EMERGENCY SHELTER KIT

The modular shelter design is a temporary, robust, panel-based structure that allows for easy extension to meet varying household space needs. The current design provides only living space that households can adapt to their needs.

It can be quickly dismantled and transported, making it suitable for temporary settings.

Installation of the **17 sq.m.** shelter, which accommodates up to **5 people**, typically takes around **1 day** with **one skilled and two unskilled workers**. This shelter can also be constructed through a household-led approach. However, vulnerable households, especially those requiring physical assistance, may face challenges in self-installation. The design can be modified for different household needs.

This document was developed by:

CRS CATHOLIC RELIEF SERVICES

OXFORD BROOKES UNIVERSITY

cendep

care

Emergency Shelter Kit – Essential Components

TIMBER BATTEN — 94 PCS

Structural timber sections (5x 2.5cm x 2.4 m) rectangular shaped high quality free of knots- minimum density: 370 KG/cubic meter - untreated. C16 or C24 graded timber.

NAILS 50mm — 2 KG

Hot galvanised iron, for wood, 5cm (2'') Used for structural joints and fixing cover-battens.

ROPE 6mm — 30 M

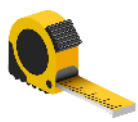
Polypropylene, diam. 6mm,minimum 3 strands, twisted

SHOVEL — 1 PCS

Head with sharpened tip in forged steel which is tempered and hardened. Supplied with a handle. Total length: 100 to 110 cm.(good quality)

MEASURING TAPE — 1 PCS

3 meters, graduated in centimetres.

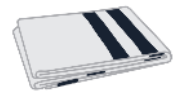


HINGES 75MM — 4 PAIRS

Galvanized and rust resistant steel hinges suitable for timber window and door shutters. Hinges to be fixed with appropriate screws. (2 pairs for windows, 1 pair for door).

TARPAULINS — 5 PCS

Tarpaulin sheet UNHCR/IFRC standard specs: standard size (4x6m); Woven high-density polyethylene (HDPE) fabric laminated on both sides with low-density polyethylene (LDPE) coating White color 3 used for structure, 1 for flooring, 1 for internal partition



CLAW HAMMER — 1 PCS

Claw Hammer - Weight: 0.45 kg. Fiberglass/metal handle, unbreakable. Head in forged steel. Good quality.

HAND SAW — 2 PCS

All-Purpose. Blade length of 500mm and an overall length of approx. 640mm. 8 or 9 TPI (teeth per inch), hardpoint teeth from tempered and hardened steel. Unbreakable handle and good saw blade.

SCALPEL* — 1 PCS

A cutting scalpel with blades , suitable for light and medium work. Easy to use

SCREWS — 24 PCS

Galvanized wood screws, 35mm length, for securing hinges to timber frames. Screws to match hinge type. NB: Hinges may come pre-packaged with their own screws

*Note: It is recommended that items such as scalpel, for which approvals are uncertain should be palletized separately

Emergency Shelter Kit – Maintenance Components

DUCT TAPE — 2 ROLLS

Adhesive/duct tape of 25-meter length, water resistance – Extra Heavy Duty, 50mm

PLIERS — 1 PCS

Combination pliers 150mm, 34mm jaw

PLASTIC FILM — 50 M²

Plastic film 0.3mm thick, up to 50 sqm per shelter. Minimum width 4m

BAG — 1 PCS

Heavy water-resistant cotton canvas. Strong webbing handles and heavy-duty nylon zip for distribution of the items 50kg

ROPE 3mm — 30 M

Polypropylene, diam. 3mm, minimum 3 strands, twisted

NEEDLE — 1 PCS

Stitching, curved, 127mm x 1.8mm, hole 1x7mm

SANDBAGS* — 21 PCS/LAYER

Empty woven polypropylene (PP) or polyethylene fabric sacks, 50 cm x 80 cm, minimum 80 GSM. Holds approx. 25–30 kg of sand or soil

TIE WIRE — 1 ROLL

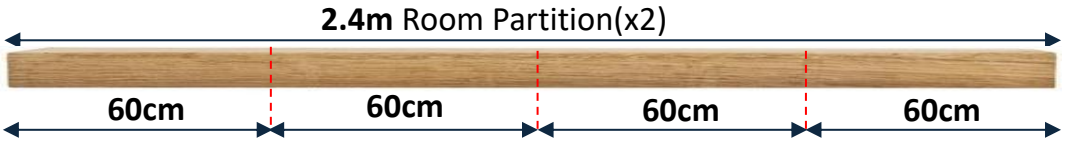
Galvanised, diam. 1.5 mm, roll

***Note: If it is not possible to procure sandbags, partners may coordinate with Food Security Cluster for access to flour sacks.**

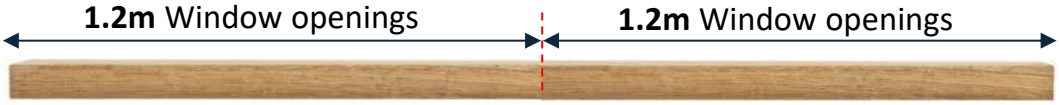
ESSENTIAL MATERIAL REQUIREMENTS

Shelter component	Timber quantity	Tarpaulin quantity
Walls	**Panels:** 54, **Door:** 3, **Windows:** 4, **Securing tarp:** 4, **Corner braces:** 1	2
Roof	**Truss x5:** 15, **Ridge:** 2, **truss braces** 1, **Securing tarp:** 10	1
Floor	—	1
Partition	—	1
TOTAL	**94**	**5**

