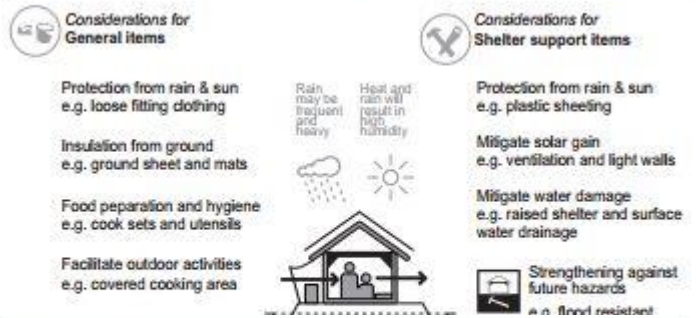
NFI considerations for warm, humid climates



Warm, humid considerations

1. Emergency relief considerations

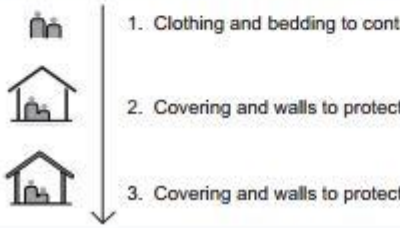
Emergency Shelter Cluster, 2008c.

Plastic sheeting	To protect from the elements and as a first step in transitional shelter
Shade netting	To protect from incident sunlight during the significant periods when it is not raining
Structural poles	Local availability of wood is likely to be higher than in other climates; consider bamboo or dressed timber
Nails	Do not distribute nails with bamboo; use wire instead
Machete	Also known as panga or cutlass
Tents	Used rarely in this climate. May be appropriate if natural resources for poles are scarce

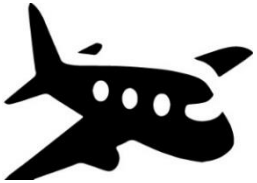
2. Recovery considerations

Upgrading roofing	Consider distributing materials to create a ventilated air space in the ceiling, improving thermal performance.

NFI priorities for warm, humid climates



WARM, HUMID CLIMATE

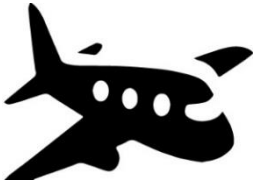


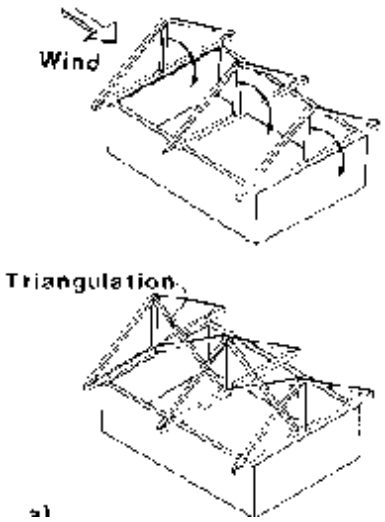


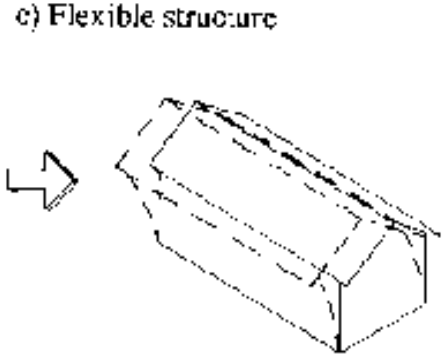
	Acute Emergency Shelter	Standard Emergency Shelter	Robust Emergency Shelter	Transitional Shelter	Permanent Shelter
Main characteristics	• Lightweight • Air lift able • Basic kit • Below sphere standards • Lifespan: 3 to 6 months	• Truck transportation • Standards kits in pipeline • According Sphere standards • Lifespan: 3 to 6 months	• Truck transportation • Top up kits on Standard E shelter • According Sphere standards • Reinforced structure • Lifespan: 6 to 12 months	• Truck transportation • Design acceptable by local culture • Structure fully reinforced and stable • Wall using flexible materials acceptable as last resorts. • 70 % of the materials shall be reusable and transportable. • Lifespan: 12 to 24 months	• Truck transportation • Design acceptable by local culture • Structure fully reinforced and stable • Wall using infilling or durable materials • Roof potentially upgraded with thatch or CGI sheets. • Lifespan: over 12 months (to 10 years) • Proper door, wall base and slab provided.
Applicable when …	• For ‘harsh to reach’ area	• Road transport • Common kit applying as baseline for all situations.	• Road transport • Mid stay foreseen (over 2 seasons)) • Unsecured returns • Land Tenure un-cleared (population stranded or in transit) • P.O.C.	• Road transport • Mid stay foreseen (over 6 months) • Secured returns • P.O.C. with high security constraint (closed PoC) • Land Tenure cleared.	• Road transport • Secured returns • Land Tenure fully cleared and documented.

[1] Excluding plastic sheet. Reusable target mainly the structural elements.

[2] Corrugated Gauge Iron or tin also called tin sheet. Gauge under 28 or 26 .

