RFUGEE SHLTER RESEARCH

COOPREATION

DANISH REFUGEE COUNCIL

EiABC

Bamboo as an Emergency Shelter Solution

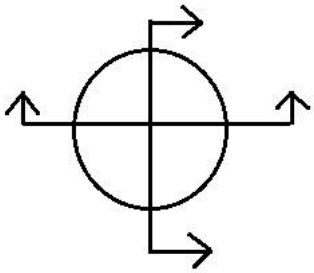
N.B. This article is also part of the Final thesis work which is submitted for the partial fulfillment of the requirement of the Bachelor of Degree in Construction Technology and Management (A few edition has been made by Biruh Misganaw for documentation Purpose)

Ethiopian natural bamboo forest is about 1 million hectares, which is 7% of the world total & 67% of the African bamboo forest area. As the number of refugees entering the country is increasing every day, it is essential to come up with a better construction system which could minimize cost, eliminate the need for imported material (in order to support the local economy), environmentally friendly and easy to construct so as to support victims to build their own shelters as this stimulates the local economy, maintains dignity, gives victims something other than their grief to focus on, and encourages a sense of ownership of the shelter and of the materials. And this could only be possible by improving the capacity within the refugee camps and employing simple and adaptable technologies like the Bamboo Tent. This method could be more effective for areas where there is a huge resource of bamboo. The application of bamboo as an emergency shelter construction material takes into account the vast amount of this resource in the country. This construction system provides a shelter solution that costs significantly less than the currently available metal reinforced plastic sheet tent construction method.

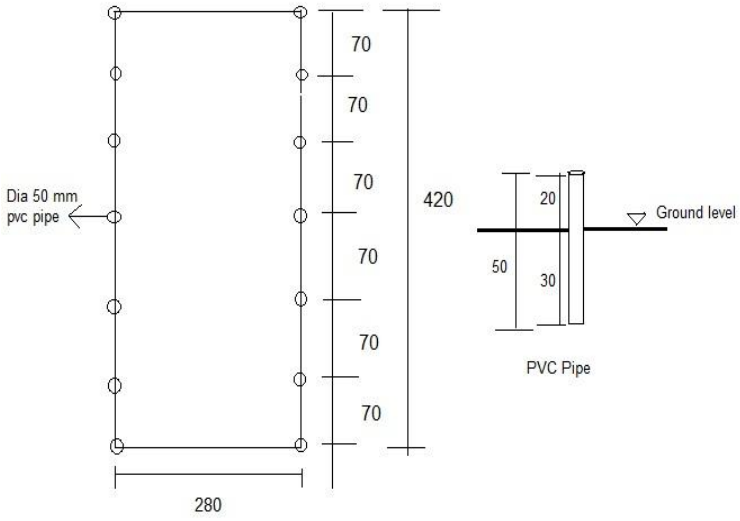
Construction Step

- Use a minimum of 10 meter Bamboo. (This helps us not to go into connecting details.) The bamboo should be of equal height.

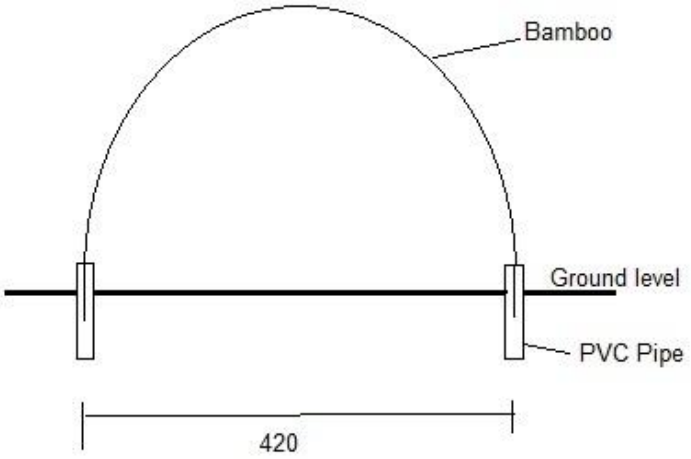
- Cut it into four parts as shown in the figure.



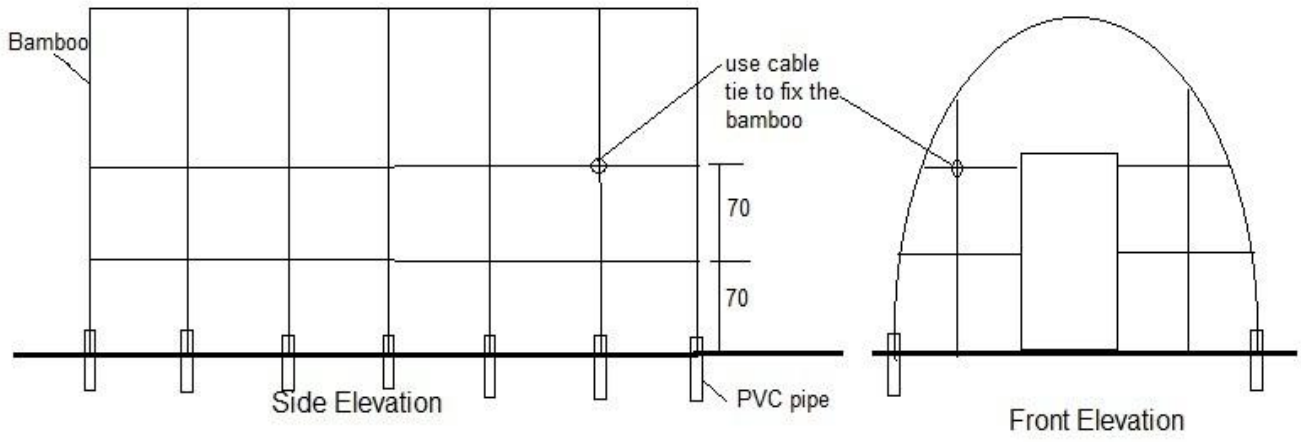
- Level a 4.2m X 2.8m area; cut a dia.50mm PVC pipe into pieces (each 30 cm length) and place them in every 70 cm as shown in the figure.