Number of nails: 2KG

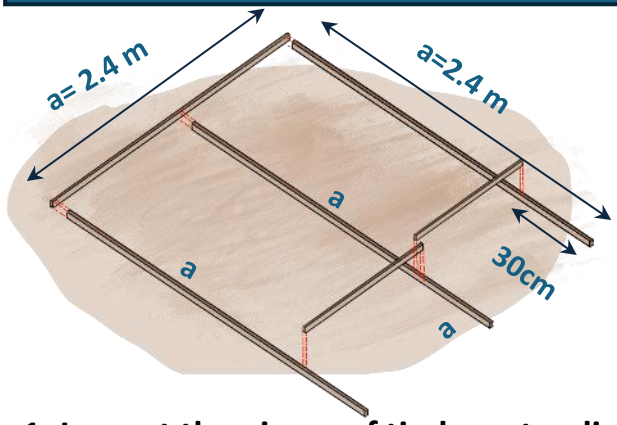


Corner bracing, Door, Center or Rafter, Fixing Tarp, Anchoring

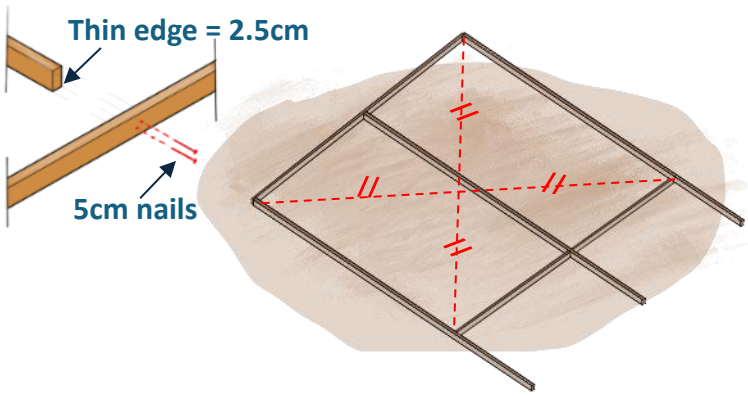


How to Build Wall Panels

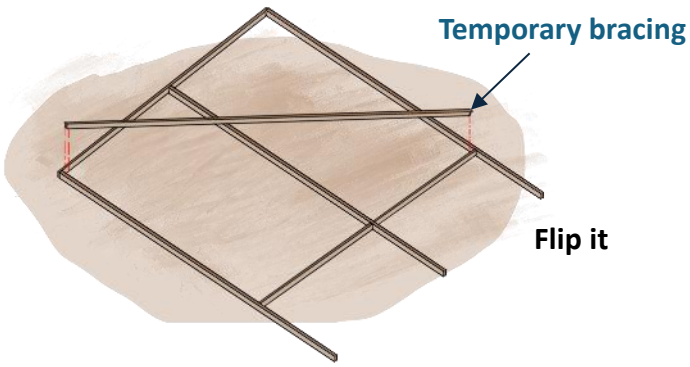
Before starting to build your shelter, **always clear the area of debris, rocks, and plants, and flatten the ground** to create a stable and safe base.



1. Lay out the pieces of timber, standing them up on the thin edge. Nail the timber together using 5cm nails.

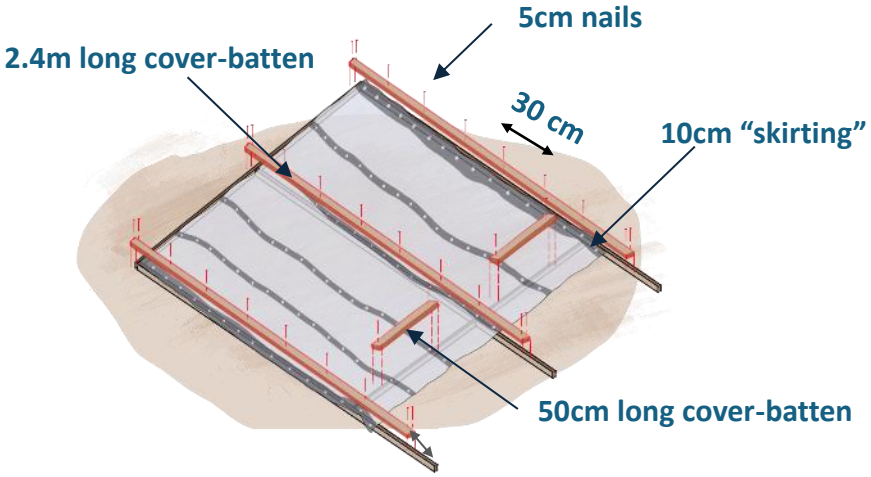


2. Check squareness by measuring both diagonals, measurements should be equal.



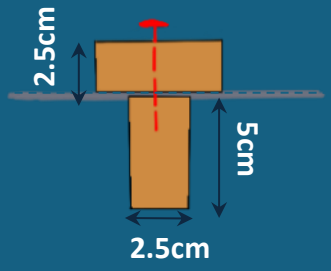
3. Add temporary bracing (of any size) to hold the panel square, then flip it to fix the tarpaulin.

4. Lay tarpaulin over the frame, leaving 10cm below to prevent water entry and aid anchoring.



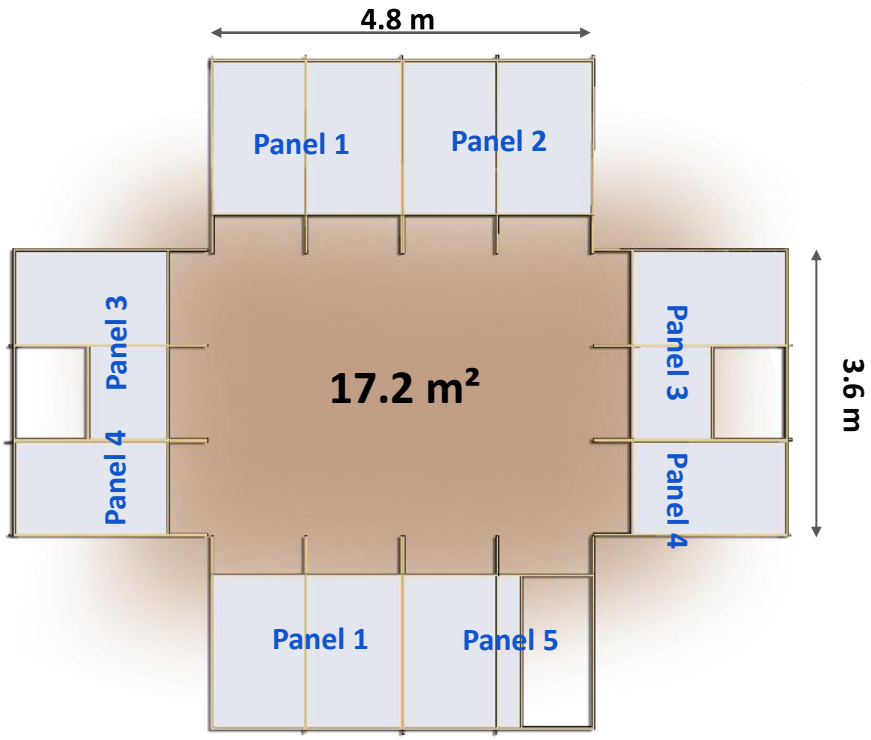
5. Fix tarpaulin with 5 cm nails through 2.4 m cover battens at 30 cm spacing, then add 50 cm horizontal battens over it.