					
Proposed kits	**2 Plastic Sheeting** **30 meter linear of 6mm or 7 mm nylon rope** **6 Pegs** **Tools:** **Hoe according distribution scheme**	**3 Plastic Sheeting** **2 Rubber binding ties** **30 meter linear of 6mm or 7 mm nylon rope** **2 Bundle or bamboo (10 pieces each)** **6 wooden poles** **36 sand bags** **Tools:** **Hoe according distribution scheme**	**Top up kit:** **6 extra wooden poles (total shall be 12 poles)** **3 bundles of bamboo** **10 extra sand bags** **200 g nails for structure (30 nails) on 6 inches** **Tools: according** **Optional 400 g of roofing nails 2,5" (around 120 nails) not from the pipeline** **If design use non split bamboo add 50 ml of 1.2 mm metal wire to tie (around 500 g)**	• **To be defined by T Shelter agencies** • **Shall preferably use timber structure (for repairs, conversion etc.)** • **Shall preferably being locally produced.** • **Shall avoid or reduce plastic sheeting, polyethylene materials** • **80 % of materials shall be locally (south sudan) materials**	**18 to 20 poles** **10 bamboo bundles (doubling wattle for wall)** **2 plastic sheeting for temporary roof (if needed)** **2 plastic sheeting for temporary wall (if needed)** **100 ml of 1.2 mm metal wire (around 1 kg)** **70 hollow cements block for floor** **2 cement bags for block mortar and slabs** **Ironmongery and nails, 1 pair of hinge, 2 lock 1 small 1 big, padlock, ½ 5 hinge nails** **2 timber 2x4 + half iron sheet (door leaf)**
Costs	Cost : 61.7 USD (without transport)	Cost : 153.3 USD (without transport)	Cost total: 225 USD Cost for the top up kit: 60 to 70 USD Cost on 10 000 units = 700 000 USD		Total cost 450 to 475 USD



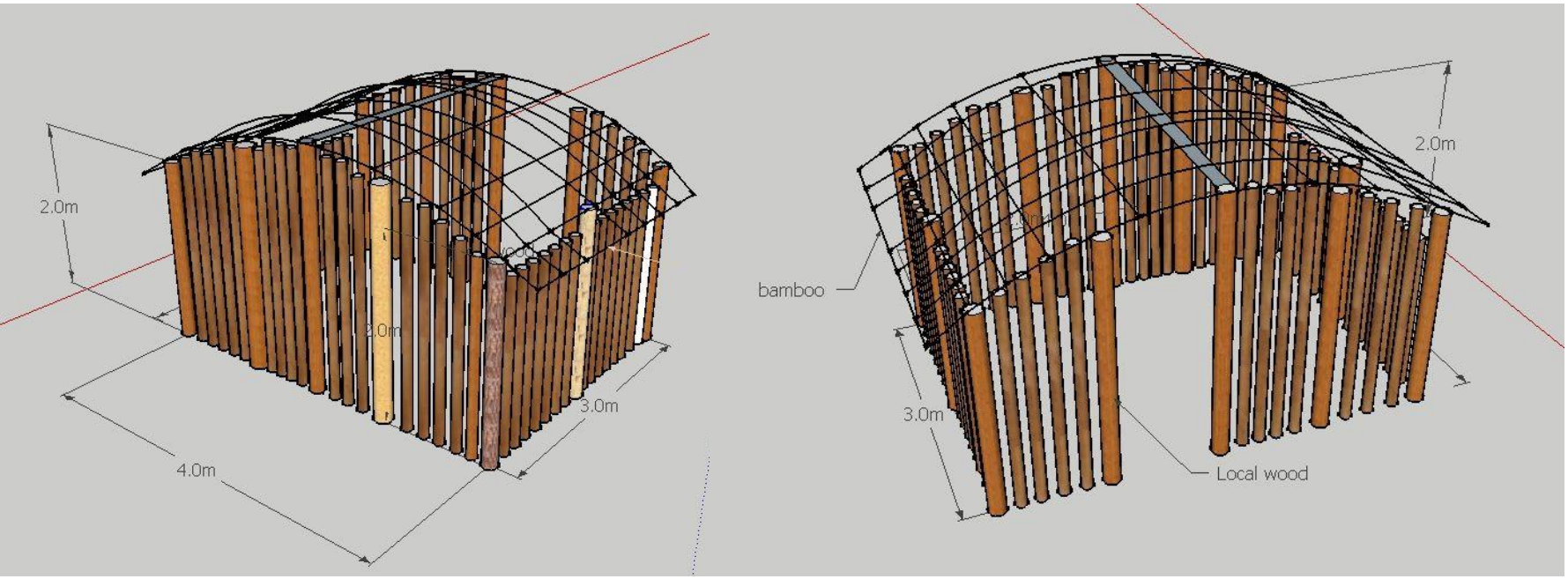


With winds or any other loads, non braced structures may drift, twist or lean.

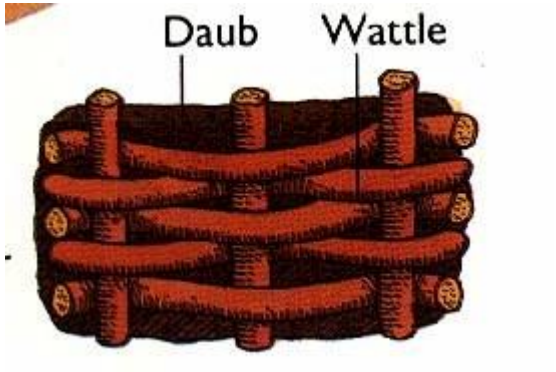
Bracing should be done on the structure, in filling material are just helping.

