

# RECIPROBOO SHELTER KIT (RSK) PREPAREDNESS PROGRAM 2016

Pyin Ma Chaung village,  
Hinthada District, Myanmar 2016

ReciproBoo Shelter Kit  
Winner Aid Innovation Award  
AidEx 2015



RECIPROBOO SHELTER  
[www.reciproboo.org](http://www.reciproboo.org)

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**Location**

Pyin ma Chaung village, Hinthada District, Irrawaddy Delta.

**Situation:**

Population 2,900  
High risk of annual flash floods resulting in widespread displacement of families, often for several weeks.

**Shelter objectives**

To assess the need for emergency and temporary bamboo shelters.

Based on this need, to train village members in the method to assemble and build bamboo ReciproBoo Shelter Kits (RSKs)

To evaluate how a disaster preparedness program based on (RSKs) might fit in with the existing community response to flooding.



Village location on flood plain below causeway



Flood defences ineffective for flooding over 6 feet



Widespread use of bamboo for construction

**Materials**

- Locally sourced bamboo.
  - Coconut lashings.
  - Polypropylene 4mm rope.
  - Pre-woven palm leaf panels
- 20 x IFRC standard 6m x 4m relief tarpaulins



Bamboo. Good quality.



Pre-woven palm leaf panels

**Tools:**

- Handsaws.
- Machetes.
- Hand pick.



Coconut fibre lashings. Polypropylene rope. Handsaws

**Village shelter requirements**

As bamboo is cheaper than rope per metre it was agreed to make the 9 pole RSK the standard emergency shelter, instead of the 7 pole RSK.

Benefits of this frame include:

1. A 24% reduction in stress ( Research 2012).
2. A frame roof ready for thatching.
3. A frame roof ready for elevating onto support poles or a wall.

**Skills level**

Building instructions were taken from the diagrams in the RSK guidelines handbook and from a single Red Cross volunteer who had attended the training course in Yangon.

The other 6 Red Cross volunteers assisting had no previous experience of this method of construction.

After the initial hesitancy when the new reciprocal frame roof concept was introduced, the village members worked swiftly with local Red Cross volunteers to complete the emergency shelter frames.

By mid morning all the shelter frames had been completed, and as the tarpaulins had not arrived from Yangon, attention turned to thatching the roofs.



9 bamboo pole RSK



using a pre-cut 2ft 6in baton to set the frame square



side rope (arrowed) being replaced by bamboo



both side ropes replaced by poles

### Thatching the RSK roof with palm leaves

This was the first time that the RSK roof had been thatched. We left the village members to show us how they would do it.

The method selected was simple and effective:

A bamboo pole was split and the 2 halves lashed across the frame in a vertical arrangement to provide the required support.  
Palm leaf panels were then overlapped in layers and attached to this frame with strips of bamboo.



The first layer of palm leaves



Two lengths of split bamboo provide the required support

### Observations

This basic emergency shelter provided quality shade and could be built by a team of 4 very quickly.

A second roof frame (the double RSK) would have provided a 7 foot corridor of standing space and 20 sq m of covered floor.

The preparation and attachment of whole split palm leaves would take considerably longer, but the skills required are likely to be within the capacity of the family receiving the shelter kit.



Frame support was remarkably flat with a good incline for water runoff



In an emergency split palm leaves, as used for thatching this permanent roof, would be layered from bottom to top.

### Elevating the thatch roof

This was to be the first time that the RSK roof had been thatched. We left the village members to show us how they would do it.

The method selected was simple and effective:

A bamboo pole was split and the 2 halves lashed across the frame in a vertical arrangement to provide the required support.

Palm leaf panels were then overlapped in layers and attached to this frame with strips of bamboo.



Holding the roof up while the support posts are dug is easy.



Shelter roof elevated. An additional central support has been added to the lower ridge pole.

### Observations

This basic emergency shelter provided quality shade and could be built by a team of 4 extremely quickly.

A second roof frame (the double RSK) would provide a corridor of 7 foot standing space and 20 sq m of covered floor.

The preparation and attachment of whole split palm leaves would take considerably longer, but the skills required are likely to be within the capacity of the local family recipients.



Loading is reasonably spread over the central frame. A third split bamboo pole lashed across the upper and lower intersecting frame points may be even better.



Elevated roof shelter. If slightly higher (3 feet) lower support posts had been used, this would have enabled the shelter to be lowered to the ground at the upper ridge pole and thereby provide the additional severe storm security of the storm profile shelter.

**A degree of industrial production;  
afternoon of day one**

Working in the shade meant that the roof frames for two types of RSK kit; the 12 pole single elevated kit and the 42 pole classroom kit, could be assembled on the ground and then carried to the final site.



Frame assembly.



Cutting the dowel holes on the posts

**Observations:**

When lashed together, each 7 pole roof frame unit was easily carried.

These frames may have been expected to distort with carrying and lifting over obstacles but they remained remarkably stable.

With advanced planning it is clear that , as every shelter roof frame is the same size, it would be possible to pre-dig the post holes for these shelters before their final assembly at their eventual location.



