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## SHELTER STANDARDS AND GUIDELINES Bangladesh Shelter Cluster

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## 1. Introduction

These Technical Guidelines and Standards have been drafted by the Shelter Cluster's Technical Working Group. The Technical Guidelines and Standards are in line with the strategies held in the Shelter Cluster Operational Framework and recommended by the Shelter Strategic Advisory Group.

These provide Standards and Guidelines that aim to ensure equitable and technically appropriate shelter solutions which are in line with recognised humanitarian and national standards.

## 2. Definitions

The terminologies used in this document has been described below

	<b>Description</b>
Household (HH)	The occupants of the affected house – this could include wider or multiple families living in one house.
Displaced	Due to the impacts of the event they have had to relocate and are temporarily living away from their original house plot.
Non displaced	Still living in their original place house plot either still in the house or on the house plot.
Buildings/Evacuation centers	Cyclone shelters, schools and public buildings used to provide emergency sheltering solution.
Host Families	Temporary accommodation provided by neighbors, relatives or communities.
Tool kits – emergency and recovery response	Standard specification agreed with TWG
Financial support – emergency and recovery response	This can be conditional or unconditional but the impact should contribute to rebuilding a safe shelter.
Temporary shelter – emergency response	A temporary structure which provides adequate shelter for a short period of time immediately after the event.
Transitional shelter – semi durable shelter – transitional response	A structure which provides adequate shelter which covers a period of time from the emergency phase until longer term durable solutions can be provided. If required they can be dismantled and relocated.
Permanent house – durable solution – recovery response	A permanent structure built to normal national standards appropriate for the exposure to hazards.

### 3. Shelter Response

#### Identify Appropriate Shelter response Options

Non-Displaced Population	Emergency Phase					Recovery Phase				
	Tarpaulins / Cl sheet	Bamboo/ Timber	Shelter Tool Kit	Cash / Voucher	HH NFI	Training /Guidance	Purchase or Arrange Khas land/ donated land in safe area	Repairs / Retrofit	Transitional Shelter	Permanent Shelter
HH with Fully damaged housing	X	X	X	X	X	X			X	X
HH with partially damaged housing	X		X	X	X	X		X		
Landless HH	X	X	X	X	X	X	X		X	X

Displaced population	Tarpaulins / Cl sheet	Bamboo/ Timber	Shelter Tool Kit	Cash / Voucher	HH NFI	Training /Guidance	Purchase or Arrange Khas land/ donated land in safe area	Repairs / Retrofit	Transitional Shelter	Permanent Shelter
HH located in collective centers/ Formal Camp					X					
Informally self-settled households	X	X	X	X	X					
Landless HH	X	X	X	X	X	X	X		X	X



## 4. Emergency Shelter Response

### 4.1 Emergency Shelter Response: Non displaced population

(Approximate cost **5,000** BDT per affected HH)

SN	Items	Quantity
1.	<b>Tarpaulin</b> 4 m x 6 m recommended minimum for covered living space of 17.5 m <sup>2</sup> .	<b>1 Pcs</b>
2.	<b>Rope</b> Nylon, polyamide, diameter 6 - 14 mm, braid, OR Jute rope, diameter approximately 20 mm.	<b>30 m</b>
3.	<b>Bamboo*</b> Use 100 mm or 3" diameter bamboo to make frame. All bamboo members should be dry and moisture free.	<b>60 m</b>
4.	<b>2 inch nails</b> with head	<b>0.5 kg</b>
5.	<b>Claw Hammer</b>	<b>1</b>
6.	<b>Knife</b> for cutting bamboo/ timber	<b>1</b>
7.	<b>Hand saw</b>	<b>1</b>
8.	<b>Shovel</b> for building a plinth	<b>1</b>
9.	<b>Hoe</b> for building a plinth	<b>1</b>
10	<b>Cash</b> for hiring labour / purchasing construction materials	<b>500 BDT</b>