STRUCTURAL COMPONENTS, BRACING

EVEN MULTIPLE VERTICAL POLES COULD LEAN



Global communities in Abey, developed a design taking account evolution to more permanent shelter using wattle and daub technics. 12 m2

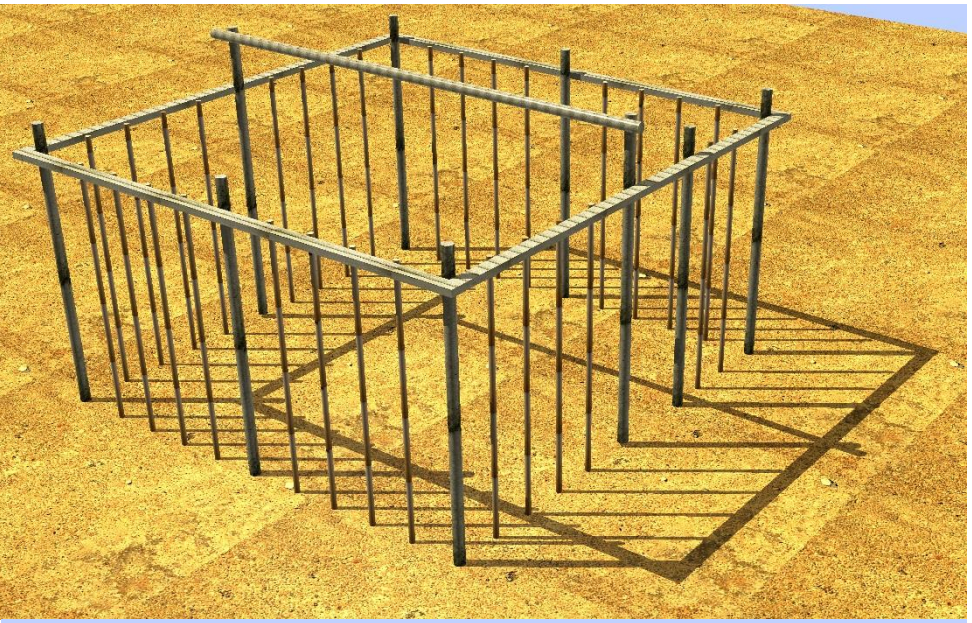


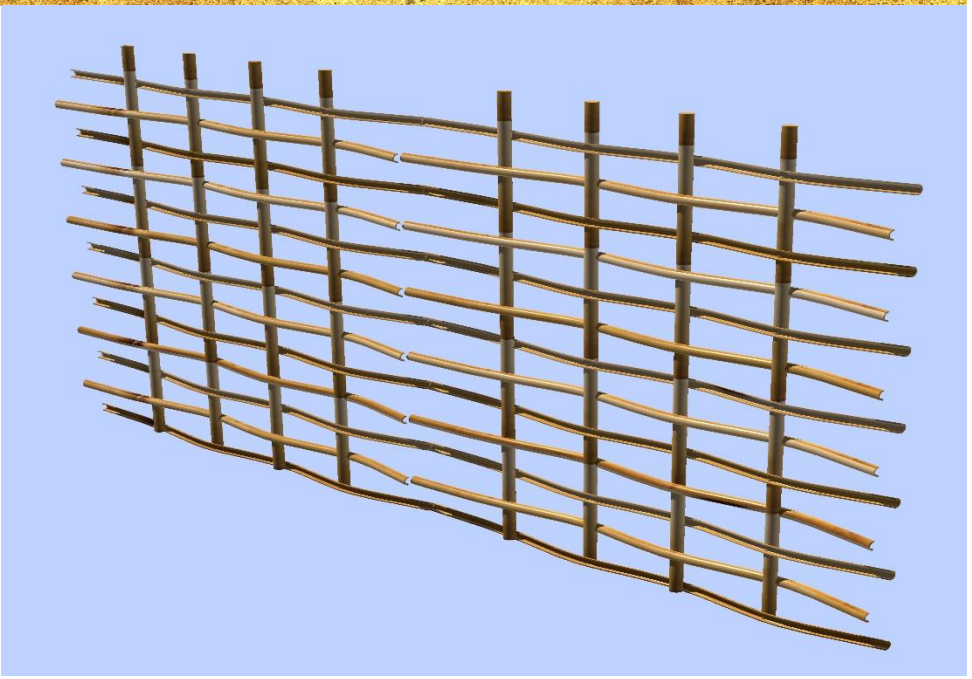
Global Communities, Abey 2014

WATTLE & DAUB GENERAL

- Clay soil as black cotton soil are useable with wattle and daub
- Possibility to amend with fibers or sand in order to reduce shrinks. For fiber better to use animal (hair) if termite are very common on site.
- Reinforcing the wall in filling do NOT dispense or proper bracing.
- In order to save materials, the main structure could be done with wooden pole and a secondary structures with Bamboo