- Place the cut bamboo in the PVC pipes. The bamboo will form an arch shape due to its flexibility nature



- Reinforce the arch by placing bamboo at the side. Use cable tie to fix the bamboo slices



- Cover it using polyester sheet. This sheet is UV resistant and will protect the bamboo from rain.

This is done by taking in consideration the minimum adequate shelter space which is described in sphere project which is 3.5 m2 per person. The advantage and disadvantages of the bamboo tent in comparison with the plastic sheet tents which are provided by UNHCR will be discussed in detail.

Bill of Quantity for the Construction of Refugee shelter Type I (Bamboo Tent)

NO	Description	Unit	Quantity	Unit Price	Amount
1	**Excavation and Earth Work**				
1.1	Site Clearance	M2	13.2	9.5	125.4
1.2	Excavation of small halls	Pcs	14	-	-
2	**Plastic Pipe work**				
2.1	Provide, cut and put in position a 50 mm PVC pipe each into a length of 70cm.	M	7	18	126
3	**Bamboo Work**				
3.1	Provide, cut and put in position a 10m bamboo each sliced into four parts.	Pcs	28	13	364
3.2	Drill the bamboo in order to insert a cable and tie the bamboo				
3.2	Use a 1.5 mm thick cable tie to fix the bamboo slices	Pack	1	60	80
3.3	Supply and fix polyester sheeting for wall and roof covering. The polyester sheet shall be prepared in a size according to the design provided and must have provisions to tightly secure it to the shelter frame	M2	30	35	1050
4	**Masonry Work**				
4.1	400 mm thick basaltic or equivalent type stone	M3	7	40.79	285.53

	masonry bedded in mud mortar above ground surface up to 50 cm.				
	TOTAL				**2031.03**

Taking as an advantage that this technology is simple that it could be done by the refugees themselves could eliminate the direct cost of the bamboo tent construction up to 1905.63 Eth. Birr (. The major advantage of this type of emergency tent is that it is simple; once trained, the refugees themselves could construct it. Plus it is worthwhile to notice that the cost of Polyester, Bamboo, PVC Pipe, Natural stone could be decreased significantly if we purchase it in mass.

The need for the masonry work around the tent is for wind protection in Addition victims can construct the masonry work high through time and construct the Masonry Shelter construction (which is the other prototype conducted by EiABC as a response for semi permanent shelter solution)

Bill of Quantity for the Construction of Refugee shelter UNHCR Plastic sheet

NO	Description	Unit	Quantity	Unit Price	Amount
1	**Excavation and Earth Work**				
1.1	Excavate over site to remove top soil to an average depth of 5cm and level surface.	M2	20	9.5	190
1.2	Excavate pits for footing pads to a depth of 30cm.	M3	0.2	50	10
	Sub-total				**200**
1	**1 - Structural Steel Work**				
1.1	Provide, cut, bend, weld and put in position	M	80	45	3600

	a rectangular hollow section (RHS) of 25mm x25mmx1.25mmfor shelter fabrication. Unit price for materials includes all the necessary accessories/assembling and erection.				
1.2	Ditto but for wind bracing.	M	27	45	1215
1.3	Provide, cut, bend, drill and put in position flat metal of 15mm wide and 1.25mm thick for strengthening shelter frame.	M	40	15	600
1.4	Provide and fix blots and nuts of 10mm diameter and 80mm long to tightly secure two RHS frames. Unit price includes drilling and other necessary accessories/materials.	Pcs	60	12	720
1.5	Provide and fix screws of 4mm diameter and 40mm long to tightly secure RHS frame and flat metal. Unit price includes drilling and other necessary accessories/materials	Pcs	100	5	500
1.6	Provide iron pieces of at least 15cm long and weld on the RHS legs of the shelter frame for anchoring and strengthening.	Pcs	10	18	180
	Sub-total				**6815**

2	**2 - Roofing and Wall Covering**				
2.1	Supply and fix plastic sheeting for wall and roof covering. The plastic sheet shall be prepared in a size according to the design provided and must have provisions to tightly secure it to the shelter frame.	M2	40	25	1000
	Sub-total				**1000**
3	**3 - Concrete Work**				
3.1	Mass concrete pads of 200mm x 200mm x 400mm in C-15 with 150kg cement per cubic meter of concrete. (Optional can be made in-situ).	M3	0.2	3500	700
	Sub-total				**700**
	TOTAL				**8,715.00**

Comparison among the UNHCR Emergency plastic sheet tent and the Bamboo Emergency tent:-

	UNHCR plastic sheet	**Bamboo Tent**
Cost	8,715 ETB	2031.3 ETB

Durability	Less than a year	Less than a year
Quality	Could be improved by improving the quality of materials(incr. Cost)	Could be improved by involving experts
Insulation	Low	Low
Ease of Construction	Needs a professional experts	Could be done by the refugees themselves