### 4.2 Emergency Shelter Response: Displaced population

(Approximate cost **3,000** BDT per affected HH)

SN	Item	Quantity
1.	<b>Tarpaulin</b> 4 m x 6 m recommended minimum for covered living space of 17.5 m <sup>2</sup> .	<b>1 Pcs</b>
2.	<b>Rope</b> Nylon, polyamide, diameter 6 - 14 mm, braid, OR Jute rope, diameter approximately 20 mm	<b>30 m</b>
3.	<b>Bamboo</b> Use 100 mm or 4" diameter bamboo to make frame. All bamboo members should be dry and moisture free.	<b>30 m</b>
4	<b>2 inch nails</b> with head	<b>0.5 kg</b>
5	<b>Claw Hammer</b>	<b>1</b>
6	<b>Knife</b> for cutting bamboo	<b>1</b>
7	<b>Cash</b> for hiring labour / purchasing construction materials	<b>500 BDT</b>



#### 4.3 Emergency Shelter Response: Alternative option instead of **Tarpaulin** (Approximate cost **16,000 BDT**)

SN	Item	Quantity
1.	<b>CI sheet</b> (instead of Tarpaulin) Thickness 0.36 mm, Galvanized	<b>2 Bundle</b>

#### 4.4 Emergency Response: **HH NFIs** (Approximate cost **3,000 BDT**)

SN	Item	Quantity
1.	<b>Candle</b>	<b>12 Pcs</b>
2	<b>Match box</b>	<b>6 Pcs</b>
3	<b>Cloth</b> (1 pcs Sharee for woman, 1 pcs Lungi for man)	<b>2 pcs</b>
4	<b>Blanket</b> (See annex 2)	<b>1 Pcs</b>
5	<b>Kitchen Utensils set</b> (See annex 2 )	<b>1 Set</b>

#### 4.5 Emergency Shelter Response: **Reference**

##### *Tarpaulins and plastic sheeting*

- A guide to the specification and use of plastic sheeting in humanitarian relief can be downloaded from:  
[https://www.sheltercluster.org/sites/default/files/docs/Plastic%20Sheeting%202007\\_0.pdf](https://www.sheltercluster.org/sites/default/files/docs/Plastic%20Sheeting%202007_0.pdf)

##### *Fixing tarpaulins and materials:*

- Fixing plastic sheet to wood and rope -  
<https://www.sheltercluster.org/References/Documents/Fixing%20Plastic%20Sheeting.pdf>
- Temporary structures in hot climates-  
<https://www.sheltercluster.org/sites/default/files/docs/Temporary%20structures%20in%20hot%20climate.pdf>

##### *Use of the emergency shelter kit:*

- Timber guidelines:  
<https://www.sheltercluster.org/sites/default/files/docs/Timber%20Guidelines.pdf>
- IFRC shelter kit guidelines-  
<https://www.sheltercluster.org/sites/default/files/docs/IFRC%20shelter%20kit%20guidelines.pdf>



## 5. Recovery Shelter Response

### 5.1 Awareness Raising and training

- Beneficiaries should be provided with awareness raising materials and training on unsafe and safe practices in house rebuilding and repairs.
- All houses rebuilt and repaired must include best practices to build back better/safer standard.
- Where households have already repaired their homes by themselves with limited or no external support they should also be provided with awareness raising training on safe and unsafe practices and given the opportunity to strengthen their houses.
- The opportunity should be taken to inform the wider community of best practices in rebuilding and repairing houses.

