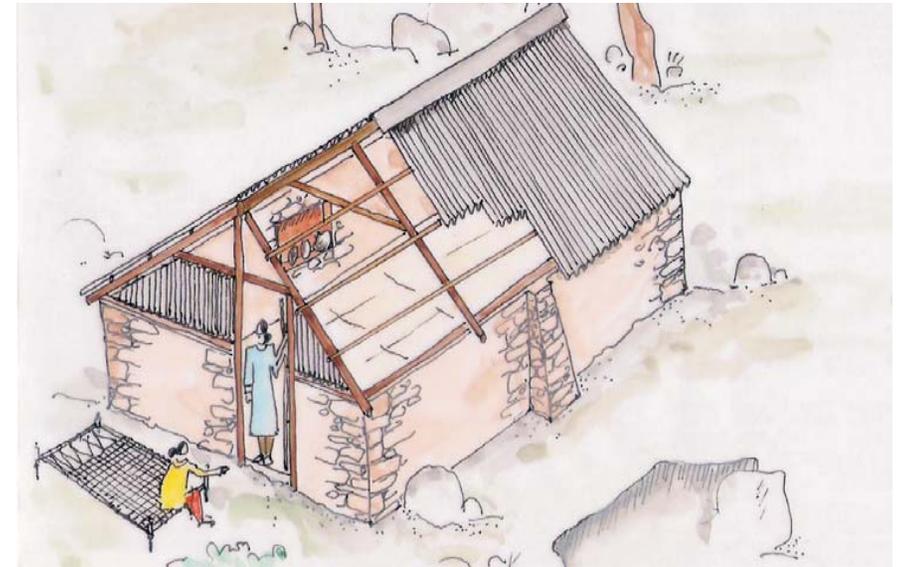
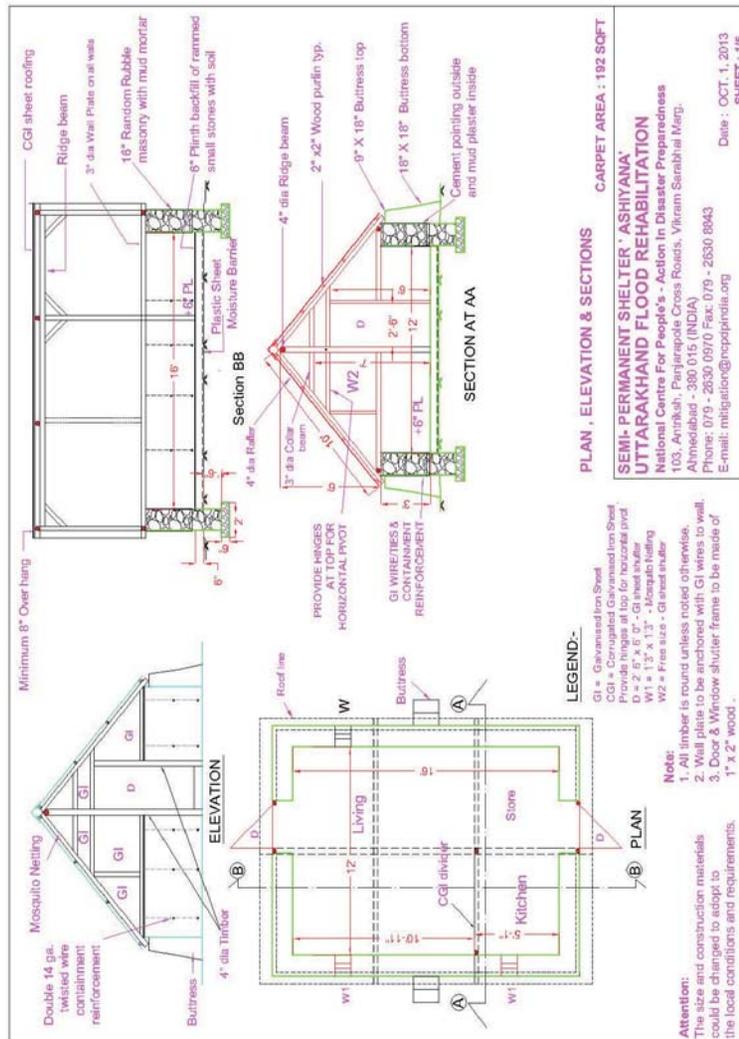




# 'Ashiyaanaa' - A Mid Term Shelter for Post Disaster Situation

Originally designed for post 2013 monsoon  
disaster in Uttarakhand



## Construction photo sequence for a Semi-permanent shelter

Remember, this is a Semi-permanent shelter. If at any time house owner wants to make it permanent he/she can extend the wall up to 8' height after providing a Reinforced Concrete band at the present wall top. The timber wall plate must be reinstalled on the new top and anchored with the wire reinforcement extended from bottom.

