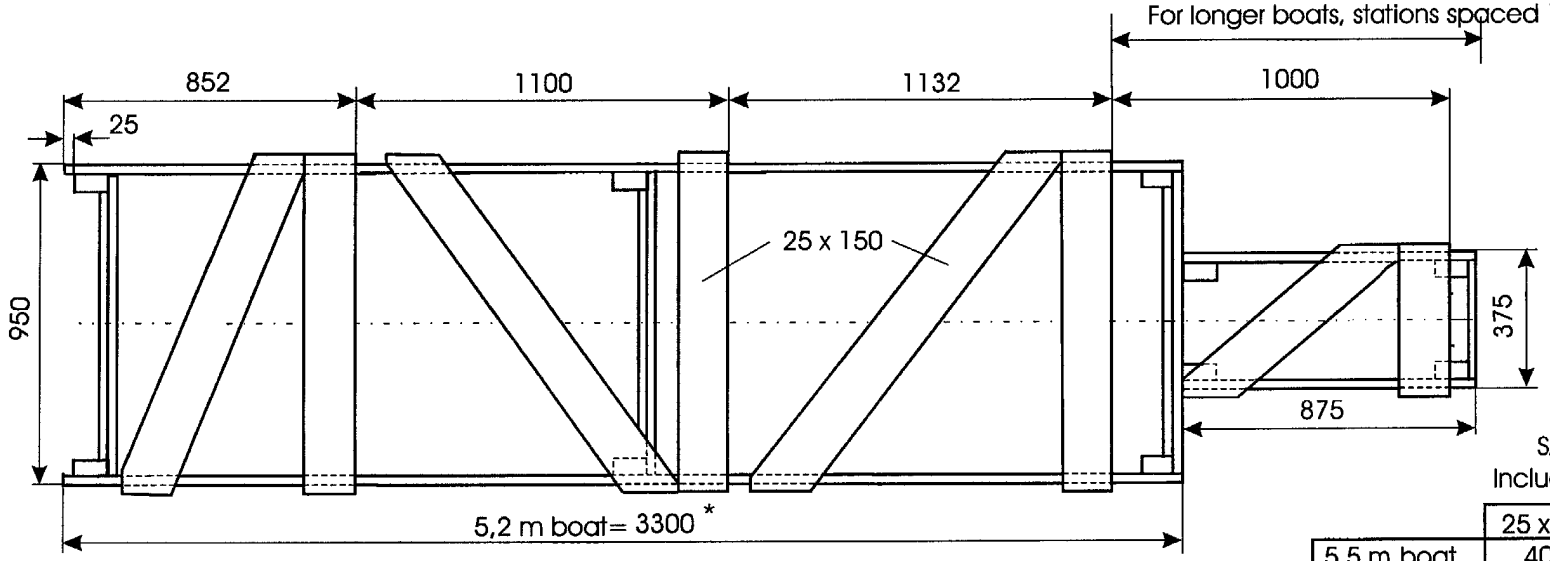






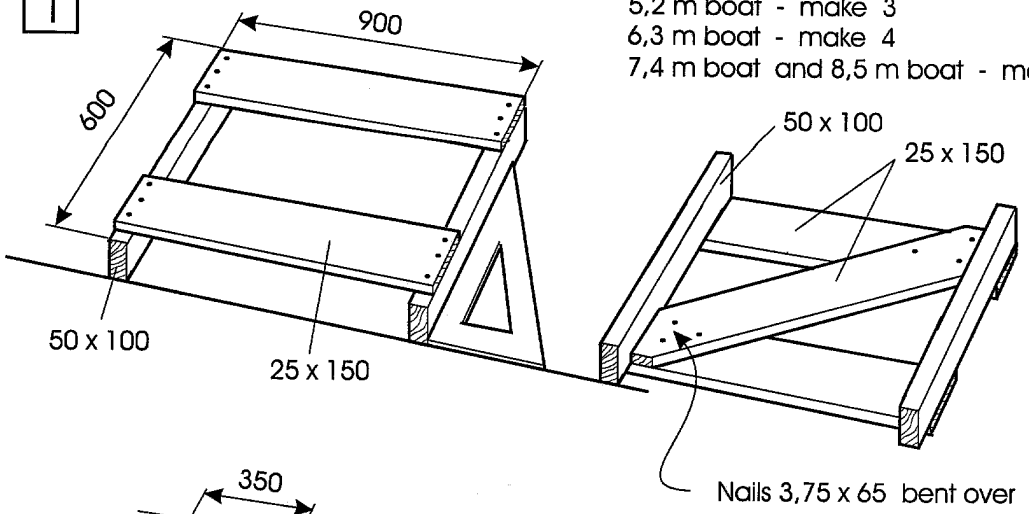
* 6,3 m boat = 4400
7,4 m boat = 5500
8,5 m boat = 6600