### 5.2 House rebuilding and repairs

#### 5.2.1 Recovery Response: Totally Destroyed House

Option	Description
<b>Recovery Option 1: Transitional Shelter</b> (Approximate cost <b>130,000 BDT</b> including Latrine)	<ul style="list-style-type: none"> <li>- New shelter construction considering general design principles. (<b>Annex 3</b>) and standard (<b>Annex 4 &amp; 5</b>)</li> <li>- Include household latrine if damaged / lost.</li> <li>- Should maximize the use of salvaged materials.</li> <li>- The design should include improved building practices to build back better/safer (<b>Annex 6</b>).</li> <li>- Disability, Gender &amp; Age need to be considered during the design phase.</li> <li>- Provision for extension and relocation.</li> <li>- Training in safer shelter awareness / build back better</li> <li>- Training for artisans (Masons / Carpenters)</li> <li>- Technical guidance/support, monitoring (<b>Annex 7</b>)</li> </ul>
<b>Recovery Option 2: Permanent House</b>	<ul style="list-style-type: none"> <li>- Complete new house construction considering general design principles (<b>Annex 3</b>)</li> <li>- Include household latrine if damaged / lost.</li> <li>- Design should comply with Bangladesh National Building Code (<b>BNBC</b>).</li> <li>- Disability, Gender &amp; Age need to be considered during the design phase.</li> <li>- The design should include improved building practices to build back better/safer.</li> <li>- Design should be culturally acceptable and user-friendly to maintenance.</li> <li>- Training in safer shelter awareness / build back better.</li> <li>- Training for artisans (Masons / Carpenters)</li> <li>- Technical guidance/support, monitoring</li> </ul>



### 5.2.2 Recovery Response: Partially Damaged House

<b>House Repairing</b> <sup>1</sup> <b>(Approximate average cost 20,000 BDT per affected HH)</b>	<ul style="list-style-type: none"> <li>- Sufficient materials to repair the house to an appropriate safe standard (see <b>Annex 3</b>)</li> <li>- Should also maximize the use of salvaged materials.</li> <li>- The repair should include improved building practices to build back better/safer.</li> <li>- Training in safer shelter awareness / build back better.</li> <li>- Training for artisans (Masons / Carpenters)</li> </ul>
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### 5.2.3 Recovery Response: Reference

**Handbook on Design and Construction** of Housing for Flood-prone Rural Areas of Bangladesh

- ↳ <http://www.sheltercluster.org/sites/default/files/docs/Handbook%20on%20Design%20and%20Construction%20of%20Housing%20for%20Flood-Prone%20Rural%20Areas%20of%20Bangladesh.pdf>

**Post-Cyclone Sidr Family Shelter Construction in Bangladesh**

- ↳ <http://www.sheltercluster.org/sites/default/files/docs/Post-Cyclone%20Sidr%20Family%20Shelter%20Construction%20in%20Bangladesh.pdf>

**Bangladesh Shelter Solutions**

- ↳ <http://www.sheltercluster.org/sites/default/files/docs/Bangladesh%20Shelter%20Solutions.pdf>

**Battling the storm: Study on cyclone resistant housing**

- ↳ <http://www.sheltercluster.org/sites/default/files/docs/Battling%20the%20Storm%20-%20typhoon%20resistant%20construction.pdf>

<sup>1</sup> Recovery assessment after Cyclone Mahasen 2013 and Flood 2014, indicate that the house repairing cost of more than 60 % affected HH fall between 5,000 to 30,000 BDT.



## 6. Implementation Methodologies

### 6.1 Cash Grants & Voucher

Cash is an option when materials are available and accessible to affected population. Cost for transportation has to be taking in consideration for cash transfer/material distribution in isolated areas or areas with difficult access.

Some agencies provide minimum tools and fixing and complement with a conditional cash grant for purchase of different construction materials (GI, plywood, lumber for frame...).

#### ***Cash Transfer Mechanisms in Emergencies:***

- ↳ <https://www.sheltercluster.org/sites/default/files/docs/Delivering%20Money%20-%20Cash%20Transfer%20Mechanisms%20in%20Emergencies.pdf>

#### ***Cash and voucher in relief and recovery:***

- ↳ <https://www.sheltercluster.org/sites/default/files/docs/Cash%20and%20Voucher%20in%20relief%20and%20recovery.pdf>

#### ***Guidelines for cash transfer programming:***

- ↳ <https://www.sheltercluster.org/sites/default/files/docs/Guidelines%20for%20Cash%20Transfer%20Programming%202007.pdf>

