FLOOD RELIEF PROGRAM

Funded By Disaster Relief Fund

Government of the Hong kong Special Administrative Region

Habitat for Humanity® Nepal

Emergency Shelter

Construction Manual

Habitat for Humanity Nepal

“A world where everyone has a decent place to live”

Habitat For Humanity Nepal is a non profit organization helping to build simple, decent and affordable housing in partnership with people in need.

Mission: Habitat for Humanity brings people together to build homes, communities and hope.

- Focus on shelter.
- Advocate for affordable housing.
- Promote dignity and hope.
- Support sustainable and transformational development.

Habitat Nepal is committed to building homes and hope in both disaster-affected and non-affected areas across the country.

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about the manual

This construction manual outlines the techniques and procedures adopted for the construction of the emergency shelter designed and developed by Habitat for Humanity Nepal. Since the manual only provides the general and the most important parameters of the construction, the readers who are interested or planning on building with bamboo are strongly recommended to consult a trained mason or get technical advice before deciding and use trained masons while building.

On the same note, this manual is also not intended as a substitute for training on bamboo house construction.

According to the condition of construction site, environment and the preferemce of the house owner, two options of shelter construction process are explained in this manual.

- First option : Floor raised with bamboo post
- Second option : Floor raised with mud.

option 1: floor raised with bamboo post

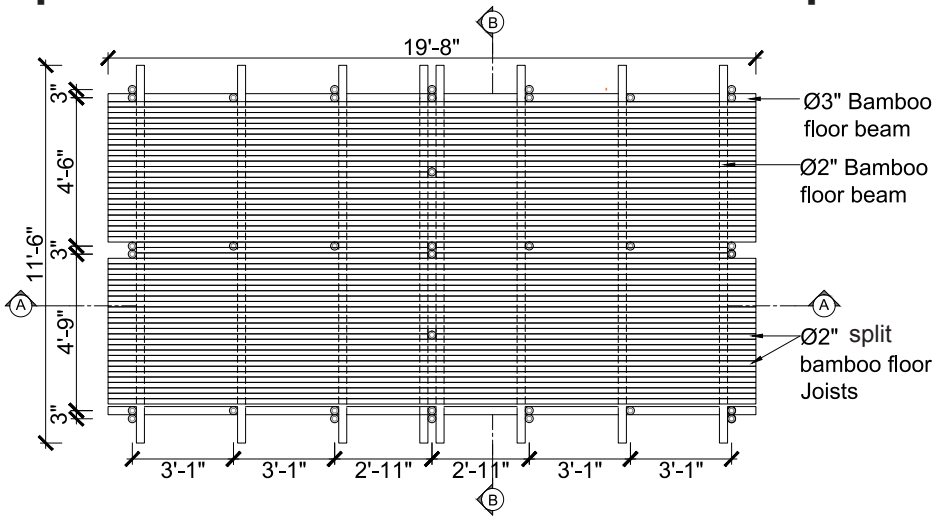


Fig 1:Floor Plan

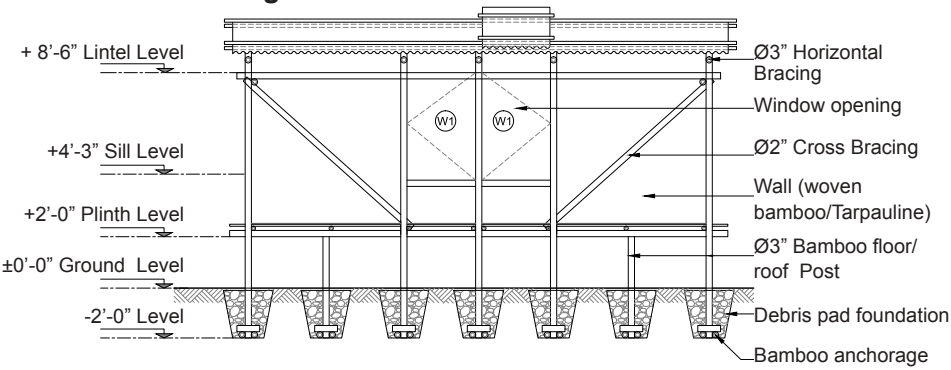


Fig 2: Section at A-A

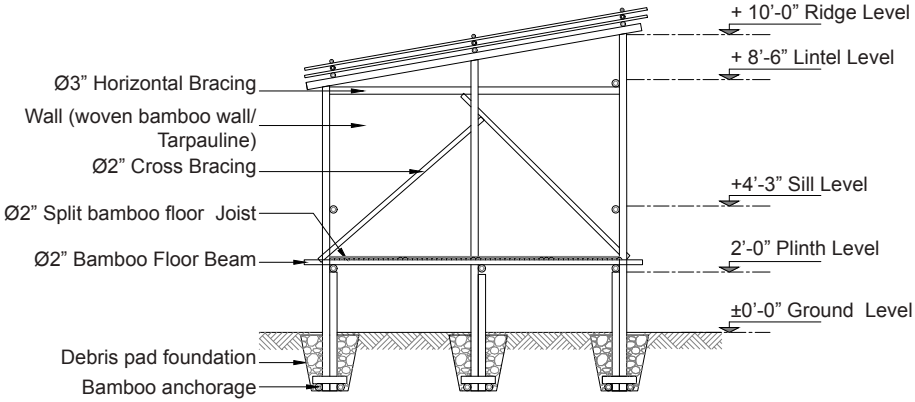


Fig 3: Section at B-B

bill of quantites

Below is the list of materials, tools and labours required to build the shelter.

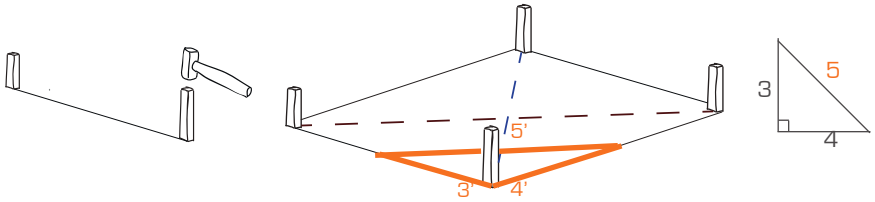
S.N	Description	Quantity	Unit	Remarks
	Materials			
1	CGI Sheets	9	nos	26 Gauge CGI sheets, Lenght: 12', width: 32"
2	Bamboo Poles	70	pcs	dia= 3", 2", 1.5", len-ght=21' , type-untreated
3	Lashing Rope	5	kg	lenght = 10'
4	Polythene Sheet	1.5	kg	0.32 mm
5	Tarpaulin Sheets	566	sq.ft	To be used as wall cover and partition
	Tools			
6	Hammer	1	nos.	
7	Saws	2	nos.	
8	Measuring Tape	1	nos.	
9	Marker	2	nos.	
10	Shovel	2	nos.	
11	Pick	2	nos.	
12	Tamper	1	nos.	
13	Cotton Thread	5	roll.	
14	khukuri knife	1	nos.	
18	Lime Powder	1	bag	
	Manpower			
19	Skilled Mason	2	md	
20	unskilled Mason/ volunteer	6	md	

points to be considered while selecting building site

- Should be easily accessible
- Should be on flat and stable land.
- No trees or plantation should be affected while clearing out the site.

steps

step-1: Draw lines for foundation according to the dimension as shown in the figure 4 and place the stakes at the ground . Check whether the stakes are at right angle using 3-4-5 method as shown in the figure below.



step-2: Dig 21 post holes of 2' X 2' in the ground as shown in the figure 4 below.

