

 DANISH
REFUGEE
COUNCIL

Bamboo Shelter



A Transitional Shelter Solution for Dollo Ado Area

Danish Refugee Council
September, 2011

Facts about Bamboo Shelter

- ❖ **Environmentally Friendly:** Ethiopian natural bamboo forest is about 1 million hectares, which is 7% of the world total & 67% of the African bamboo forest area. Bamboo grows up to 3.5m per year. Bamboo can be continuously re-harvested every 3 years, without causing damage to the plant system and surrounding environment. During the time it takes to regenerate, the bamboo plant's root system stays intact so erosion is prevented. Continuous harvesting of this woody grass every 3-7 years, actually improves the overall health of the plant.
- ❖ **Durable:** Bamboo has better tensile strength than many alloys of steel, and a higher compressive strength than many mixtures of concrete. It even has a higher strength to weight ratio than graphite.
- ❖ **Low Cost:** The total cost of a bamboo shelter including transportation and labor is about 221USD (current price).
- ❖ **Low Construction Duration:** The bamboo shelter is easy to construct and the whole construction can be done in 2 days.
- ❖ **Balance the Standard between Host community and Refugees:** Bamboo shelters are compatible to the existing host community shelters, which could eliminate any potential conflict among the refugees and host community.
- ❖ **Portable:** Shelter construction should focus on providing refugees with materials that they can take back to their country when return is possible. Taking this into account, bamboo shelters are designed and constructed in such a way that it can be dismantled easily.
- ❖ **Fire Resistant:** Bamboo sticks have good fire resistance compared to the existing shelter materials. e.g. wood, cloth and canvas
- ❖ **Secured Material Supply:** The supply and quality of bamboo is guaranteed by the Ministry of Agriculture/Bamboo Coordinator. The cooperation between DRC and MoA, including the purchase of bamboo, ensures a smooth supply of bamboo from sustainable sources.
- ❖ **Up Gradable:** The bamboo shelters can be enlarged and upgraded with different cladding materials such as; polyester plastic sheeting, Bamboo mats, palm leaf mats, grass mats and clay.
- ❖ **Better Insulation:** Due to the double layer (palm leaf mat on the inside and bamboo mat on the outside) the bamboo shelters have a better insulation than a plastic sheet, CGI sheet or canvas.

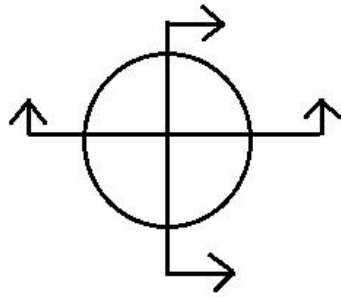
- ❖ **Safety:** The bamboo shelter has a safe and lockable door (both inside and outside) and window which is made out of bamboo for personal protection.
- ❖ **Livelihood Activities:** Bamboo mats and Palm leaf mats can be produced by the refugees and host community. (Raw materials will be supplied by the IPs.)
- ❖ **Knowledge Transfer:** Experiences from other countries shows that bamboo is a suitable and durable construction material. This 'know how' can benefit not only the refugees but also Ethiopians in using this huge amount of bamboo resource they have easy at hand.
- ❖ **Minimize the Amount of Water Consumed for Shelter Construction:** The bamboo shelter construction decreases significantly the amount of water needed for shelter construction.
- ❖ **Locally Available:** Ethiopia has got a huge amount of bamboo resource. The Ministry of Agriculture is willing to assist with the harvesting and plantation of bamboo in Dollo Ado.
- ❖ **Wind Resistant:** In addition to the strength of the bamboo, the bamboo shelter is designed in such a way that it can resist wind. The dome shape of the shelter makes the bamboo shelter to be more wind resistant.
- ❖ **Culturally Acceptable:** Dome shaped shelters (houses) are common in Somali Region and are culturally acceptable. In addition the bamboo shelters are designed having a partition of two rooms in order to secure privacy and to respect gender needs.



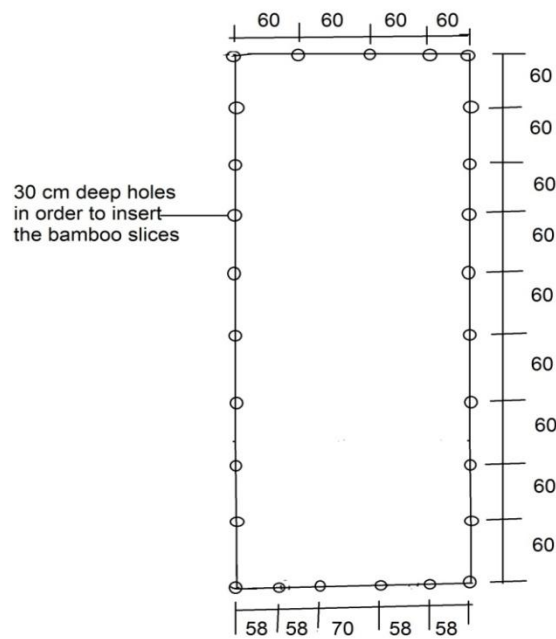
Construction Step

- Use a minimum of 5 cm diameter and 7m length Bamboo.
- Remove the unnecessary parts on both edges.
- Cut the bamboo into four parts, as shown in the figure below, and immerse it in a treatment bath which is filled with 35 grams of salt per liter of water in order to protect the sliced poles from termite attack. The bamboo needs to be immersed in the salt water for one week. Then it should be placed in a dry area so that it can dry. This process will remove all the sugar found in the bamboo, which