#### ***Cash Vouchers and Manual:***

- ↳ <https://www.sheltercluster.org/sites/default/files/docs/Cash%20and%20Vouchers%20Manual.pdf>

#### ***Cash Workbook:***

- ↳ <https://www.sheltercluster.org/sites/default/files/docs/SDC%20Cash%20Workbook.pdf>

### 6.2 Participation

There are different ways for beneficiary to engage in the definition and implementation of a programme. It is crucial for a further sustainability of the project that beneficiaries' engagement take place along the whole decision making process. Contribution by the beneficiary can be done through: definition of the design of assistance, investment of economic/material/human resources, main power through skill and unskilled labour, site supervision, approval works done by labour on the construction of transitional and permanent house.

### 6.3 Owner Driven Approach

Refer to 'owner driven housing guidelines'.

- ↳ <https://www.sheltercluster.org/sites/default/files/docs/ODHR%20Guidelines.pdf>



**Annex 1: Specification for Emergency Shelter items**

	<b>SPECIFICATIONS</b>	<b>Quantity</b>	<b>Units</b>	<b>Indicative Picture</b>
<b>Roof Covering</b>	<b>TARPAULINS</b> , woven plastic, Width 4 m Length Sheet of 6 m. Weight 170g/m <sup>2</sup> +/- 5%, plus 10% for the reinforcement bands under ISO 3801.	1	Pcs	
	<b>CI Sheet ( Colour)</b> Min 0.36 mm thickness, Galvanized	2	bundle	
<b>Materials</b>	<b>Bamboo</b> , 100 mm or 4" diameter bamboo to make frame. All bamboo members should be dry and moisture free	15	M	
	<b>ROPE</b> , nylon, diameter: 12 mm, 30m, in roll, Preferred colour: Black / Dark Green. Three strings possibility to untie	1	Roll	
	<b>NAILS</b> , 0,5 kg Steel, 2 inches long (to be supplied in sealed bag).	0.5	Kg	
<b>Toolkits</b>	<b>HAND SAW</b> , total length 750mm, for wood, Good Quality, tempered, hardened and set teeth. Unbreakable handle. Blade covered by protective cardboard	1	Pcs	
	<b>CLAW HAMMER</b> , Weight: 0.750 kg/pc. Replaceable Wooden handle. Forged head, not cast. Good Quality	1	Pcs	
	<b>HOE</b> , head only is 230 x 175 mm, 1.360g in forged steel, Supply with varnished hard wood handle length approx. 110-120cm, supply blade covered by cardboard	1	Pcs	
	<b>Cutting knife</b> , wooden handle, supply blade covered with protective cardboard	1	Pcs	