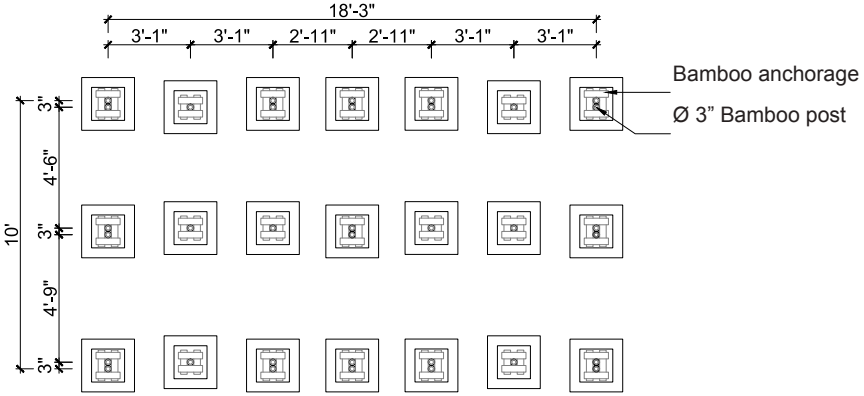
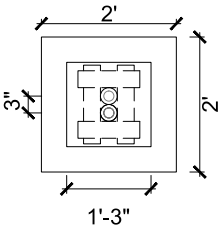


Fig 4: Foundation layout plan



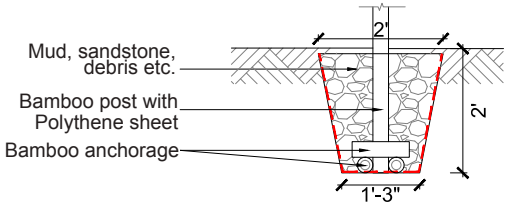


Fig 5:Debris foundation detail

step-3: Cut the required length of floor and roof posts with saw, tie them together and wrap them with polythene sheet. Cut the upper ends of the posts in fish mouth cut as shown in the picture 1.

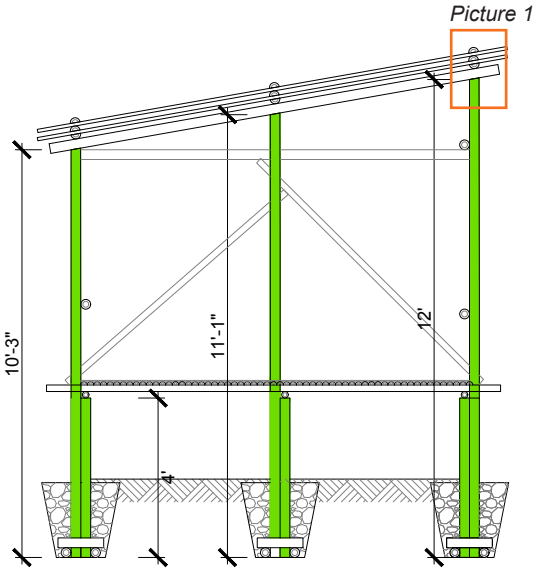


Fig 6: Floor and roof post dimension

Picture 1: Fish mouth cut

Floor post and roof post connection

* According to the geographical condition and the environment of the site, floor posts can be cut 4' or 3' in lenght after consulting with a technician or a trained mason.

step-4 : Tie bamboo posts to the anchorage as shown in the picture below, place it inside the post hole. Then fill the hole with debris and tamp using wooden tamper.

Post and ancorage connection

Tampering debris in foundation

S.N.	Dia.	Length	Quantity
1	3"	10'-3"	5
2	3"	11'-1"	3
3	3"	12'-0"	5
4	3"	4'-0"	21

Bamboo Post

Bamboo anchorage

Sn.	Dia.	Length	Quantity
1	2"	11"	84

step-5: Place and tie floor beams of 3” dia. to the bamboo floor post with rope. Place the next set of 2” diameter beams on top, perpendicular to the beam below. Place split bamboo joists of 2” dia. above floor beams as shown in figure 8.