NAILS : 3.35 x 65 - 1,5 kg
BOLTS : 10 x 120 - 2 pieces with washers

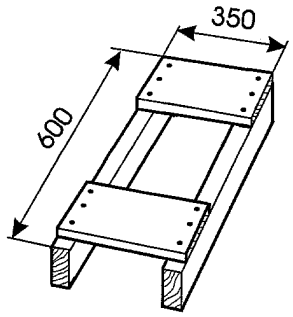
SAWN TIMBER
Including 25 % waste

	25 x 150	50 x 100
5.5 m boat	40 m	7 m
6.3 m boat	48	9
7.4 m boat	56	10
8.5 m boat	64	10

1



5,2 m boat - make 3
6,3 m boat - make 4
7,4 m boat and 8,5 m boat - make 5



All boats - make 2

2

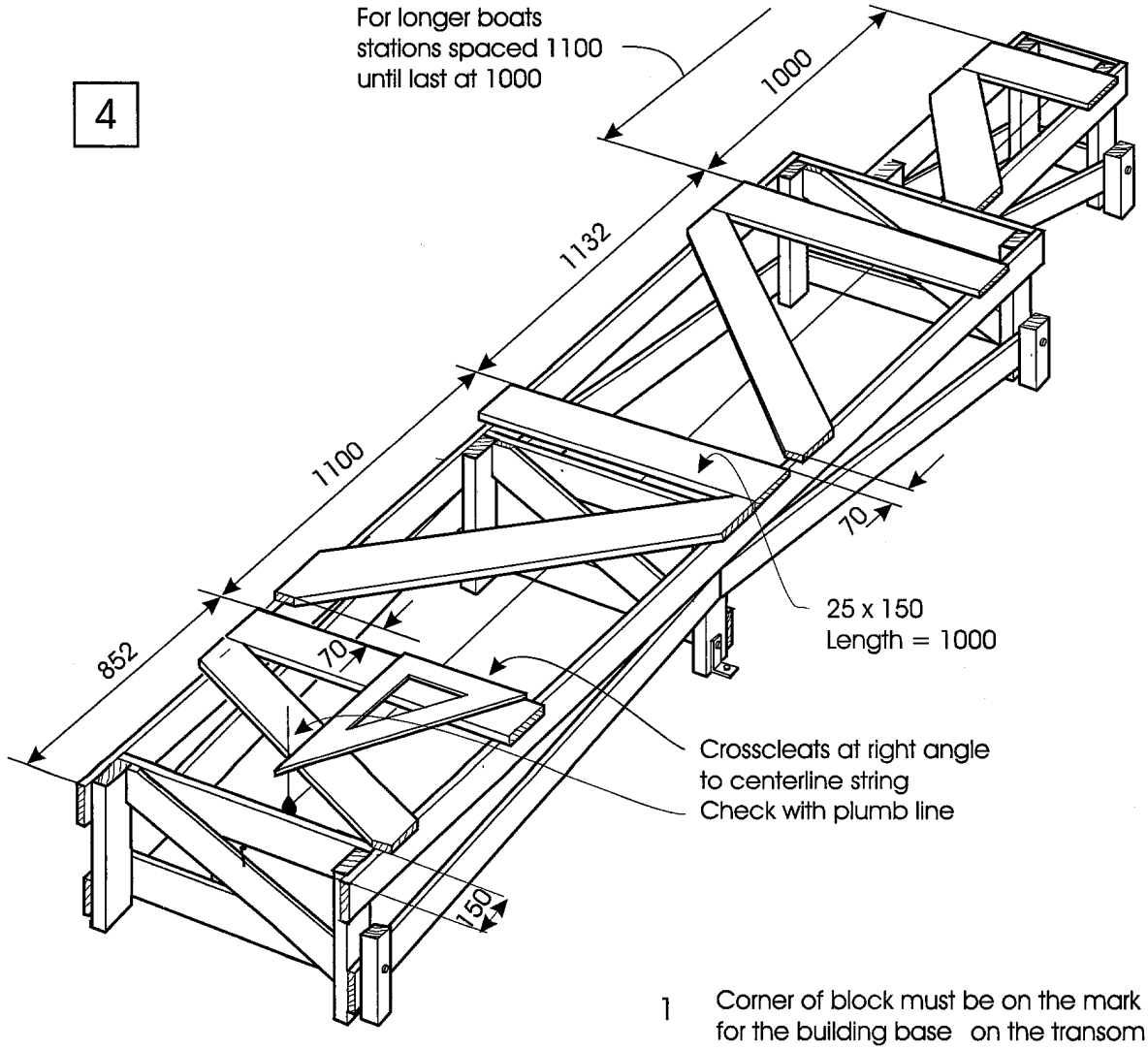
Plane the top edge straight
Check with string and ruler