**Annex 2: Specification for HH NFIs in Emergency**

SN	Specification		Quantity
1	<b>Candle</b> Height 6.0 to 6.50 inches; Dia 0.70 inch, burning life more than 3 hours.		12 Pcs
2	<b>Match Box</b> Good quality, branded product, Carborized 100% safety match, 60 ±2 sticks.		6 Pcs
3	<b>Blanket</b> , woven, 80% wool, 1.5x2m, high thermal resistance		1 Pcs
4	<b>Cloth</b>		2 Pcs
5	<b>Kitchen Utensils set</b>		<b>1 Set</b>
	Items	Specification	Quantity
	Aluminium Cooking Saucepans (Paatil) with Lids	<b>1 Pc. Big Size with lid:</b> 11 No. make (Rice) Material: Aluminium; Weight: 450 gm (without lid) Top Dia: 9.0 inch; Height: 7.70 inch. Finish: No sharp edges <b>1 Pc. Small Size with lid:</b> 10 No. make (Curry) ; Material: Aluminium ,Weight: 300 gm (without lid); Top Dia: 9.4 inch; Height: 5.5 inch. Lid weight in both size: 100 gm, Diameter of Lid: 8.7 inch (rice), 8.7 inch (curry), Finish: No sharp edges	2 Pcs
	Steel Bowl	Material: Stainless steel, Weight: 100 gm/pcs Top dia: 6.5 inch; Height: 1.75 inch. Finish: No sharp edges	1 Pcs
	Plastic Mug	Material: Food grade quality plastic. 100 % Poly Propylene. unbreakable, flexible and injection moulded. Capacity: 2 liters; Weight: 100 gm/pcs Top dia: 5.9 inch; Height: 6.45 inch. Finish: No sharp edges	1 Pcs
	Steel Glass	Material: Stainless steel Weight: 50 gm/pcs Top dia: 2.75 inch; Height: 4.4 inch. Finish: No sharp edges	2 Pcs
	Aluminum Plates	Material: Aluminium . Suitable for contact with food. Weight: 100 gm/pcs Top Dia: 9.9 inch; Height: 1.3 inch. Finish: No sharp edges	2 Pcs
	Spoon	Material: Stainless steel Length: Rice spoon- 11.20 inch; Curry spoon- 11.50 inch; Tea spoon- 5.70 inch. Finish: No sharp edges.	3 Pcs
	Seamless Aluminum Bucket	Material: Aluminium. Heavy duty with handle. Weight: 600 gm/pcs with handle Top Dia: 12.00 inch (inside); Bottom Dia: 7.00 inch (outside), 6.25 inch (inner side) Height: 9.100 inch (Outer), 8.60 inch (inner). Finish: No sharp edges	1 Pcs

**Annex 3: General Design Principles**

Indicators	Criteria:	Design Principles
Climate Suitability	- Ventilation	<ul style="list-style-type: none"> <li>- Design of the shelter to allow adequate ventilation to reduce internal temperatures.</li> <li>- The design should allow for climate suitability improvement (e.g. option to include further openings, to add further partitions)</li> </ul>
Social/ economical Suitability	<ul style="list-style-type: none"> <li>- Locally available material and manpower, utilising familiar techniques</li> <li>- Options for further improvement</li> <li>- Accessibility</li> </ul>	<ul style="list-style-type: none"> <li>- Local procurement, where availability permits, should be prioritised; this stimulates local economy and reduces unnecessary transportation costs.</li> <li>- Use of well-known materials and techniques will promote the participation of the beneficiaries in construction process and its maintenance</li> <li>- Use of familiar construction techniques will allow families to make improvements as money become available.</li> <li>- Use local appropriate techniques.</li> <li>- Shelters should provide options for access of disabled people.</li> </ul>
Cultural suitability	- Typology according to household activities, privacy and gender as well as options/capacities of reconstruction.	<ul style="list-style-type: none"> <li>- Design shelters to meet local household activities, as well as local cultural/Tradition/ practice requirements.</li> <li>- The design of the shelter should enable flexible use of both available interior and exterior space.</li> <li>- Respect design and techniques adopted by beneficiaries when building their own shelter.</li> </ul>
Resource effectiveness	<ul style="list-style-type: none"> <li>- Use salvaged materials.</li> <li>- Allow future reuse of materials.</li> <li>- Minimize impact on natural resources</li> </ul>	<ul style="list-style-type: none"> <li>- The use of salvaged materials is encouraged when in good condition (bricks, door/window-frames, roof, structure/truss etc.)</li> <li>- Provide best practice guidance on material selection and re-use to prevent detrimental construction methods.</li> <li>- Select quality construction materials for transitional shelters that can further permanent solutions.</li> <li>- Consider construction techniques that enable dismantling , extension, improvement and reuse of materials.</li> <li>- The choice of materials should avoid increased pressure on limited locally available natural resources.</li> </ul>
Appropriate Location	<ul style="list-style-type: none"> <li>- Location</li> <li>- Land tenure</li> </ul>	<ul style="list-style-type: none"> <li>- Shelter should be constructed at or near the existing homestead, without inhibiting permanent housing process.</li> <li>- Minimise exposure to hazards: avoid hazardous locations and apply DRR recommendations.</li> <li>- Take account of access to livelihoods- the ability for small business and trade in or near the location.</li> <li>- Ensure proper land rights for minimum 10-years tenure for permanent sites.</li> </ul>
Site Risk Mitigation	<ul style="list-style-type: none"> <li>- Cyclone</li> <li>- Earthquake</li> <li>- Heavy Rains</li> <li>- Floods</li> </ul>	<ul style="list-style-type: none"> <li>- Shelter design must include earthquake and hurricane resilient techniques.</li> <li>- Shelters to be built on safe portions of land.</li> <li>- Drainage of the area around the shelter to be examined. When necessary, construct water diverting features or rainwater containment.</li> </ul>