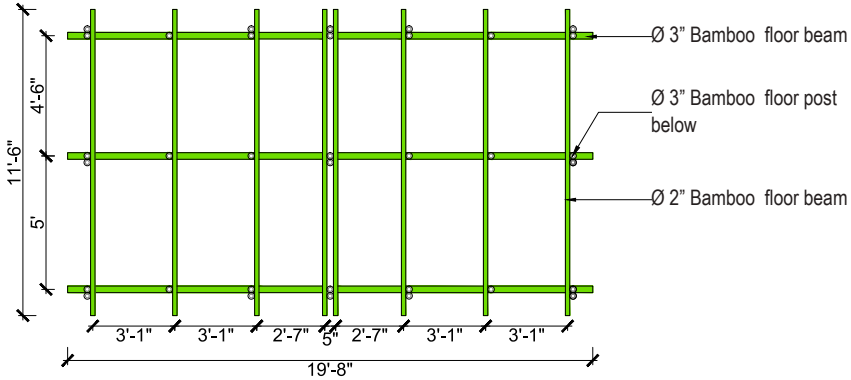


Fig 7: Floor beam layout

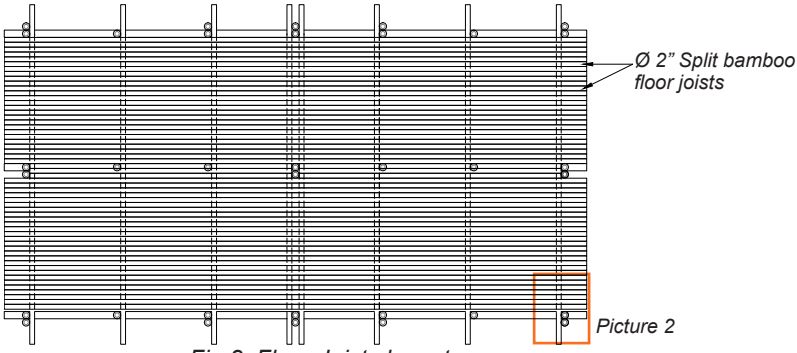


Fig 8: Floor Joists layout

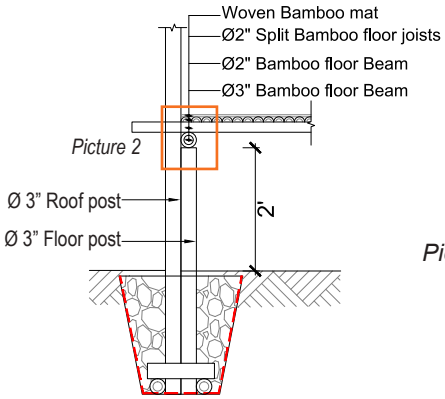


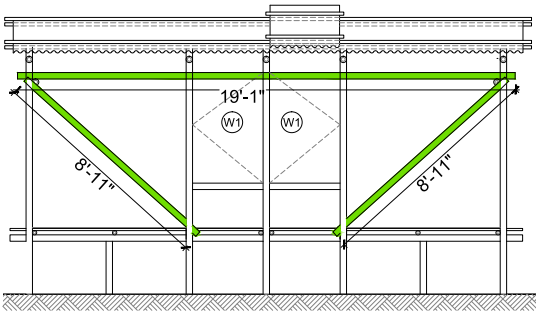
Figure 9 : Floor post and beam detail

Picture 2 : Floor post, beam and joist connection

Sn.	Type	Diameter	Length	Quantity
1	Beam	3”	19’-8”	3
2	Beam	2”	11’-6”	8
3	Joist	2” (split bamboo)	19’-8”	49

** After consulting a technician or a trained mason, floor can be raised by 1’ or 2’ from the ground according to the site condition.*

step-6: Tie diagonal bracings of required dimensions to the roof post. Then tie the horizontal bracing at lintel level as shown in figure 9 and 10.