The frame is constructed as a T-section which makes it strong.



The tarpaulin should be pulled tight to keep the structure square, but not so tight that it bends the timber.

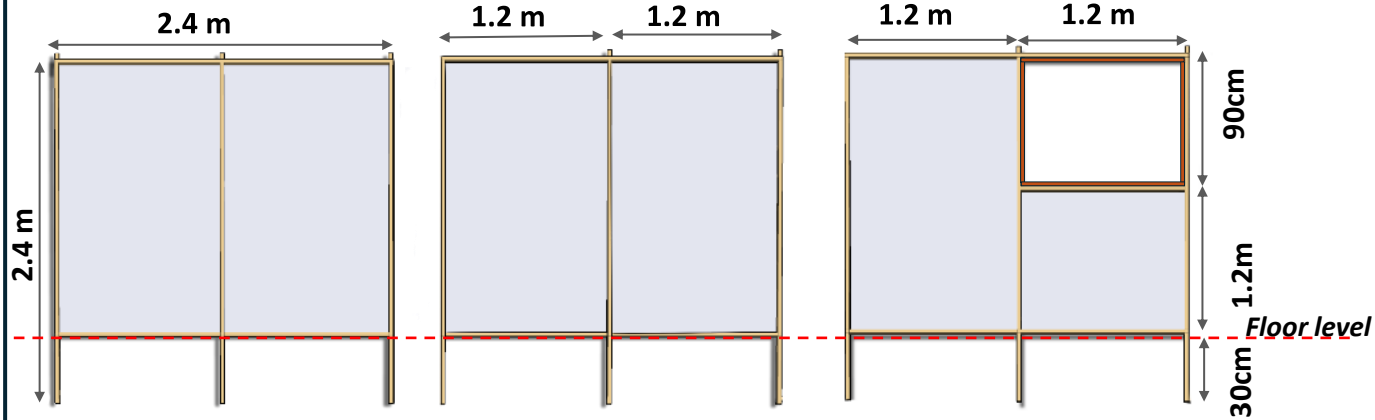
Wall Panels Details



Household size (# people)
5

Shelter size (m^2)
4.8x3.6= 17.2m^2

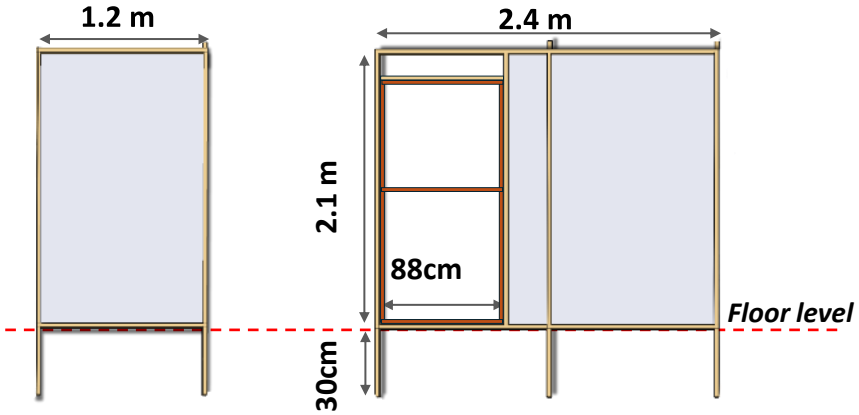
Embed poles 30 cm deep, k**eep internal height at** 2.1 m
Install door and window shutters with hinges and screws.



Panel 1 – 8 timbers

Panel 2 – 7 timbers

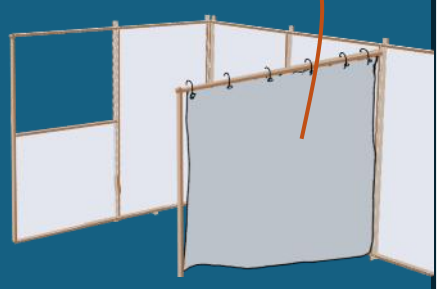
Panel 3 – Window panel* - 8 timbers
Window frame: 2 timbers



Panel 4 – 4 timbers

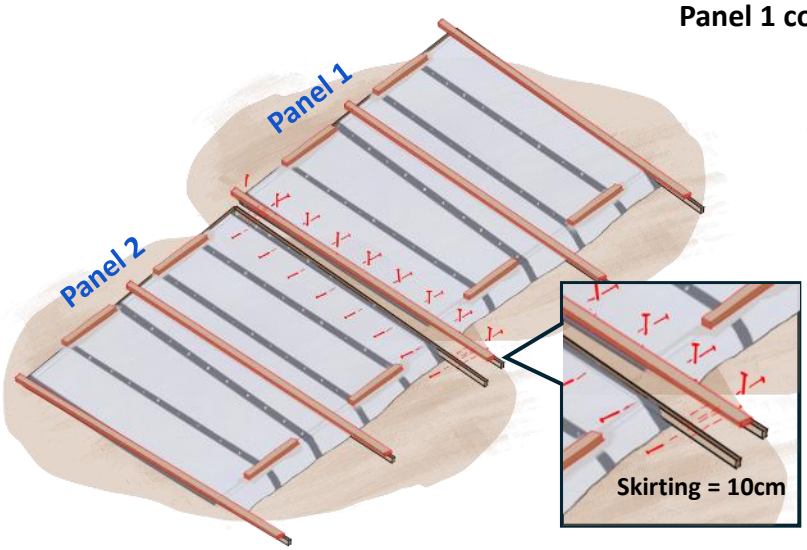
Panel 5 – Door panel – 7 timbers
Door frame: 3 timbers

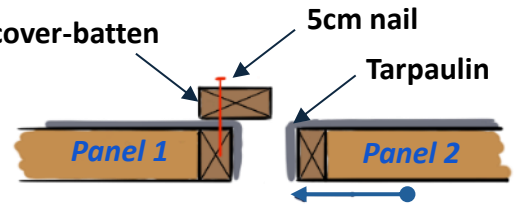
An internal movable partitions can be added using a tarpaulin