3

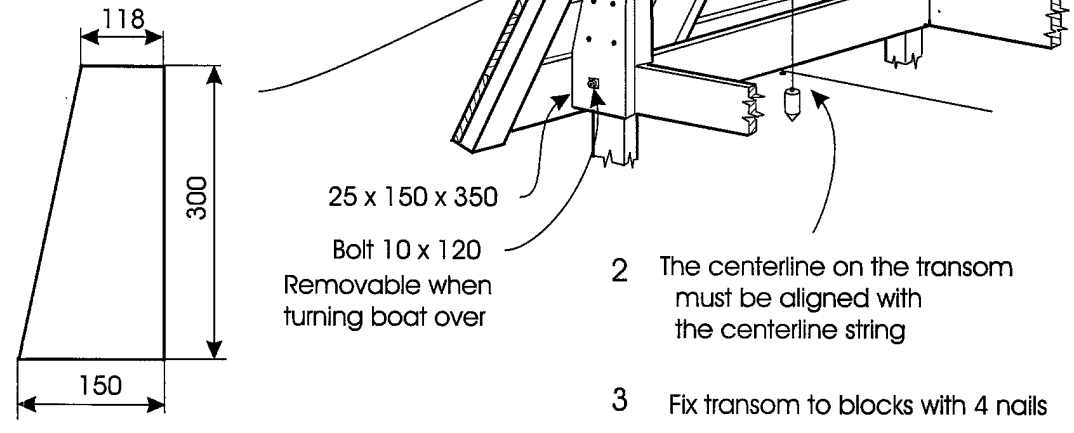
5,2 m boat A = 3300
6,3 m boat A = 4400
7,4 m boat A = 5500
8,5 m boat A = 6600
All boats B = 875