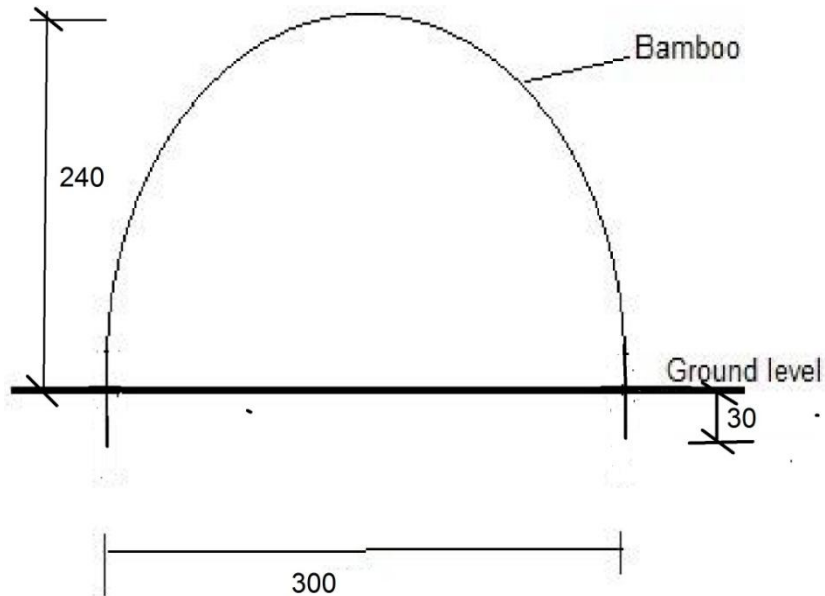
otherwise will attract termites and other insects.



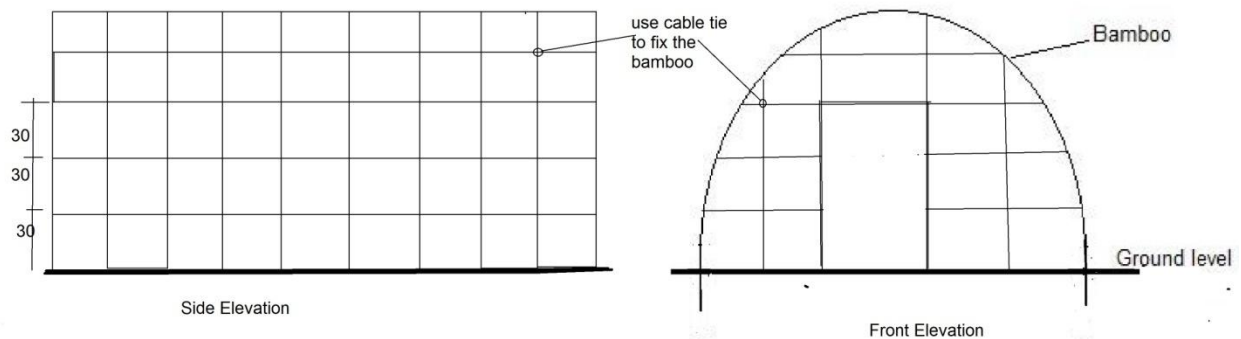
- Level a 3m X 6m area; dig holes of min 30cm depth, place sticks every 30 cm and fix in ground every other stick with the distance as shown in the figure below.



- Place the cut bamboo in the holes as shown in the figure below. The bamboo will form an arch shape due to its flexible nature



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



- Cover the bamboo frame with palm leaf mats in the inside and with bamboo mats on the outside. Use cable ties to fix the mats. Leave a (50 x 20) cm space at a height of 180 cm open as window.
- Construct a 75X175cm door using half bamboo slices. Drill the bamboo slices and connect it using binding wire.
- Make a window shutter out of pieces of palm leaf mats and bamboo mats closeable from the inside.

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

NO	Description	Unit	Quantity	Unit Price	Amount ETB
1	Excavation and Earth Work				
1.1	Site Clearance	M2	28	9.5	266
1.2	Excavation of small holes	Pcs		-	-
3	Bamboo Work				
3.1	Provide, cut and put in position a 7m bamboo each sliced into four parts.	Pcs	33	15	495
3.2	Drill the bamboo at connection points in order to insert a cable and tie the bamboo				
3.2	Use 1.5 mm thick cable ties to fix the bamboo slices	Pack	5	100	500
3.3	Supply and fix palm leaf mats for the internal wall and ceiling covering. The palm leaf mat shall be prepared in a size according to the design provided and must have provisions to tightly secure it to the shelter frame	M2	36	20	720
3.4	Supply and fix bamboo mats for the external wall and roof covering. The bamboo mat shall be prepared in a size according to the design	M2	36	20	720

	provided and must have provisions to tightly secure it to the shelter frame.				
	4. JOINERY WORK				
4.1	Supply and fix bamboo door of half poles; price includes provision for padlock.				
	door size: 175 X 75mm	Pcs	1	15	45
	window size: 2 X 25m	Pcs	1	15	15
	TOTAL				2761

- Price per sq. meter = 153birr = USD 9/-
- The camp committee will issue two plastic sheets of each USD 11; total USD 22, in case of a successful rainy season. The sheets will be collected after the rainy season. Thus, it is believed that selling of the sheets is avoided.