*** Households are advised to choose door and window sizes and position based on their privacy and security needs.**

Wall Panels

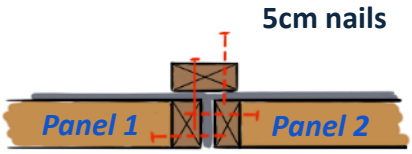




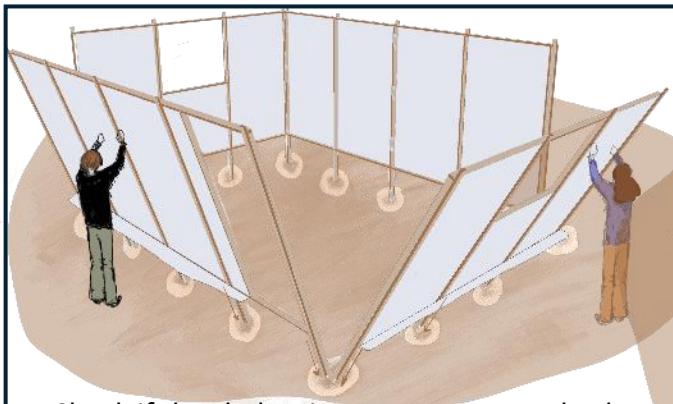
A. Move Panel 2 closer to Panel 1

B. Connect the panels together by nailing the cover-batten

C. Nail the cover-batten timbers once the panels are lifted

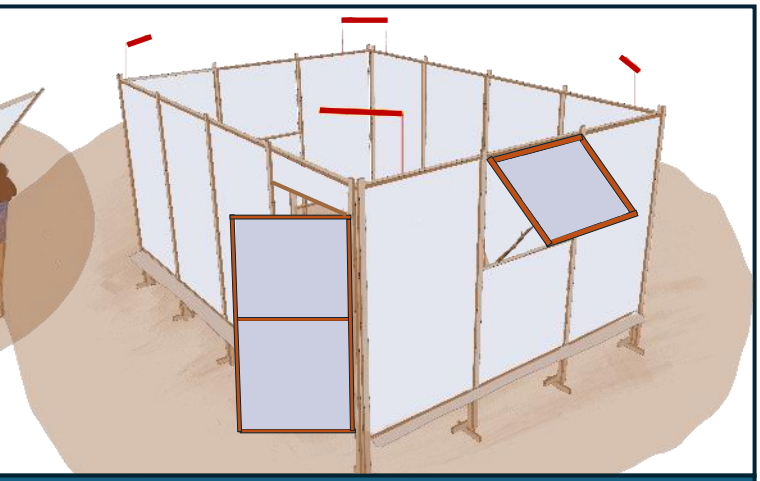


Lift the panels together.



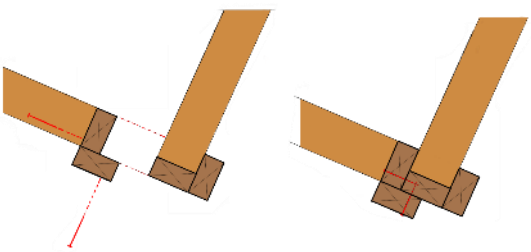
Check if the shelter is square: measure both diagonals—they should match.

Add corner bracing

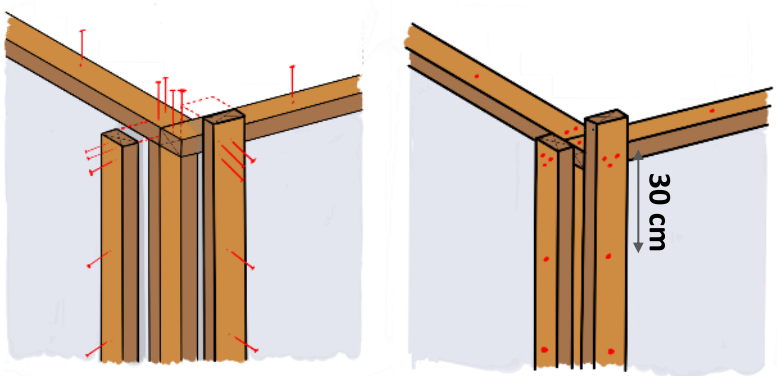


Add door and window frames*: a side-hinged door and **two** top-hung windows that serve as a canopy for privacy, weather and sun protection.

How is the corner joined together?



Shelter Corner - Plan view

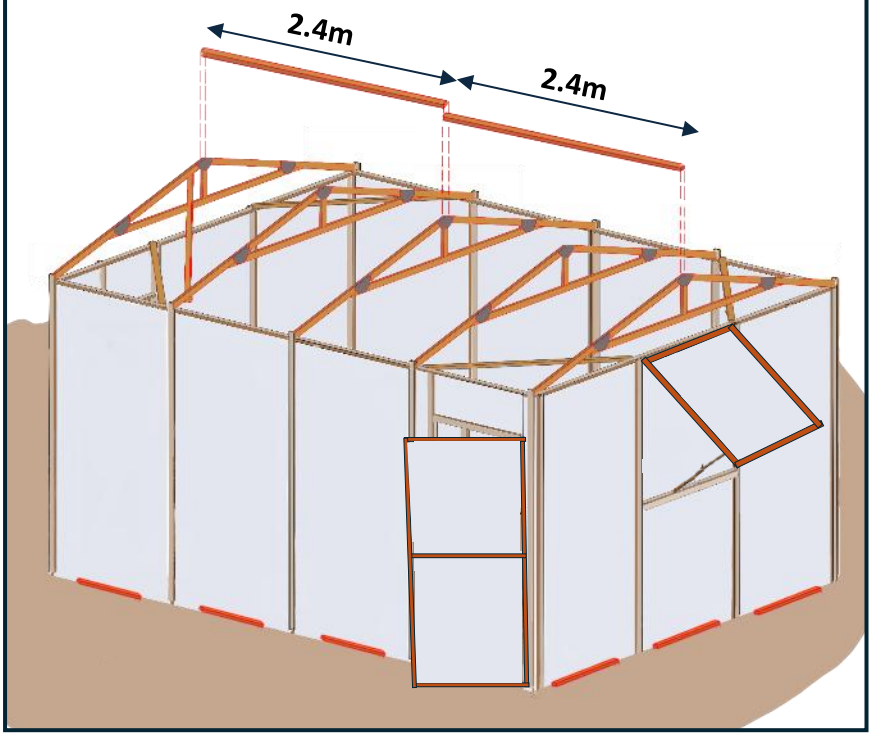


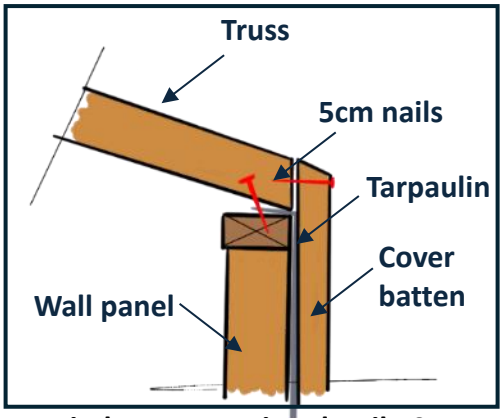
Connect the corners securely using 5cm nails