BUILDING JIG

4

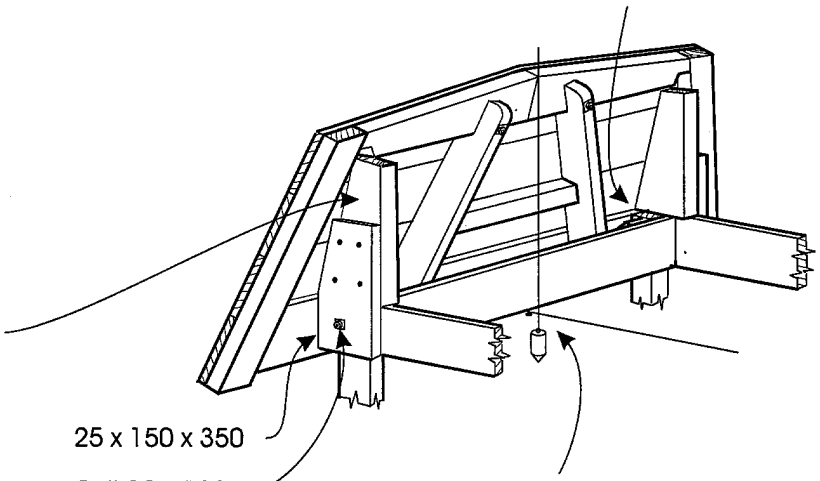


5



Thickness = 50

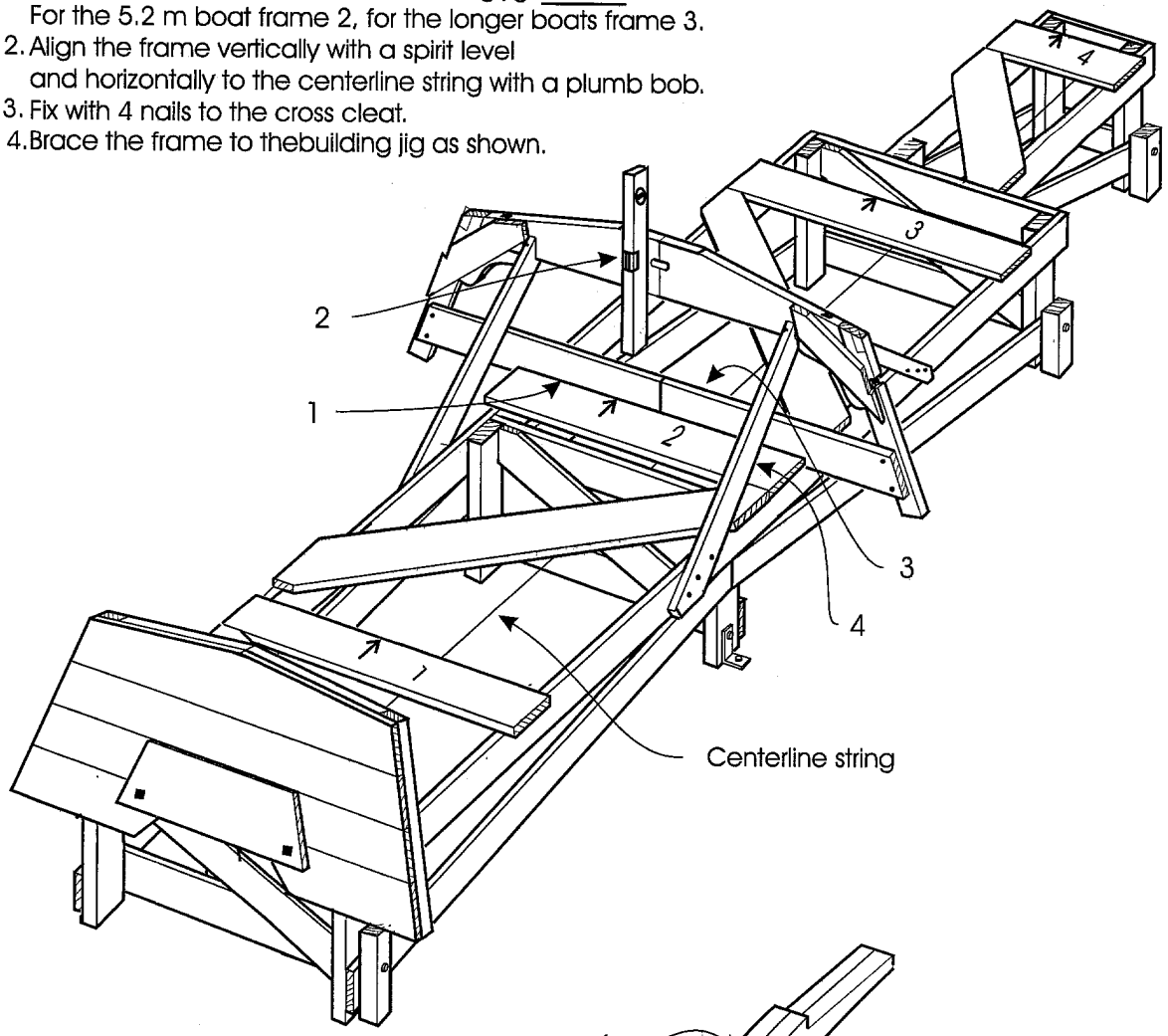
1 Corner of block must be on the mark for the building base on the transom



