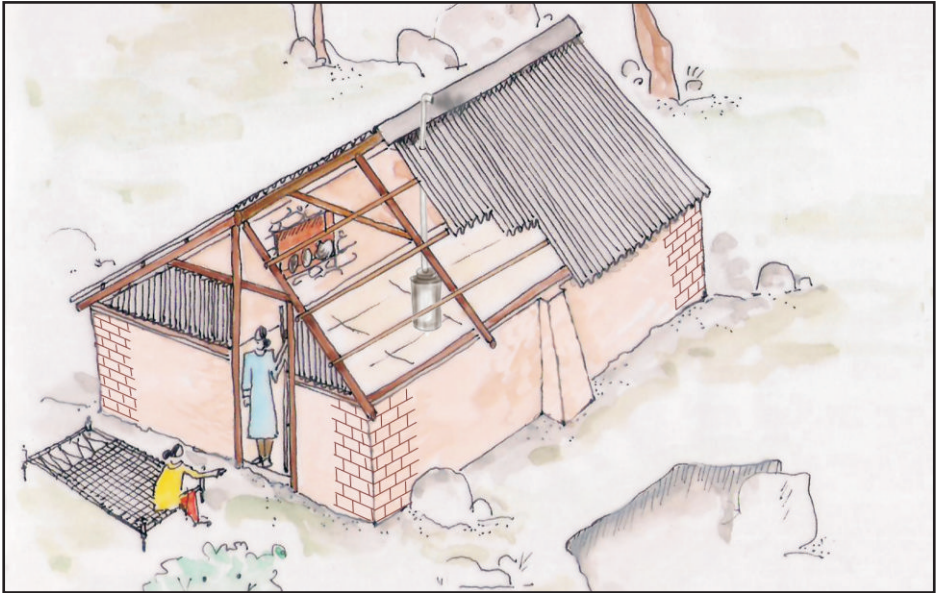


'Ashiyaanaa' for Disaster Affected Kashmir



Step by Step Construction of a Semi-permanent house

Remember, this house is Semi-permanent. If at any time house owner wants to make it permanent he/she can extend up the wall on top of the wall plate cum band up to 8' height along with the wire reinforcement. Install a new wooden wall plate cum band at the top and securely anchor it to the wall with the vertical reinforcing wires.



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Sustainable Semi-permanent Mid-term House for Disaster Affected People

The design and construction of “*Ashiyana*” the midterm house was done for Uttarakhand after the Disaster in June 2013. After the training of nearly 70 artisans in construction of this house, **more than 300 were built** by different groups including Reliance Foundation and Amar Ujala Foundation in six months.

This year Kashmir is facing similar situation after the floods. People have lost their homes and quickly need houses to live in until permanent houses are built. *Ashiyana* the Semi-permanent house shown in this booklet can be built easily and quickly by the people It can be made more habitable by improvisations done by them to insulate the roof from within and making timber floor.

For any successful program the technology should be such that it

- Promotes the use of the local materials with minimum use of outside materials.
- Improves the ways in which the local materials are used with improved technology to provide resistance against disasters.
- Promotes economically affordable technology
- Promotes self help

Critical issues for post disaster shelter construction..

- a. Tents or a universal type of tin-shed: For mid-term shelter these do not work in providing basic house like comfort
- b. Prefabricated shelters such as those made of industrial materials do not work since these...
 - i. Are expensive, and all the resources goes out to industries
 - ii. Are difficult to maintain,
 - iii. Are not salvageable in the end,
 - iv. Degrade rapidly when not in use, and remain as eyesores in the area for years to come.
 - v. Experience major bottleneck in large scale construction because of complicated logistics including the availability of the number of kits and number of trained teams.

Ashiyana faces none of these problems. This is why it was possible to build so many houses of this design by different groups in far off places in Uttarakhand

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 or bricks and mud mortar in full width of the excavation and compact it well.

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.



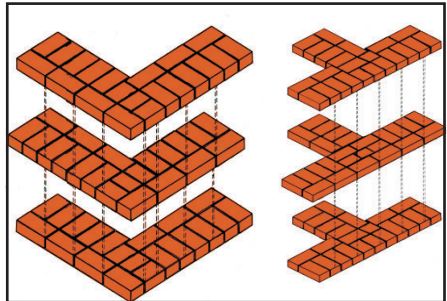
Attach holdfast on all posts, to solidly fix them to walls.

Foundation, Plinth and Wall Masonry could be built using Bricks, Concrete Blocks or Un-Coursed Rubble or their appropriate combination

**Wall thicknesses will be as follows
Brick Wall = 14"; Concrete block wall = 12"; UCR - t = 16"
Masonry is to be made in mud mortar to permit maximum salvaging in the end.**



Mud must be of good quality clayey soil. It must be kept wet at least for three days and must be thoroughly mixed everyday before using it.