*** Households can add mesh for insect protection and privacy. A canopy can be installed over doors to reduce water ingress.**

Pitched Roof

Use two 2.4 m lengths for the ridge beam.
They connect the trusses and support the tarpaulin.



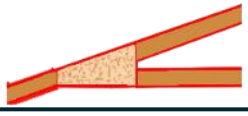


Timber connection detail - 01

Fix diagonal braces at both ends, attach them to the underside of the first two and last two trusses.

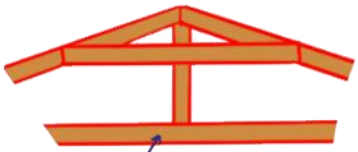
Alternative 01:

OSB or plywood gusset plates for stronger joints



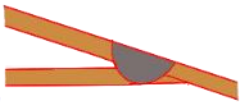
Alternative 02:

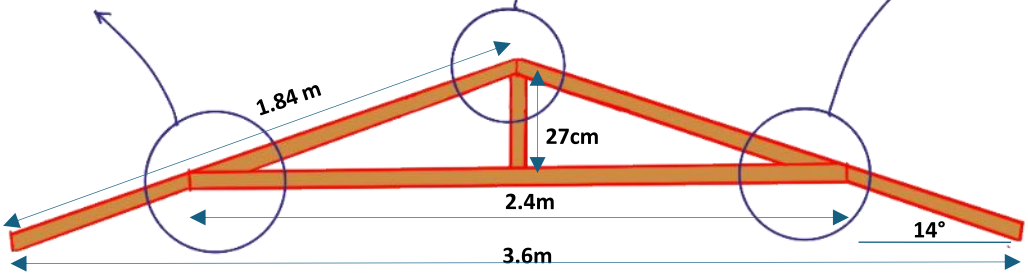
Horizontal pieces of timber are doubled, one on either side.



Alternative 03:

Used tin cans can make strong connections when OSB or plywood is unavailable





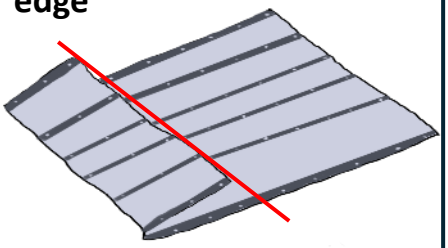
To ensure uniformity and save time, construct all trusses simultaneously by stacking them one on top of the other or using one as a template. This approach guarantees that each truss is identical and reduces the risk of errors during the assembly process.

Pitched Roof Cover

1. Fold the Tarpaulin to facilitate its raising to the roof

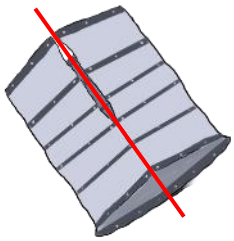
First fold:

Fold the left-hand edge towards the centre line. Repeat for right-hand edge



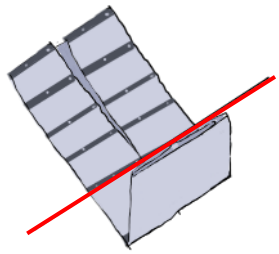
Second fold:

Fold both sides again to the centre.



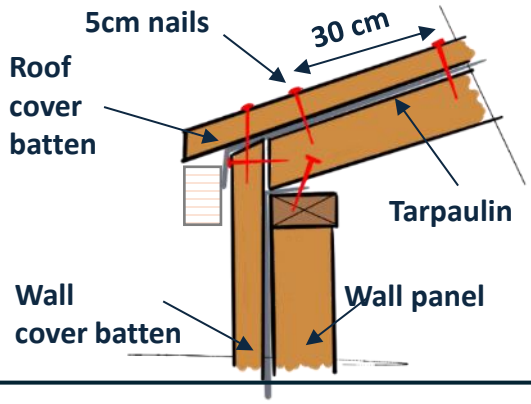
Third fold:

Fold top and bottom to the centre as shown.

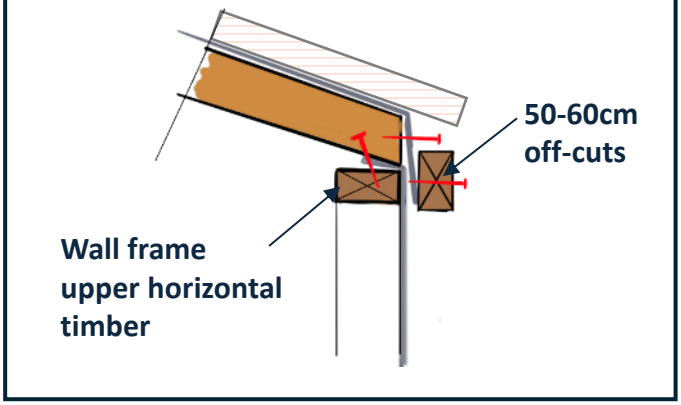


2. Lift the folded tarpaulin on to the middle of the roof. Progressively unroll the tarpaulin over the roof structure.

3. Add timber cover battens to secure the tarpaulin to the trusses. Use the short off-cuts to nail tarp to the top of the walls.