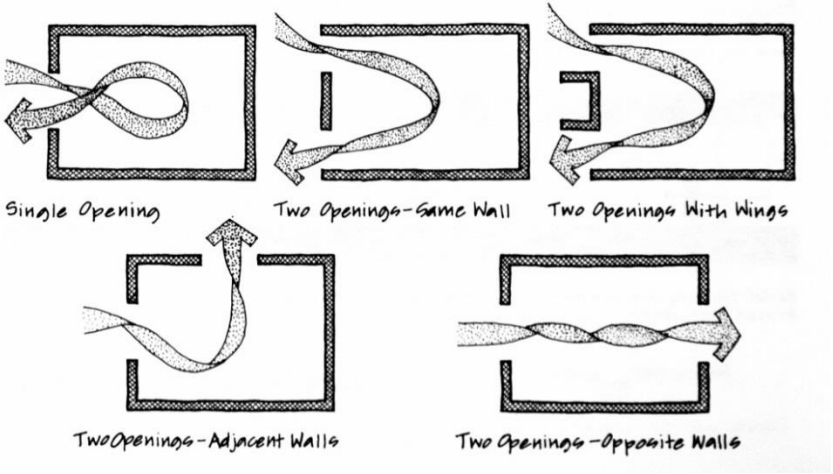
WATTLE & DAUB SPECIFICATIONS

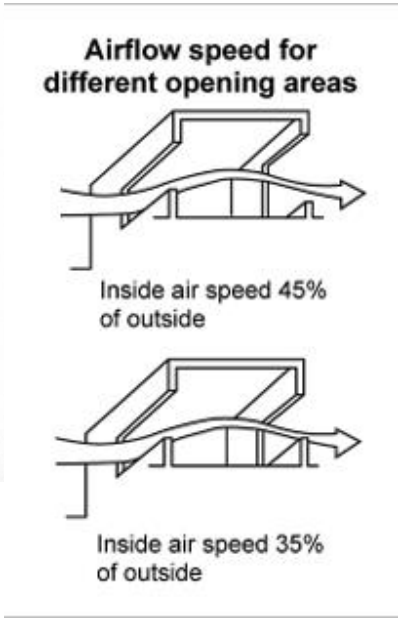


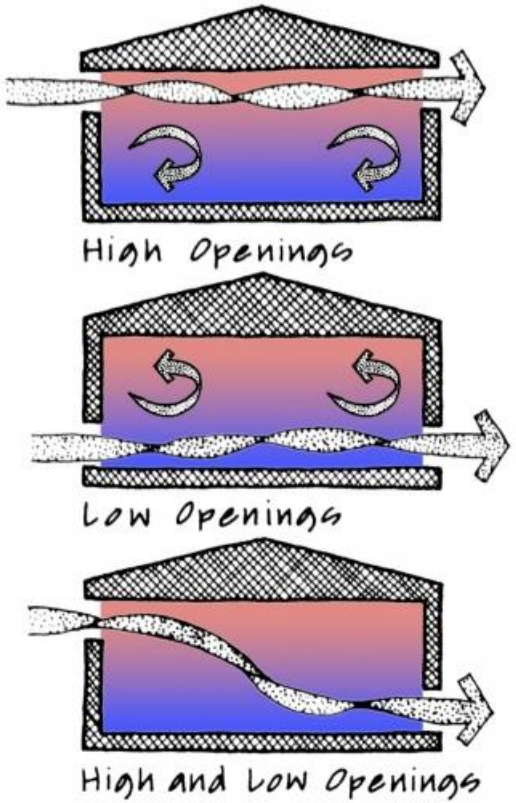


STRUCTURE USING WOODEN POLES, BAMBOO CULMS & BAMBOO LATTICES

- Primary structure 9 vertical elements
- Rigidity ensured on upper frame with wooden pole or similar elements.
- Door reinforced
- Secondary frame made with bamboo culms
- Lattices (optional) to act as wattle.