## Excavation for Foundation



Following the rule of 3:4:5 or 9:12:15 to get 90° angle at each corner, mark the outside boundary line of the foundation trench.



Mark out the inner foundation line from the sides of this rectangle 2' away to create 2' wide foundation.



Drive 2 pegs in ground at 1'-6" offsets for each boundary line at the corners so that the excavation does not disturb them



Dig trench 2'-0" wide and 2'-0" deep. Dig extra for buttresses as marked in the foundation drawing in the centre of the long walls on the outside face.



Make 6" to 9" thick (two courses) strip footing with flat stones and mud mortar in full width of the excavation and compact it well.



Interior view with the owners



Finished house

## Design of a Midterm (semi-permanent) shelters

These shelters are not temporary shelters. Here people will stay for longer duration, say from few months to few years till the permanent houses are built. These shelters will need basic facilities like toilets and kitchen which could be built outside in a semi-temporary structures.

### Few points which are considered while making mid-term shelter designs are

- .
- i. It is Most economical
- ii. Fastest since the people themselves can pitch-in in a big way without having to depend upon specialists.
- iii. Up-gradation possible in due course,
- iv. Use of local Materials that can be effectively supported by local artisans, and maintained easily by the families.
- v. Materials can be later salvaged and recycled for extending or modifying the permanent housing.
- vi. Minimum quantity of material will have to be brought from outside.
- vii. Tents or a universal type of pre-fabricated houses are not considered because they do not work since tents do not last for a long time, and one can not re-cycle any materials from pre-fab houses.
- viii. The simple design is planned to strengthen peoples' initiatives to build their own mid-term shelters.
- ix. If special cash incentive for families who build their shelters in specific time frame may also speed up the process of midterm shelter requirements



The triangular portions in the end walls above the lintel level should be covered with metal mosquito netting to permit lighting and ventilation.



Side view with small window and butress



Finished interior with storage space above the finished wall



Finished kitchen with

### Installation of main timber posts and door frame posts



Dig 5" diameter hole 3' deep for main timber posts and 4" diameter holes 2' deep for the timber posts for door frame in the gable walls



Apply coal tar (or burnt engine oil) on the portion of the posts which will be inserted in the ground.



Cover the portion with thick polyethylene tightly tied with string.



Insert posts in the ground where the holes were made and pack it tight with soil-gravel etc. .



Each post must be secured and should not move. All posts should be in plumb with holes.



Attach holdfast on all posts, to solidly fix them to walls.

## Masonry for foundation, plinth and walls



Do not use round river boulders for wall masonry. If they are to be used break stones to get angular faces



Use angular stones available on the mountain side and gullies. Get stones that are of right size for 16" thick walls.



Leave 4" from both sides of the footing and start construction of 16" thick stone wall in mud mortar above the footing.



Continue construction of 16" wide stone wall following all the basic rules of stone masonry.



Use proper size angular stones



Use plumb bob and string line for each course of wall masonry

## Installing cladding and doors and windows on end walls



Install the 3'-0" high divider with CGI sheet nailed to the posts as required to make kitchen space.



Add additional horizontal wood pieces at the door lintel level and install 2"x1" sized wood on the ballis on either side of the door opening to ensure proper rectangular opening.



Make door shutters using sized timber with cladding of 24 gauge GI sheet. Install these with hinges.



To close the small openings left in the long walls, make wooden window frames along with mosquito netting.



Alternatively a window can be installed opening like a chajja if desired.



The trapezoidal portion of the end walls between the top of stone walls and up to the door lintel level is to be closed using GI sheets with nails.