Sn.	Type	Dia.	Length	Quantity
1	Cross Bracing	2”	8’-11”	4
2	Cross Bracing	2”	7’-3”	2
3	Cross Bracing	2”	7’-11”	2
4	Horizontal Bracing	3”	10’-3”	2
5	Horizontal Bracing	3”	19’-1”	2

Figure 10 :Diagonal bracing

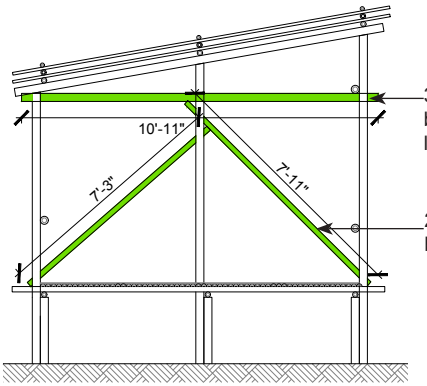
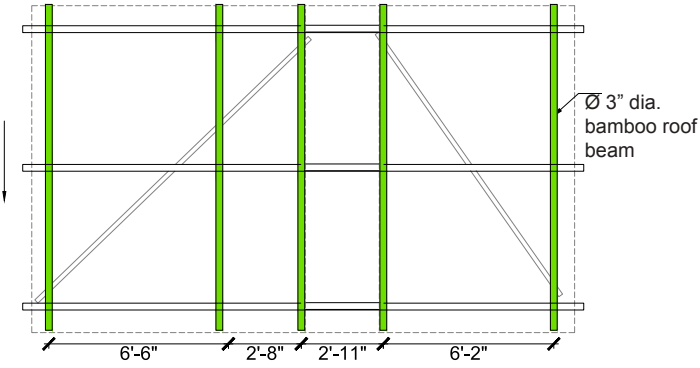


Figure 11 : Diagonal and horizontal bracing

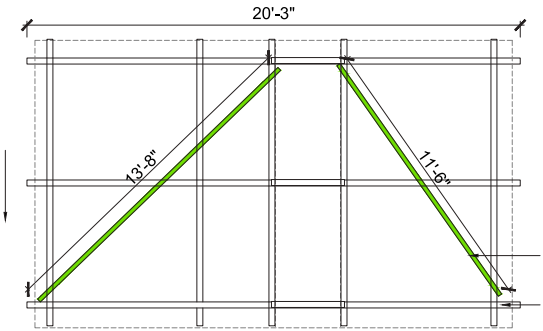
step-7: Place the roof beams on the top of the bamboo post and tie with rope. Refer the table in step 8.



Roof beam and post connection

figure 12: Beam layout

step-8: Place the cross bracings at roof level and then tie to the beams with rope.



Sn.	Type	Dia.	Length	Quantity
1	Beam	3"	11'-5"	5
2	Purlins	3"	20'-3"	6
3	Purlins	3"	3'	3
4	Cross bracing	2"	13'-8"	1
5	Cross bracing	2"	11'-6"	1

Figure 13 : Roof cross bracing and purlins

step-9: Place bamboo purlins on top of the roof beam and tie with rope. Arrange 8 no. of CGI sheets over them leaving one sheet width vacant at the middile as shown in picture below. Tie 2 layers of purlins together to hold the CGI sheets in place.