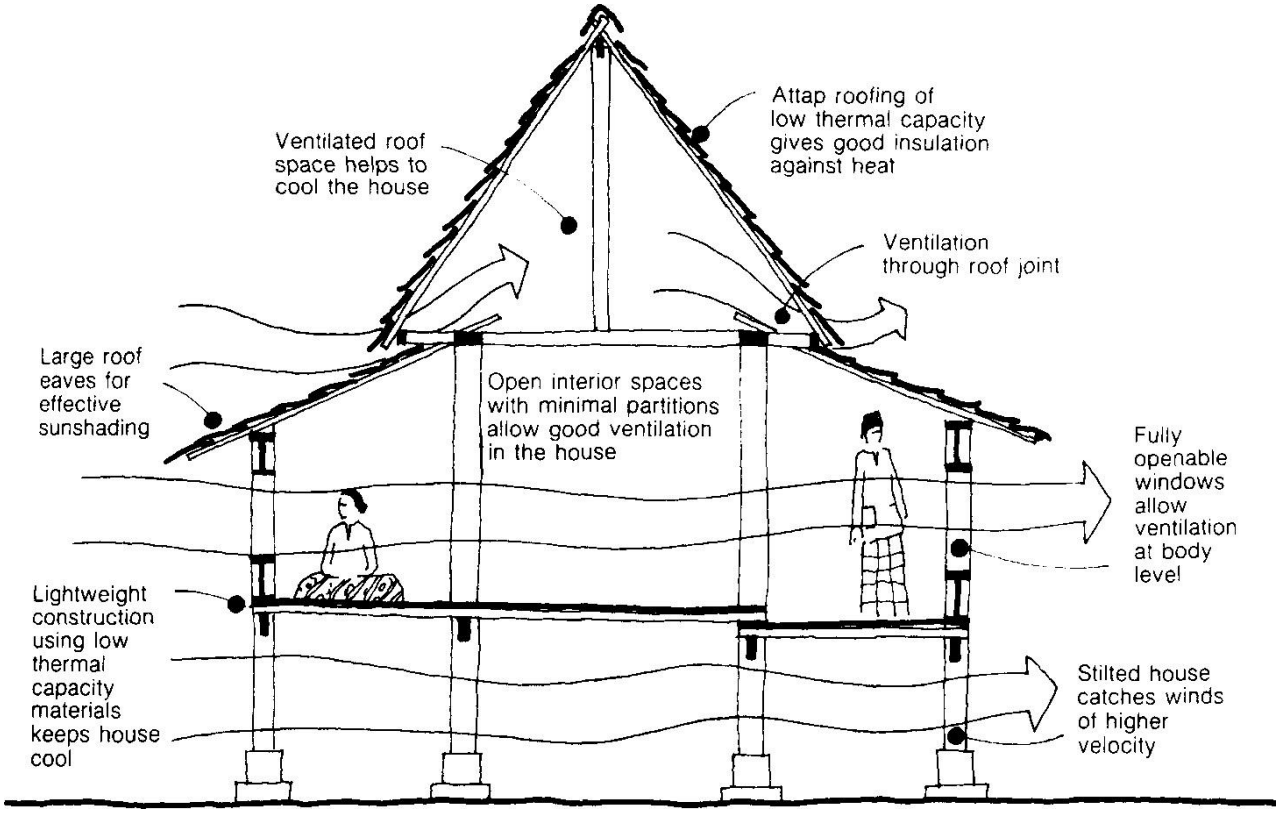






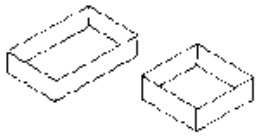
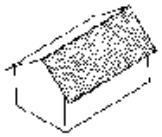
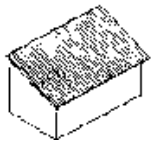
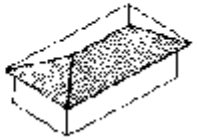
- Cross ventilation (opposite)
- Difference of opening size
- High-low ventilation

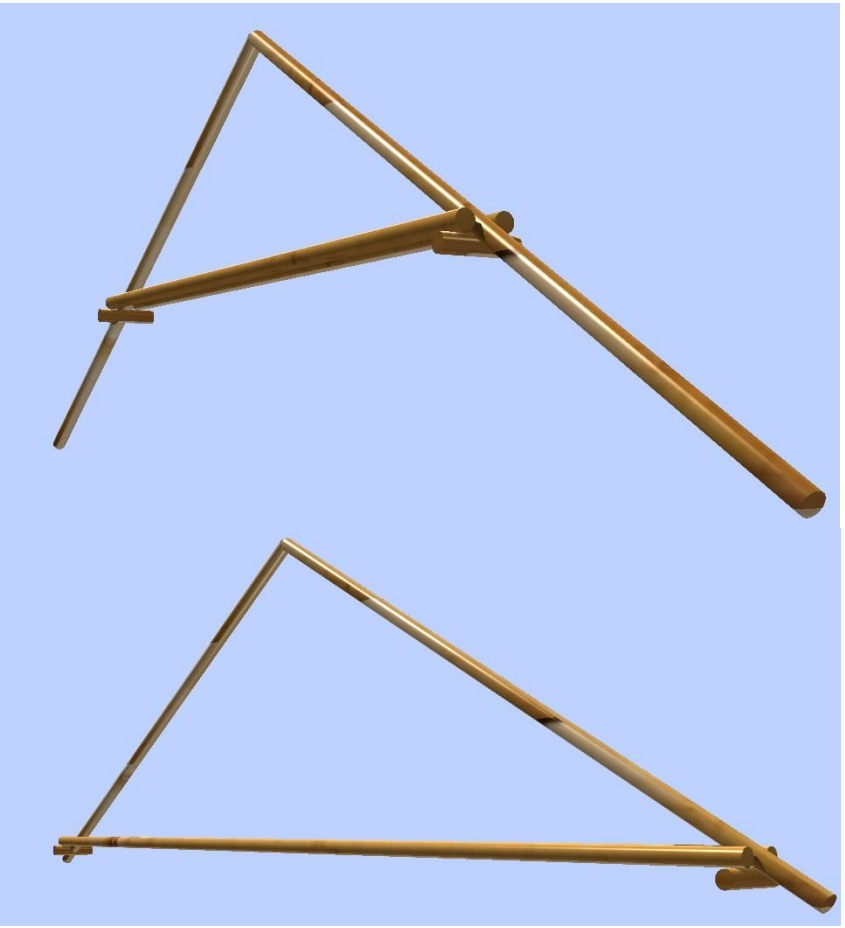
VENTILATION PRINCIPLES

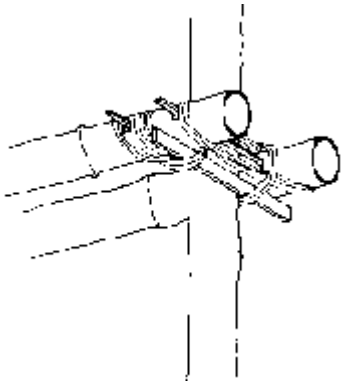


VENTILATION (EXAMPLE)