## Annex 4: General Standards for transitional shelter

Transitional shelter are shelter provided during the period between a disaster and the achievement of a long-term durable shelter solution. It provides a habitable covered living space, a secure, healthy living environment with privacy and dignity for those living within it.

The shelters are designed so that materials are re-useable for when families can move onto a more permanent site, contributing towards construction of semi-permanent and permanent houses.

All transitional shelters must have appropriate latrine facilities. The latrine design will be comply with the guidelines and standards of WASH cluster.

Indicators	Standards
Size	- Min 18x11ft covered living space for family of 5
Design life	- Min 24 months (Ability to move onto permanent site)
Location	- Location on plot shall allow further incremental development of shelter - Allow space for DRR measures
Use of salvaged material	- Only appropriate quality salvaged materials (e.g. avoid burnt, decayed, swollen material) - Check amount of salvaged material available to beneficiaries. - Design of shelters not fully to rely on availability of this type of material.
Plot preparation	- Properly clear site from physical hazards from the flood (e.g. trees likely to fall, debris, salvaged material, also from neighbouring plots) - Properly prepare site following DRR principles (good compaction soils)
Construction process	- If possible apply traditional, well-known construction methods based on existing skills of available labour. - Construction process to be speedy (pre-fabrication of components reduces on site cutting or drilling) and simplified to enable the participation of semi or un skilled labour.
Foundation	- Excavation should be deep enough to reach stable or hard soil type. - Ensure good soil compaction where required.
Plinth	- Raise plinth above highest flood water level with multiple stepping. - Good quality compacted clay. - Include protective brick wall where necessary.
Structure	- Inform on simple solutions to improve the shelters resistance: e.g. braces, improved joists, ratio length: width, slope and overhang of roof etc.) - Use strong posts at the corner and place other posts with adequate interval. - Ensure that frame material (eg. wood or metal) bear the load rather than fasteners/fixings. - Current local practice to treat bamboo and wood members uses burnt engine oil or paint. - The structures of transitional shelter should be demountable to allow the reinstallation of the shelter in a new (or original) location or the reuse of the materials.
Wall cover	- Combination of bamboo / local plant matting and CGI (whole wall cladding with CGI sheet is not recommended)
Roof	- All roofs should be hipped (Ensure water drainage from the roofs.) - Overhang limited to 1.5'ft. - CGI sheets 0.36mm - "J" Hooks for proper anchorage.
Head height	- 6.5 feet min – plinth to ceiling

**Annex 5: Hazard Specific Standards for Transitional shelter**

Hazard	Standards
Heavy Rains and Floods	<ul style="list-style-type: none"> <li>- Pitch Roofs: slope min 0,5% gradient.</li> <li>- Recommended extension of eaves: max. 1 feet.</li> <li>- Raise plinth level high with multiple stepping enough to protect the base of the wall.</li> <li>- For block construction use plaster on external walls to increase life span of wall.</li> <li>- Brick Wall in perimeter to protect plinth from washing away.</li> </ul>
Fire Hazards	<ul style="list-style-type: none"> <li>- Perform site planning and disseminate information on appropriate safe use of fire near the shelter.</li> </ul>
Cyclone/ Strong Winds	<ul style="list-style-type: none"> <li>- Form of shelter: rectangular or square type (ratio length to width approx. 1:1 or 1:1.5)</li> <li>- Secure shelter to the ground (strong foundations)</li> <li>- Use rope or wire to anchor the roof of the house with ground or trees.</li> <li>- Use appropriate bracing</li> <li>- Roof structure with adequate strength for proposed roofing material</li> <li>- Apply metal strapping to reinforce roof structure to withstand cyclone</li> <li>- Sufficient pitch to withstand winds: min. 30°- 35°</li> <li>- Use J hook for roof fixing.</li> </ul>