Purlins should be securely anchored to the rafters using metal straps or GI wires in addition to nails.



### Installation of CGI sheet roofing



Install 10'-0" X 3'-0" CGI sheets with 3" of overlap on consecutive sheets on purlins. Before attaching sheets make sure the overhang of roof on both ends of the building is equal.



Use J hooks on the periphery of the roof with flat metal and rubber washer to attach sheets to purlins, and use 2 1/2" nails with flat metal and rubber washer on all other joints.



CGI sheet installation in progress



Install GI ridge piece on ridge opening to seal the gap between the CGI sheets on the opposite faces with the overlap of min. 6".

### Fundamental Rules of Stone masonry

Place every stone on its broad face and not the narrow face



Place the length of every stone in to thickness of the wall, and not along the length of wall to make them interlocked with each other.



At the corner, place long stones with their length along length of wall



Each stone must be in contact with the stone under it, not mud mortar



Break all vertical joints in stone wall



Put one header at every 3'-0" distance.



Looking from above the middle joint of the wall should not be in a straight line,



Use stone chips to fill gaps between stones instead of mortar. Every course does not have to be leveled.



Continue wall construction up to plinth level



Rafter and ridge beam connection



Always use hand drill for making pilot hole in all timber joints

**Attention: When the level reaches 6" above ground level (plinth level), the openings for doors should be made in the masonry construction.**



Attention: Make twisted wire anchors from 4- 14ga. GI wires as in photo



Attach rafters to ridge beam and wall plate with GI strip and nails.



Four sets of rafters installed on ridge beam.



Attention: At 6" above ground level install the already made GI wire anchors on the stone wall as shown in the anchor location plan. Make sure that wire loops project out on both faces of the wall.



Attention: Put one more set of GI wire anchors 1'-6" higher exactly above the lower anchors. Use plumb bob to ensure that on both faces the loops projecting out at both levels are exactly in vertical line.



Install 4 purlins on each side of the roof with nails. Using spirit level or tube level ensure that all the purlins (batons) are level (not sloped).



While installing these on top of ballis use packing under purlins to compensate for the unevenness of the ballis.



Prepare seat on top of the middle post with knee braces on ground and install it in the hole in the ground.



The bottom portion must be coated with used engine oil and wrapped in plastic before inserting it in the ground.



Fix it with the ridge beam with metal strap and nails.

### Installation of rafters and purlins

Install 4 sets of rafters. Care should be taken to see that 10' long (critical) CGI sheet must extend out a minimum of 2" beyond the wall plate.



One end of each rafter is to rest on the ridge beam and the other on the wall plate.



Rafter and wall plate connection.

### Attention: At 2'-3" from the ground create 2 - 15"x15" window openings



At 2'-3" from the ground create 2 - 15"x15" window openings long walls. Do not place window near corner and make more than 3 windows.



Always use cotton string and tube level to ensure proper alignment and levels.



Attention: Stop construction of walls at 3'-6" (Maximum 4') height from the ground level. Do not finish the wall



Remove all mud mortar stuck to wall surface and clean the wall.



Rake all exterior open joints in the random rubble masonry including door window jambs to the depth of 1/2".



Seal the exterior joints with 1:4 cement mortar. Finish door threshold and window sills with cement plaster.

## Installation of timber wall plate assembly



Prepare timber ballis for wall plate



Make the wall plate assembly on top of the wall



Attach 12" to 13" long ( flush with the inside face of the wall) ballis stiffeners with metal straps and nails.



Timber to timber metal strap connector.



At corners install diagonal stiffeners as shown in plan.



Connect the wall plate to the vertical posts in gable walls using metal strap and nails.



Anchor the wall plate assembly using doubled 14 gauge GI wires that are securely attached to the wire loops projecting out of the walls at approximately 6" and 2-0" from the ground.



For this insert 2 nos.14 ga. twisted wires in the anchor hooks, bend it vertical and take it to the wall plate.



Tie wall plate and all the stiffeners tightly with twisted wires. Insert nails as required for tying and once it is done bend the nails over the wire.



## Installation of ridge beam



Install 4" dia. ridge beam from ballies on top of the main posts and fix it with GI strap with nails to the posts.



The overlapping joint between ridge beam ballies should be done with metal straps close to middle post.