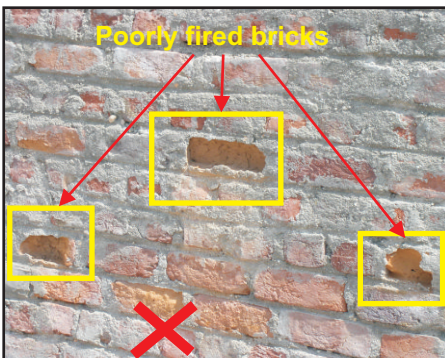


"L" Junction

"T" Junction

Bonding for 340mm (13 1/2" wall to wall junction

Fundamental Rules of masonry for brick and concrete block masonry



Do not use inadequately fired or over-burnt bricks



Always place bricks with its frog (groove mark) facing up to ensure better bond with mortar.

Fundamental Rules of Brick Masonry



All walls must be built at the same time, or bring out the masonry from one wall in stepped-like manner to which the other wall will be connected.



Use tube level in every second or third course, and plumb bob while beginning each new course at the corner



Use stretched string in every course to keep brick/block in one line



Break all the vertical joints.

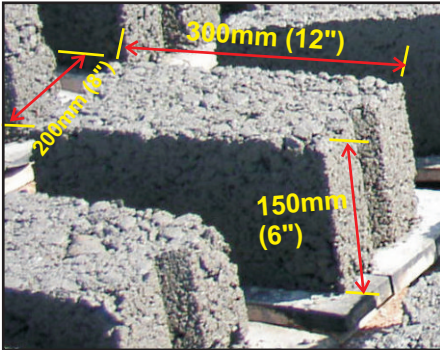


All vertical joints must be 10mm to 15mm wide, and must be filled properly with mortar.

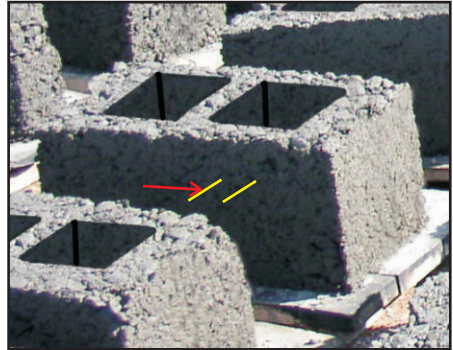


Place mortar on top of a masonry course only when ready to put the next course.

Different Types of Concrete Blocks



Solid Block

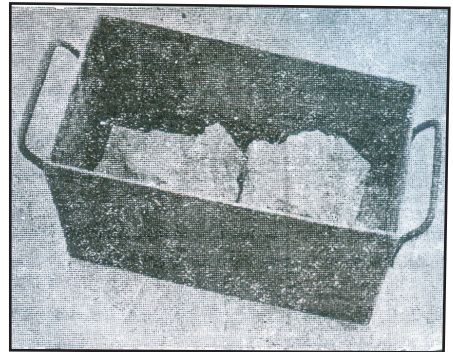


Hollow Block

Solid and hollow Concrete Block should be no bigger than 300 x 200 x 150mm (12"x8"x6") so that it can easily be carried by one person. Wall Thickness 35mm Min. for hollow blocks.



Top & Bottom Surfaces must be rough for good bond and must have Strong edges and if possible must have a groove on sides or on top



Alternatively, stone-crete blocks may be made and used if small stones and sand are available

Points to Remember:

- When blocks are purchased they should be fully cured and hence, strong.
- If blocks are freshly made and still damp, then the curing should be continued.
- Follow all rules of brick masonry for concrete block masonry

Masonry for foundation, and plinth



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

Fundamental Rules of Stone masonry



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

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



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

Making masonry walls of all types Disaster Resistant with the help of Containment Reinforcement of 14 gauge GI Wires



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



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.

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 joint between two pieces of ballies for ridge beam to be done with metal straps. It is advisable to create the joint on top of the third post. See the location of the post in plan.



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.



Rafter and ridge beam connection



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



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



Four sets of rafters installed on ridge beam.



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.



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".

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 small window frames from sized wood and cover them 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.



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 with acts as a smoke vent in a kitchen. A butress is to stabilize the long wall against earthquake forces.



The interior space is large where a person can stand up even near the wall.



Windows in the back wall which gives extra light and ventilation. The top hung shutter acts like a chajja.



Finished interior with storage space above the finished wall all around the room.



Finished interior with a window, wood burning stove and storage space above the finished wall.



Interior view with the owners



Finished house

Design of a Midterm (semi-permanent) House

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

Noteworthy points of this design:

- i. It has reasonable comfort level unlike tents or tin shed, but is economical
- ii. Is fast to build since the people themselves can pitch-in in a big way without having to depend upon specialists unlike prefab houses.
- iii. Its up-gradation is possible in due course,
- iv. It uses local materials that can be effectively supported by local artisans, and be easily maintained by the families.
- v. Materials can be later salvaged from it easily unlike the prefabs, and recycled for extending or modifying the permanent house when built.
- vi. Minimum quantity of material requires to be brought from outside.
- vii. The simple design allows people driven initiatives to build their own mid-term homes.
- viii. Cash incentive by the government for families who build their shelters in specific time frame could help speed up the process
- ix. Is earthquake and wind resistant
- x. Uttarakhand people and masons found them very strong, and large.



Step by Step Construction of a Semi-Permanent House - NCPDP