ROOF TYPES

Floor plan	Roof shape
Square	Pyramid roof
	
Rectangular or square	Double pitched roof
	
Rectangular or square	Mono pitched roof
	
Rectangular	Hipped roof
	



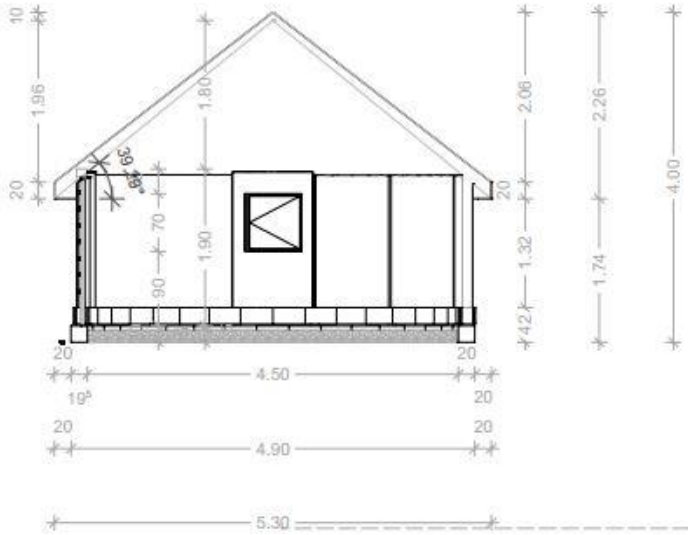


- The full bamboo culm shall not be nailed (avoiding cracks and splits) better to use rubber tie or metal wires
- Bamboo lattices could be nailed if nail diameters are corrected (less than 2 inches)

ROOF STRUCTURE, IMPORTANCE OF TIE OR COLLARS FOR THE TRUSSES.

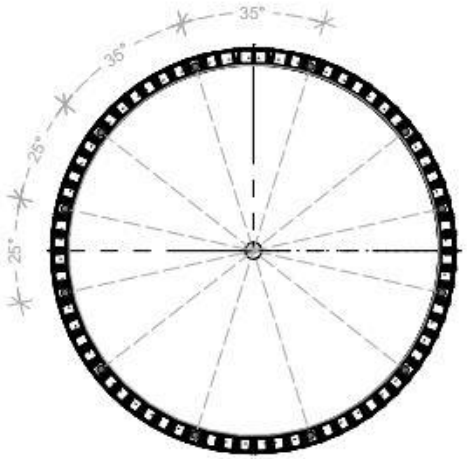
PERMANENT SHELTER (EXAMPLE)