CGI Sheets Layout

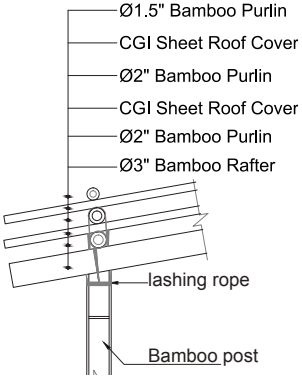


figure 14 : Roof connection detail

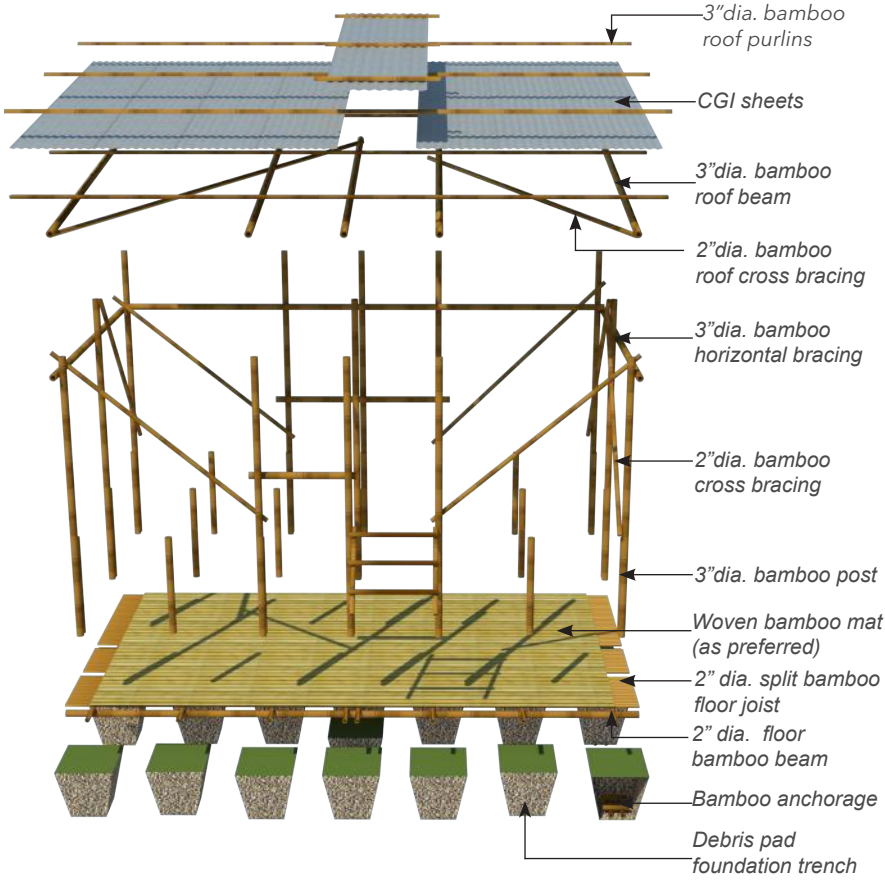
Place the remaining CGI sheet over the void and place 3' length purlins on top of each purlins below to hold the sheet down. This provides air movement inside the shelter through the roof.

step-10: Finishing

1) Woven bamboo matting can be placed over the floor joist as the floor finishing material or other materials can be used as per the preference of the home owner.

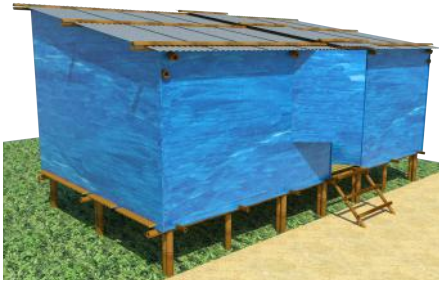
2) Either woven bamboo matting or tarpaulin sheets can be used as the wall finishing material.

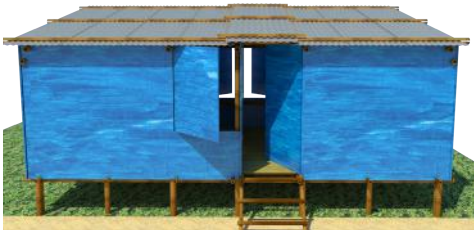
shelter structure



3D images of emergency shelter (Floor raised with Bamboo post)