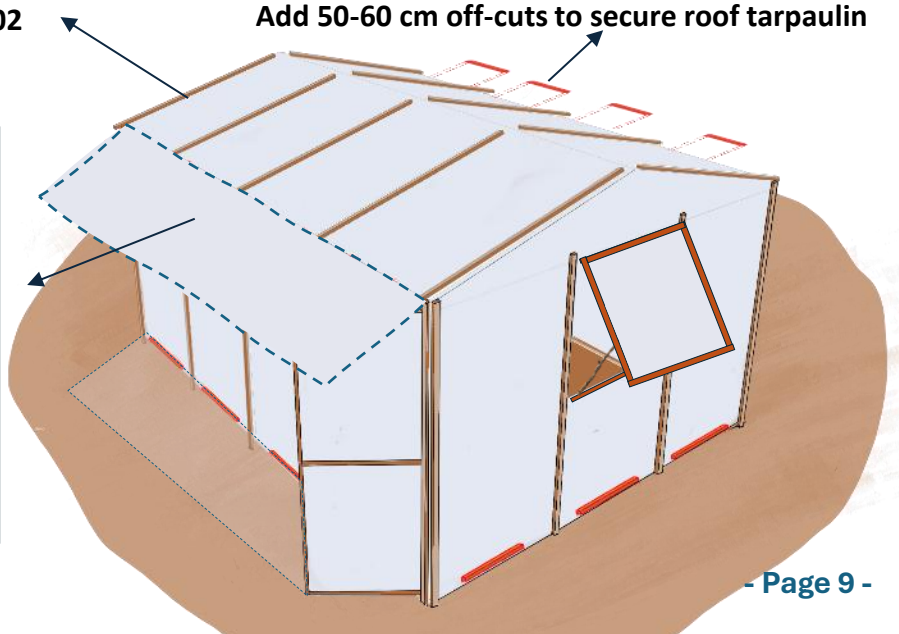


Timber connection detail - 02



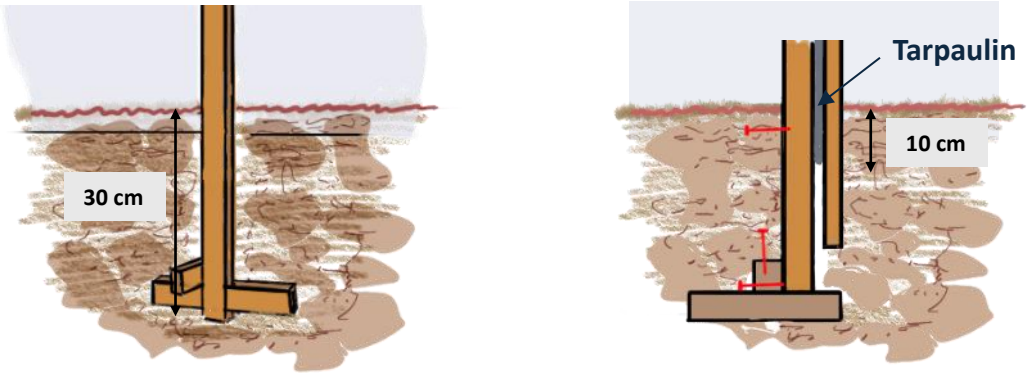
Add 50-60 cm off-cuts to secure roof tarpaulin

Add a sloped canopy above the door to prevent rainwater entry. If there is space, extend the canopy sideways to create a sheltered cooking space



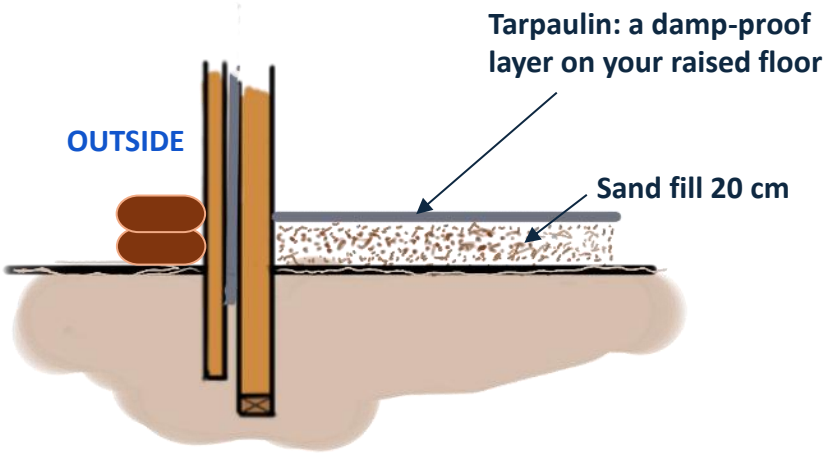
Flooring and Anchoring

Embed poles 30 cm deep. Bury tarpaulin edges 10 cm into the ground.