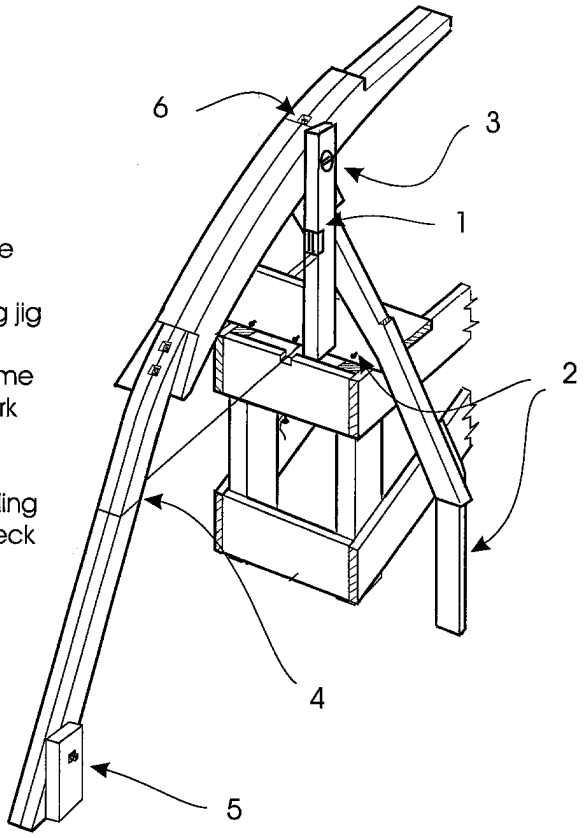
2 The centerline on the transom must be aligned with the centerline string

3 Fix transom to blocks with 4 nails

1. Place the middle frame on the building jig forward of the cross cleat. For the 5.2 m boat frame 2, for the longer boats frame 3.
2. Align the frame vertically with a spirit level and horizontally to the centerline string with a plumb bob.
3. Fix with 4 nails to the cross cleat.
4. Brace the frame to thebuilding jig as shown.