woven bamboo wall cover



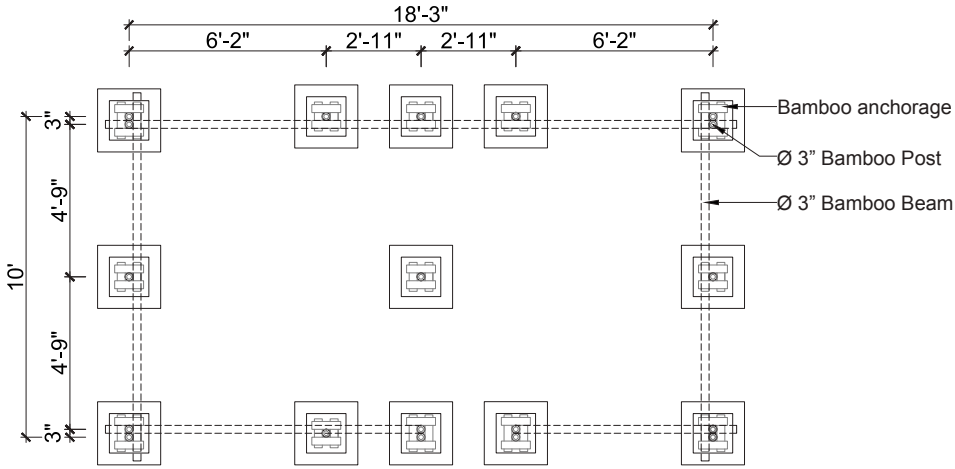


tarpaulin wall cover

option 2 : floor raised with mud filled platform

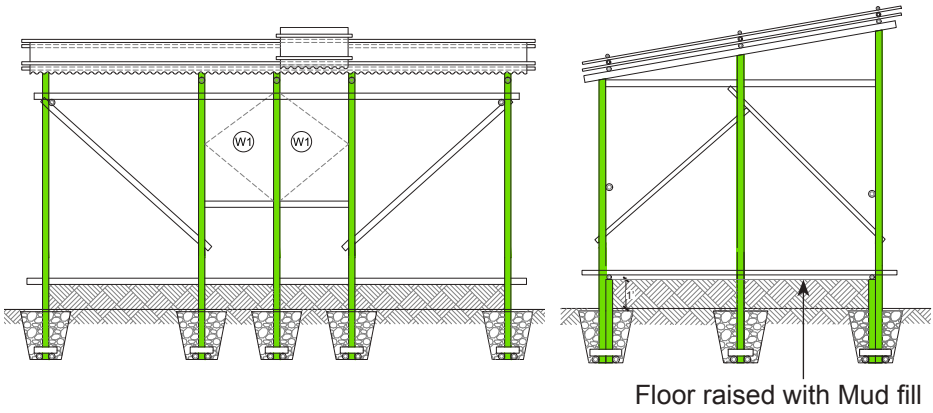
step-1: See page no. 4

step-2: Dig 13 post holes of 2' X 2' in the ground as shown in the figure below.



step-3: See page no. 5

step-4: According to the geographical condition, environment of the site and preference of the home owner, floor can be raised by filling mud creating a tampered platform of mud fill.



Instead of using floor joists, mud can also be used as floor finishing material.

*** Construction process from step 5 to step 10 is same as in option 1.**

bill of quantites

Below is the list of materials, tools and labours required to build the shelter.

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9	Marker	2	nos.	
10	Shovel	2	nos.	
11	Pick	2	nos.	
12	Tamper	1	nos.	
13	Cotton Thread	5	roll.	
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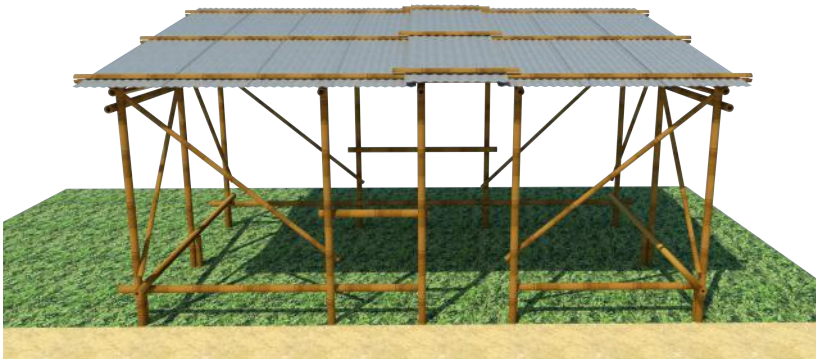
18	Lime Powder	1	bag	
	Manpower			
19	Skilled Mason	2	md	
20	unskilled Mason/ volunteer	5	md	

3D images of emergency shelter (Floor raised with mud filled platform)



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