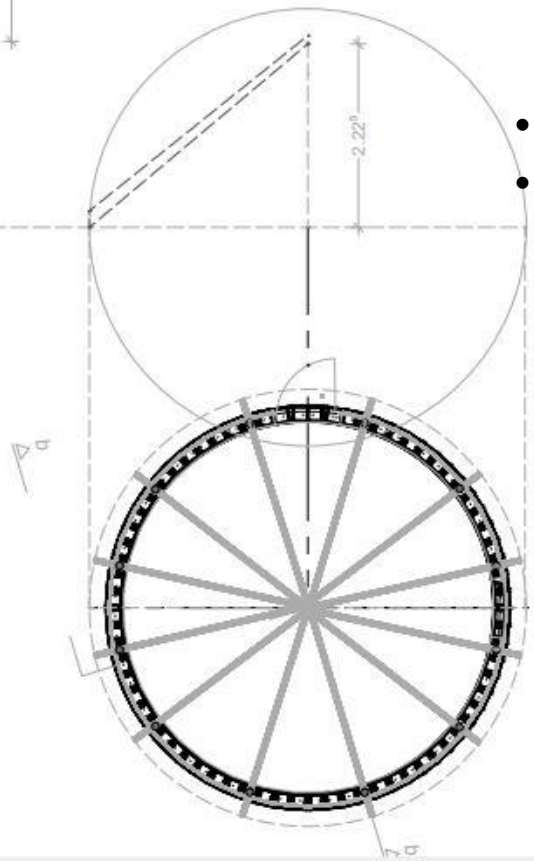
GENERAL COMPOSITION

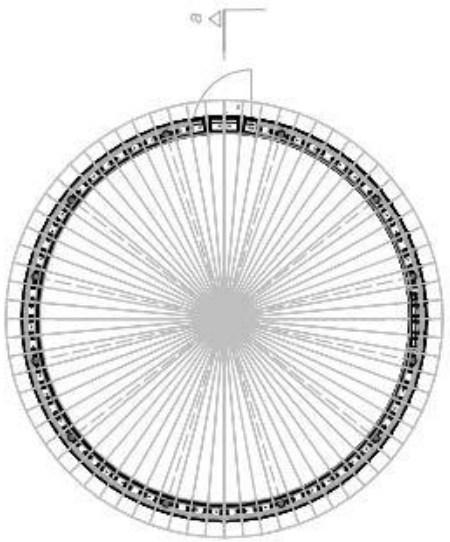


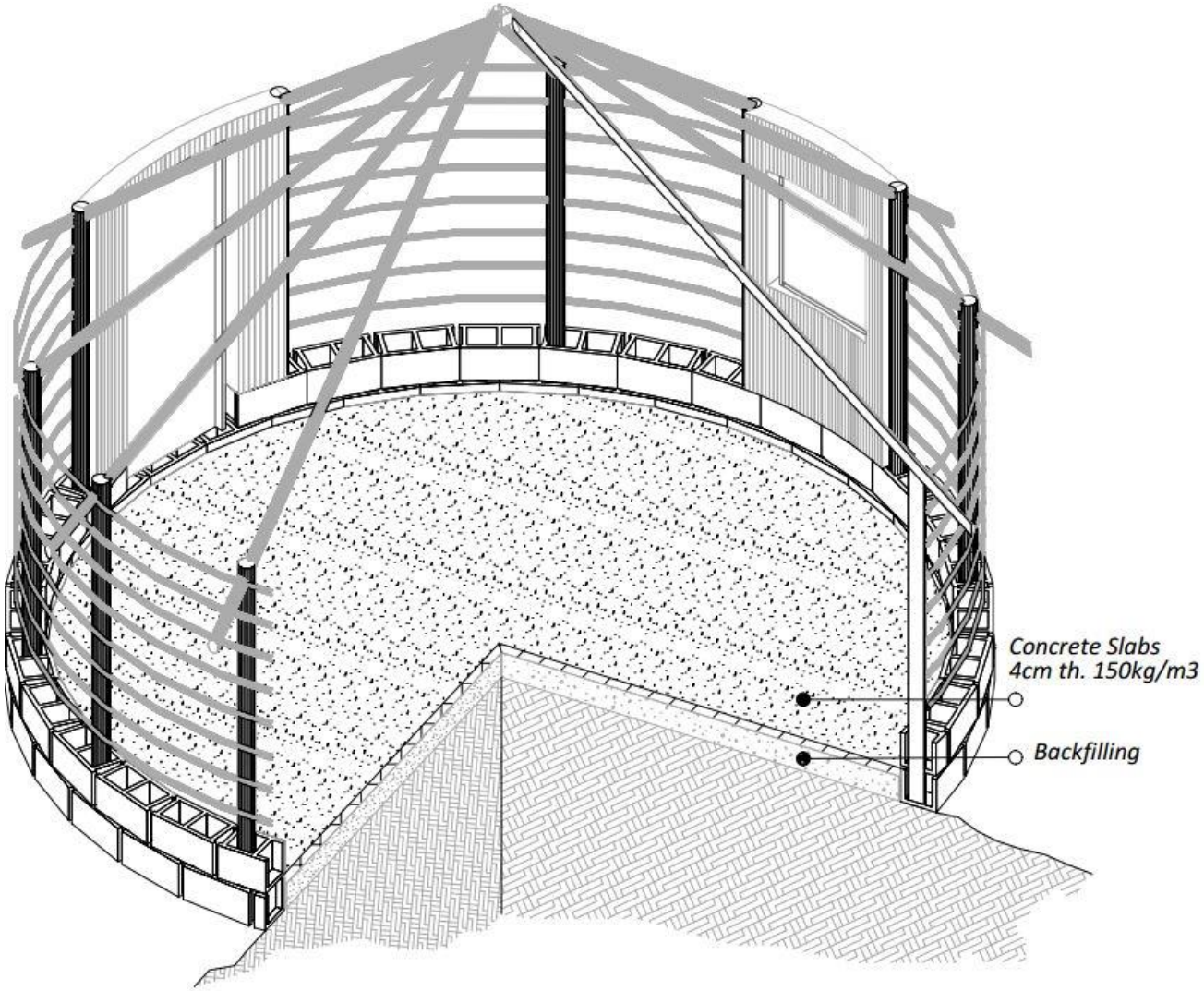
Main elements:

- Cultural acceptance (tukul)
- Local material (thatch roof)
- Investment on expensive items (cement blocks, slabs, door, hinges)
- Reinforcing structure
- Improving wall base and floor