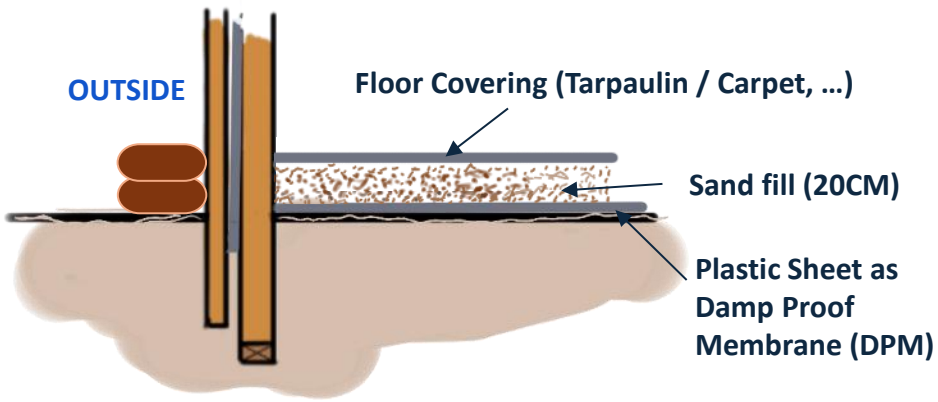


Raise the Shelter Floor

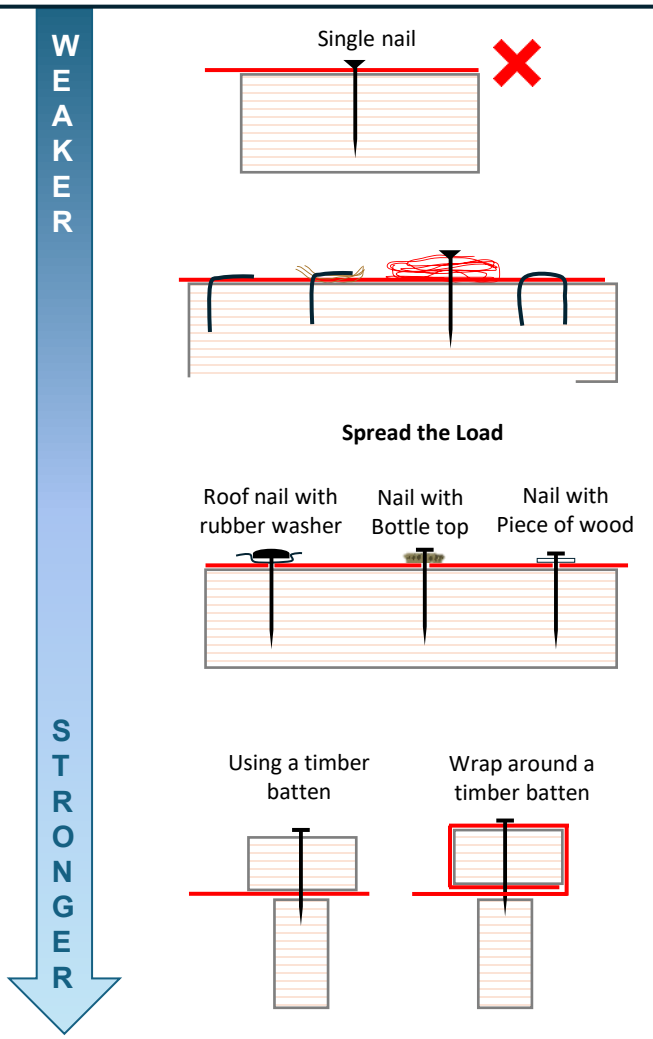
Raise the floor 20 cm with compacted sand and place sandbags around the perimeter to prevent water entry.



If materials are available, it is a good idea to have a raised floor inside the shelter that is kept dry and contained by a plastic sheet (a damp-proof membrane - DPM).



Tarpaulin and Timber connection



Standard nails will easily pull through tarpaulin as they have small heads

Standards nails can be improved by bending them or nailing them through folded tarpaulin or rope. U-shaped fencing staples can also be used.

Standard nails can be improved using washers or bottle caps (sharp side away from tarpaulin) to spread the load. Alternatively domed head nails can be used.

Using timber battening is very good for spreading the load.

Tarpaulin should be folded over on itself at connection points.

As far as possible, the tarpaulin should be fixed along all edges to spread the load.

References: "Shelter Cluster website, Hurricane Beryl 2024 - Regional Response, Fixing tarpaulin" and "OXFAM Technical Brief – Plastic sheeting use and procurement in humanitarian relief"

The connections shown above also help seal nail heads by using folded tarpaulin, washers, bottle caps, small wood pieces, or timber battens—reducing the risk of roof leaks. When available, **screws with rubber washers** can also be considered for improved sealing.

HELPFUL TIP

Once good-quality tarpaulin is procured, it's essential to fix it in a way that

- ✓ **Spreads the load,**
- ✓ **Prevents flapping,**
- ✓ **Avoids friction points,**
- ✓ **Limits heat buildup.**

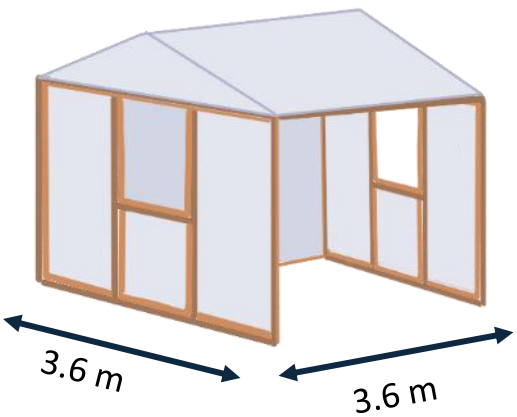
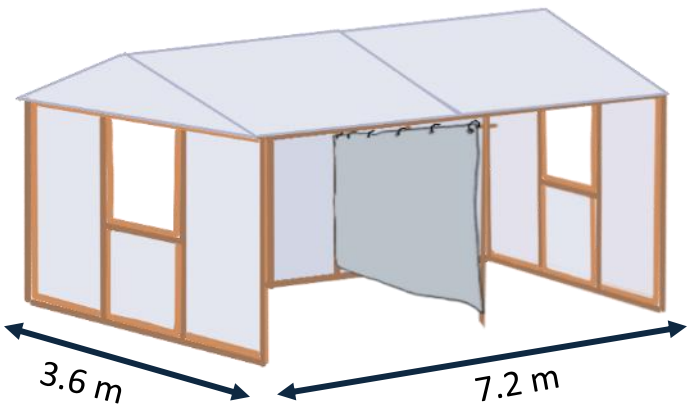
To avoid tearing, fixings should be distributed over a wide area.

Modular Shelter Extensions for Adaptable Space Needs

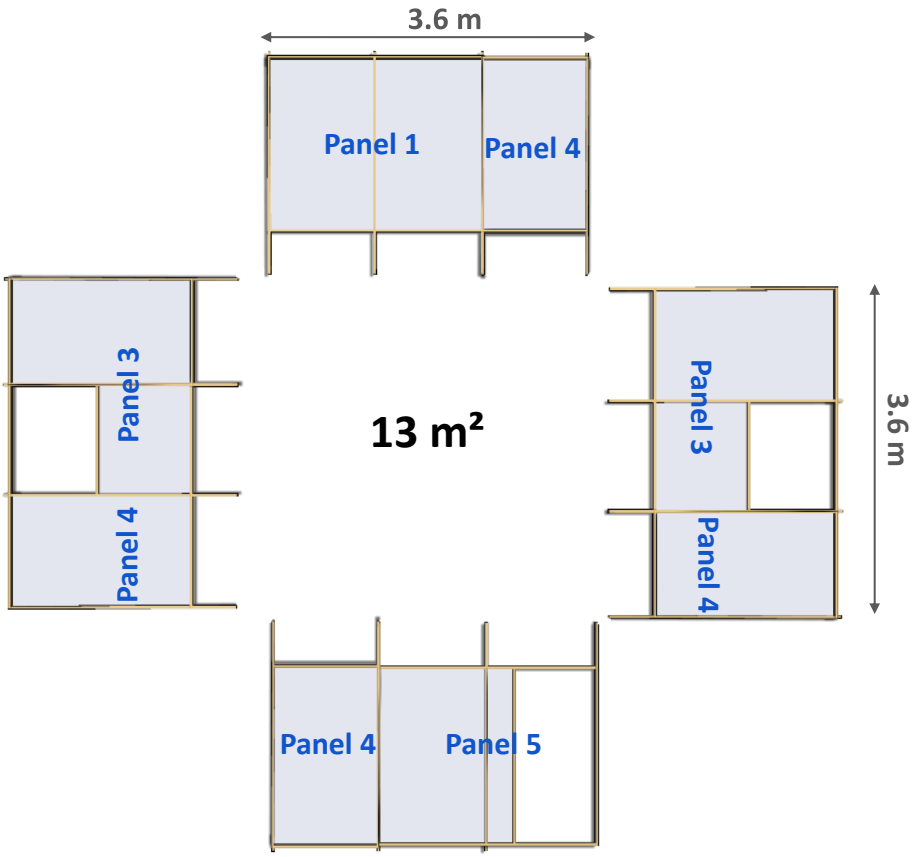
The modular design of the shelter enables easy extension to accommodate households of varying size.