Classroom frames ready for moving



Starting the classroom frame late afternoon

**Day 2 : single elevated shelters**

Support poles were dug into the ground so that ropes were not required for guy rope anchors.

Starting at a mid point on the back wall , two half tarpaulins were first attached to create an entrance at the front ( as suggested by this IFRC publication). The main tarpaulin was then pulled over the top to create an awning at the front that could be closed at night.



Single elevated frame 12 pole frame



Two half tarpaulins positioned and being attached to central roof frame

**Observations:**

This simple upgrade of the basic emergency shelter was well received.

The back wall could have been made much higher if required. The stability of the roof frame actually increases as the frame is lifted towards the horizontal.

Alternatively a second frame could be added at the front to create the much larger double elevated shelter.



Front tarpaulin opening secured



Shelter with awning open.



**Day 2 : Four unit reception / classroom**

This was the second time this shelter had been built. It was completed with speed and efficiency.

Most of the discussions during the build were centred on the arrangement of the tarpaulin covers.



Halfway point; this is in fact the double elevated shelter that the emergency shelter can be upgraded to.



Laying out the two additional roof frames to mark the position of the support posts

**Observations:**

This shelter provided quality shade, even during its construction.

Consideration was given to using single support poles at the central opposing points, but as the double poles worked so well this was not adopted. The double posts also made construction easier by preventing too many layers of bamboo at intersections.



Second central support post in position



4 unit frame nears completion

**Day 2 : four unit reception / classroom**

This shelter provided a well ventilated, dignified temporary reception space.

By building the structure as two independent but interlocking double elevated shelters, additional strength was provided for the structure.

**Observations:**

The covered space provided by this shelter is impressive at 40 square metres.

Height and roof incline can be adjusted for individual requirements. The dimensions we selected were well suited for our communal meeting place.

Frame dimensions would in future need adjusting to fit the tarpaulins .

Unlike traditional roof frames, the weight of the reciprocal frame roof is supported by the corner posts and not the ridge poles This means it is easier to build the walls with non -supporting bamboo lattice panels or other local materials as required.



The complete shelter awaiting wall construction



Single shelter and 4 unit classroom



Well ventilated communal space



Double support poles for additional security

**Day 2 : storm profile shelter**

Cutting the support poles to about 1.2 metres results in the severe storm profile shelter.

**Observations:**

This feature demonstrates the versatility of the reciprocal frame roof to provide a secure shelter for a family together with their possessions in a severe storm.

The shelter is completed by attaching the end walls and anchoring the edges of the tarpaulin to the ground by burying it in a shallow trench.

Inside living space was considered comfortable for the required temporary period.

Rather than cutting the support poles it would be easier to simply replace them with shorter posts.

It should be noted that all the other shelters, including the classroom, can be lowered by simply lifting the higher side ridge pole off its support posts and lowering it to the ground. This simple rotation can be reversed when the severe storm has passed.



Emergency RSK prior to cutting down the 2 support poles



Storm profile shelter



Temporary living space for 5 persons

Further shelter points.



Tie down arrangement below bamboo node



Standard arrangement. Side ridge poles secured on top of main support ridge poles



Alternative arrangement. Side ridge poles secured beneath main support ridge poles



Tie down to dowel preferred  
S. Halbert 2016



Double support poles work well. Note additional top ridge pole added to support tarpaulin



Storm shelter frame providing acceptable inside floor space

**Key lessons for future community preparedness programs.**

- 1. The need for this type of shelter in Myanmar.**  
 This village community at risk from recurring floods expressed that there was a clear need for a portable, rapidly assembled, upgradeable shelter kit in the region.
- 2. The speed and efficiency of adopting the new construction concept.**  
 Within the first hour village members were adept at preparing the shelters using the guide booklet diagrams and instructions from the Red Cross volunteer that had attended the Yangon training. Common mistakes, such as not leaving sufficient support pole protruding for guy rope attachment and not placing ridge poles underneath frame poles were soon corrected. Village members added their own personal refinements and remained enthusiastic to the end.
- 3. This building method fits in well with traditional skills.**  
 The village members demonstrated skills with machetes, hand saws, lashings, thatching and tarpaulin attachment that well exceeded the requirements for building these shelters.
- 4. A well organised program could be completed in one day.**  
 Taking the village members through the steps from 7 pole emergency RSK, to double RSK, to single elevated RSK to double elevated RSK would provide instructions for the full range of shelters. The larger classroom is just a modular “add on” to the double elevated RSK.
- 5. Future programs.**  
 In this village we were unable to notify the community in advance and so the bamboo was purchased locally from a store the day before. At the end of the program it was agreed that the 20 tarpaulins would be stored at the local Red Cross office so that they could oversee future distribution. Preparation, treatment, storage and recycling of bamboo were not addressed on this occasion; this is something that will be important for a large scale preparedness program. The genuine interest in this innovation suggest that setting up a partnership where aid agencies provide tarpaulins and training and the community prepares and stores the bamboo could work well.

The following flow chart is taken from page 3 (Objectives) of our [Shelter Preparedness Program](#). Most of these objectives were achieved.