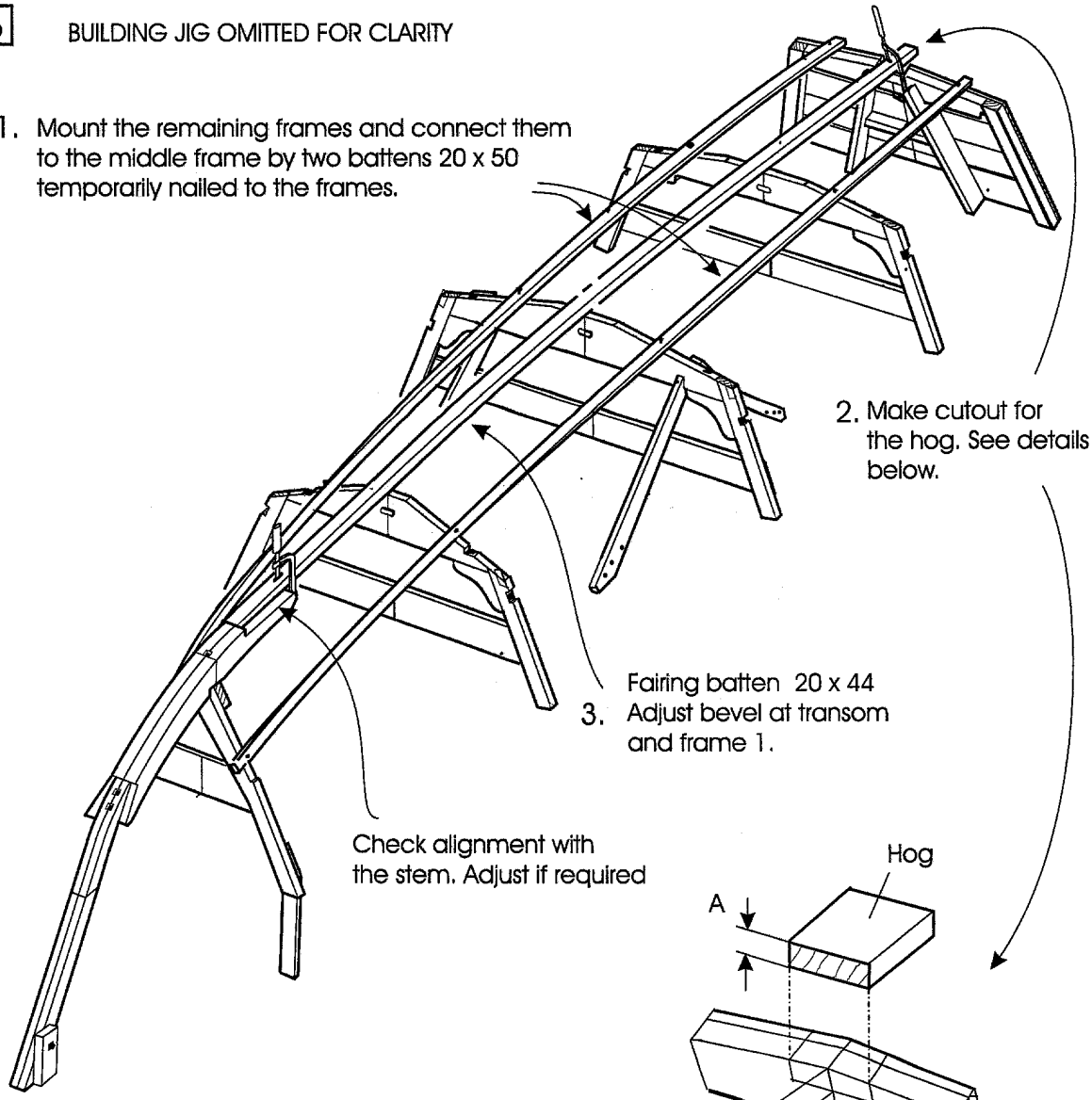


1. Align the forward frame on the building jig in the same way as the middle frame.
2. Nail the frame to the building jig and support it to the ground.
3. Place the stem on to the frame and align with the centermark on the frame.
4. Stretch a line along the top of the building jig corresponding to the construction base. Check that this line meets the mark for the construction base on the stem.
5. Fix the end of the stem firmly to the ground.
6. Drill hole and bolt the stem to the frame.



3 BUILDING JIG OMITTED FOR CLARITY

1. Mount the remaining frames and connect them to the middle frame by two battens 20 x 50 temporarily nailed to the frames.

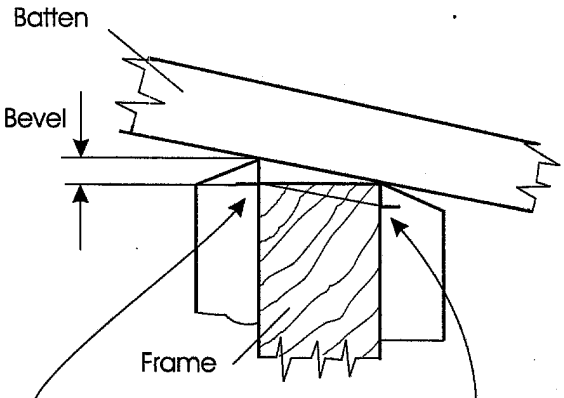


2. Make cutout for the hog. See details below.

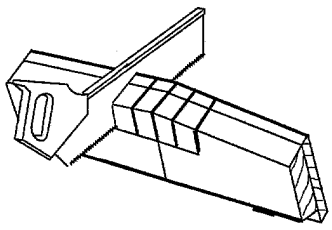
Fairing batten 20 x 44

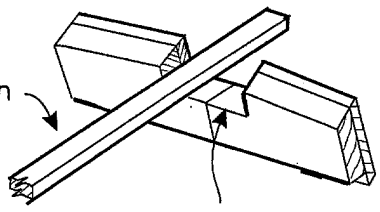
3. Adjust bevel at transom and frame 1.

Check alignment with the stem. Adjust if required



Mark gap between batten and frame = bevel on a stick and transfer to the other side of the frame.





Do not cut below this line