To avoid weakening the structure, **the shelter width should not exceed 3.6 m**, while the length can be adjusted as needed.

In the following section, we will explore adaptable models that allow for incremental extensions using the same panel system described on page 5.

		
Household Size*	3-4 people	6-7 people
Shelter size	3.6x3.6= 13 m²	7.2x3.6= 26 m²

HOUSEHOLD SIZE (# PEOPLE)	SHELTER SIZE (M²)
3	3.6x3.6= 13 m²
4	



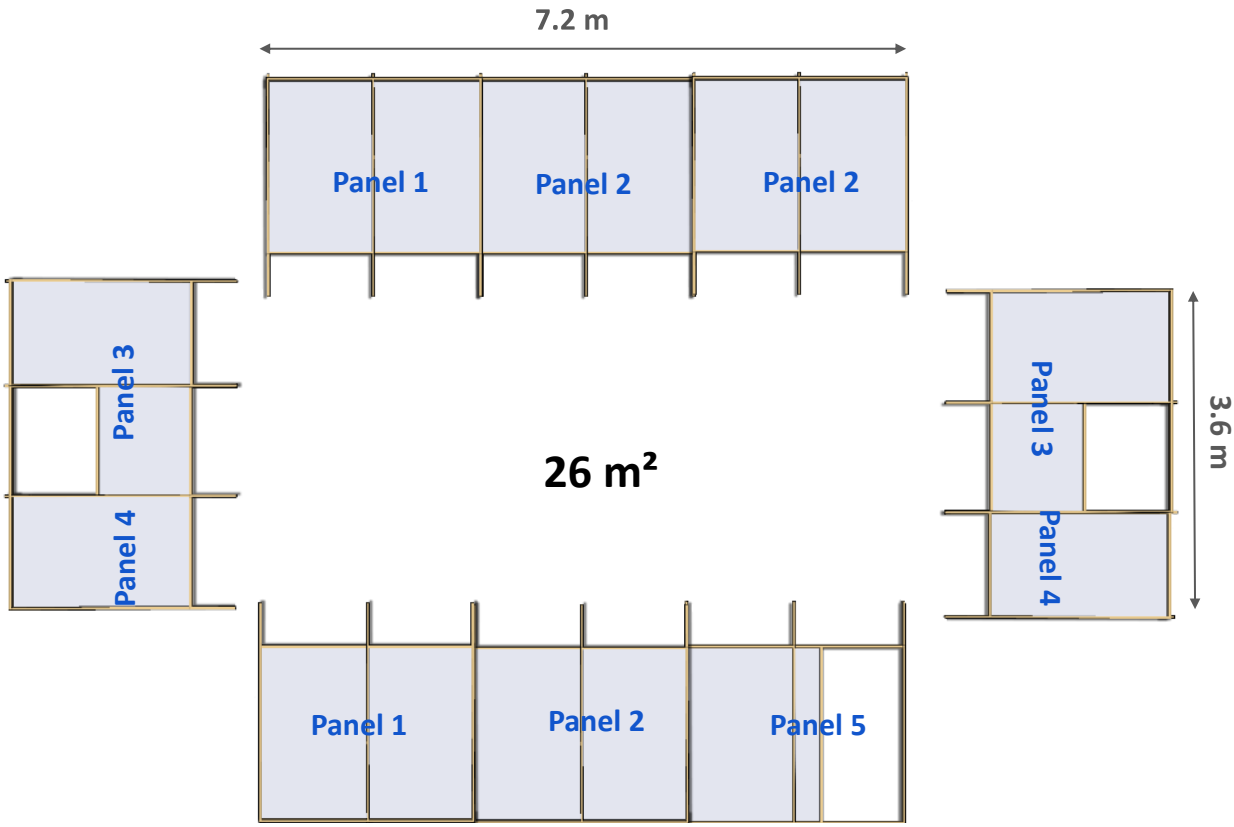
ESSENTIAL MATERIAL REQUIREMENTS

Shelter component	Timber quantity	Tarpaulin quantity
Walls	**Panels:** 47, **Door:** 3, **Windows:** 4, **Securing wall tarp:** 3, **Corner braces:** 1	2
Roof	**Truss x4:** 12, **Ridge:** 1.5, **truss braces:** 1, **Securing roof tarp:** 8	1
Floor	—	1
Partition	—	1
TOTAL	**81**	**5**

Number of nails: 2KG

* Households are advised to choose door and window sizes and position based on their privacy and security needs.

HOUSEHOLD SIZE (# PEOPLE)	SHELTER SIZE (M^2)
6	7.2x3.6= 26 m^2
7	



ESSENTIAL MATERIAL REQUIREMENTS

Shelter component	Timber quantity	Tarpaulin quantity
Walls	**Panels:** 68, **Door:** 3, **Windows:** 4, **Securing wall tarp:** 6, **Corner braces:** 1	2
Roof	**Trussx7** 21, **Ridge:** 3, **truss braces:** 1, **Securing roof tarp:** 14	2
Floor	—	2
Partition	—	1
TOTAL	**121**	**7**

Number of nails: 2.5KG

* Households are advised to choose door and window sizes and position based on their privacy and security needs.