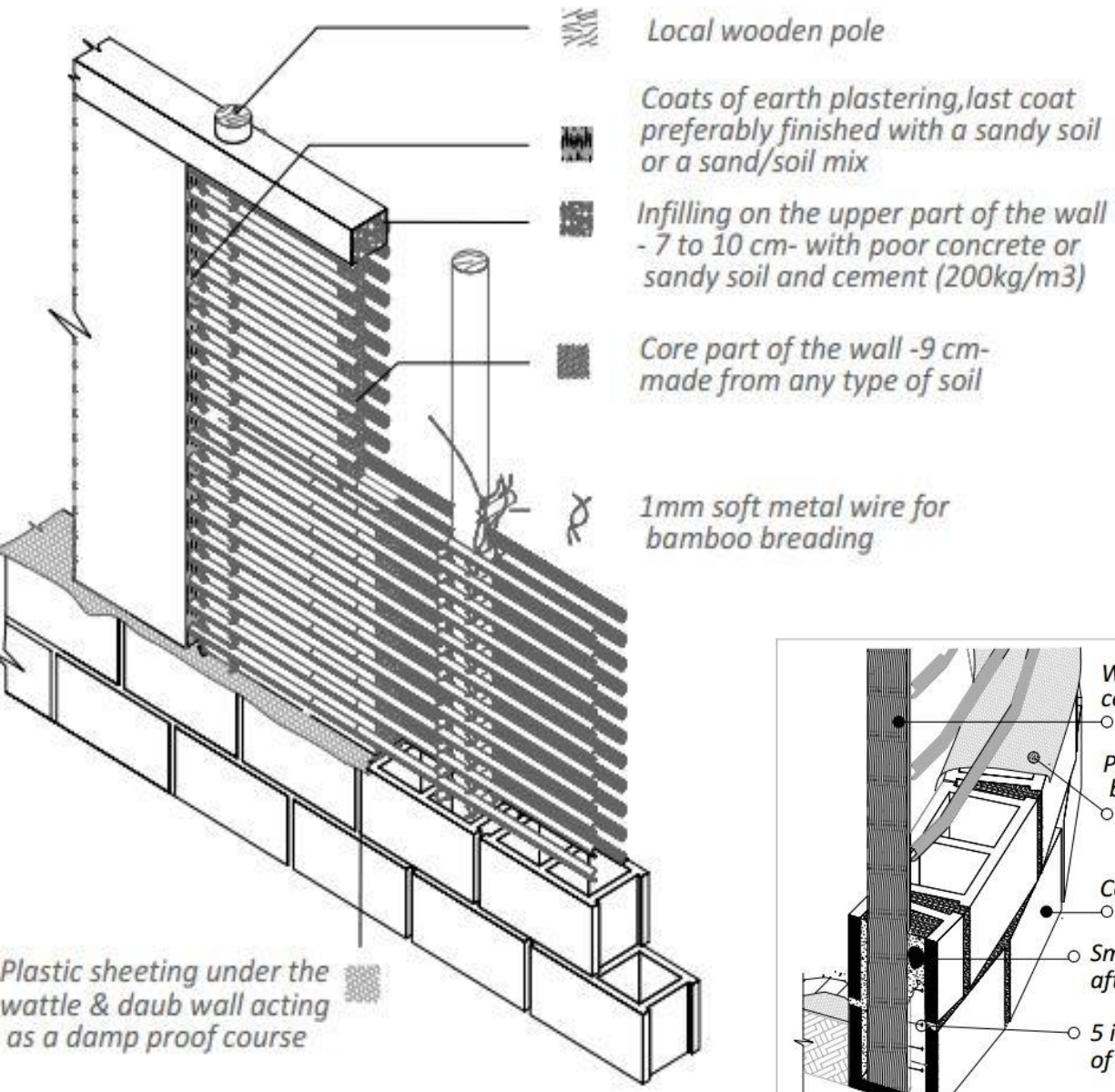




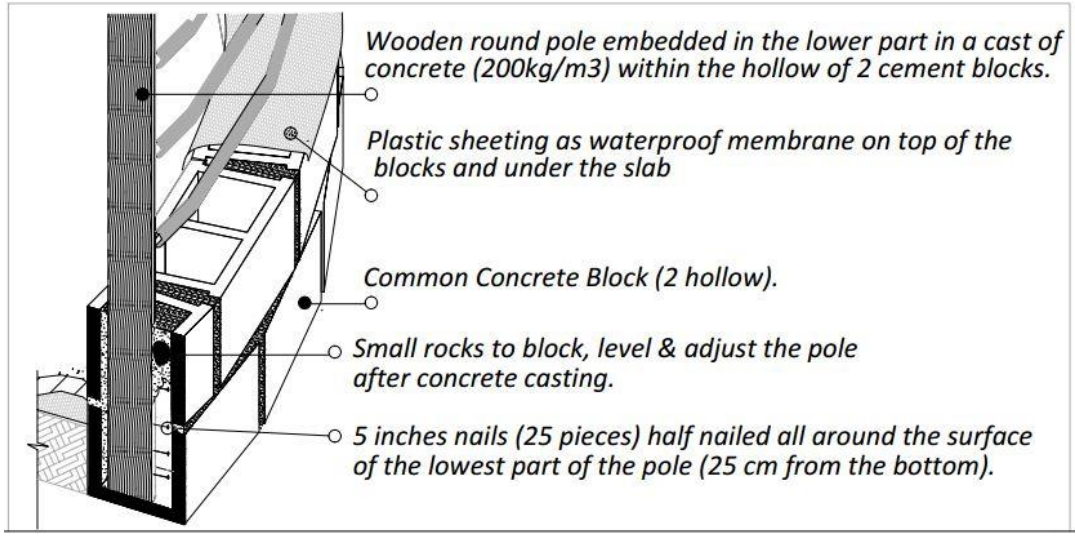




AXONOMETRIC VIEW



- 2 designs of wattle and daub technics



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Earth construction specialized NGO
Craterre-EAG

Shelter cluster
http://sheltercluster.org/

Compressed Stabilised Earth Block Manufacture in Sudan, Doctor E.A. ADAM, UNESCO publication

Transitional Shelter Guideline, shelter center

Transitional Shelter, 8 designs, IFRC

MCR, Roofing system. Skat

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