**Annex 6: Technical recommendation for Transitional Shelter design**

Description		Specification
<b>Size of the shelter</b>		
Core part of the shelter		Length x Width x Height 18 feet x 11 feet x 7 feet
Veranda		Length x Width 18 feet x 6 feet
<b>Foundation &amp; Column</b>		
Foundation	Materials	RCC Pillar 15 Inch x 6 inch base/ 3" CC work / Plastic sheet/ Sand Compaction
	Shape & Size	T shape & Size: 5 inch x 5 inch x 17 inch
	Depth	1.5 to 3 feet
Pillar/ Column	No	10 Pcs
	Size	5 inch x 5 inch
	Height	12.5 feet
	Materials	RCC: 4 no 8 mm rebar (with 2 extended)
Plinth	Material	Stabilize mud(Cement + Mud)/ Brick
	Height	3 feet (Height Depends on highest flood level. Two steps is recommended)
	Use of brick	10" Brick wall + 15" x 6" base (Provision for Future extension)
<b>Roof</b>		
Shape		Hipped
Length of canopy		1.5 feet
Slope		30 to 35 Degree
Roof cover	Material	Color CGI sheet
	Thickness	0.36 to 0.40 mm



Description		Specification	
Roof cover	Length	8 or 9	
Ridge Cover	Material	GI sheet	
	Thickness	0.36 to .40 mm	
	Length	6 feet	
Roof Drainage	Material	4 " PVC pipe	
Purlin	Material	Mild steel (Steel cap and Rubber washer is recommended over purlin)	
	Cross section	38mm x 38 mmx 3 mm	
Rafter	Material	Mild steel	
	Cross section	38mm x 38 mmx 3 mm	
Truss	Material	Mild steel	
	Section	38mm x 38 mmx 3 mm	
<b>Rooms</b>			
Partition	Material	Bamboo fence	Use Bamboo pole/ stand type frame
Ceiling	Material	Bamboo fence	
Door	No	2	
	Size	3 feet x 6 feet (double shutter)	
	Material	Wooden frame + wooden shutter	
Window	No	3	
	Size	2.5 feet x 3 feet	
	Material	Wooden	
Side wall	Material	1 layer brick + 2'-9" CGI sheet 0.25 mm thick painting + Bamboo mesh with plastic sheet	
<b>Bracing</b>			
Material		Wooden	GI wire
Cross Section (in x in)		3 x 2	10 no
<b>Connection/ Joints</b>			
Roof	Roof covering to Purlin	6 mm dia 75mm long 'J' hook + Steel cap + Rubber washer	
	Purlin to Rafter	Nut & bolt	
	Rafter to Beam	2 extended rebar from RCC pillar_ bend	
	Truss Member	Nut & bolt	
Wall	Wall plate	50 x 50 x 3 mm	
	Beam to column	2 extended rebar from RCC pillar_ bend	
	Column to side wall	GI wire (12 mm down grade hole in Pillar is required)	
	Column to partition	GI wire (12 mm down grade hole in Pillar is required)	
	Bracing to column	Nut and bolt	
	Side wall to partition	GI wire	
Foundation	Column to foundation	Solid	
Cyclone Strap		20 gage SI sheet	
Extension		In MS angle provide hole for fixing extension part	
Rain water harvesting		(23+13) ft 4" PVC pipe + 1.5 " Clamp in U/ V shape+ water filter	

