



HERITAGE FOUNDATION'S DRR - COMPLIANT SUSTAINABLE CONSTRUCTION

BUILD BACK SAFER WITH VERNACULAR METHODOLOGIES

Final Narrative Report

22nd June, 2013

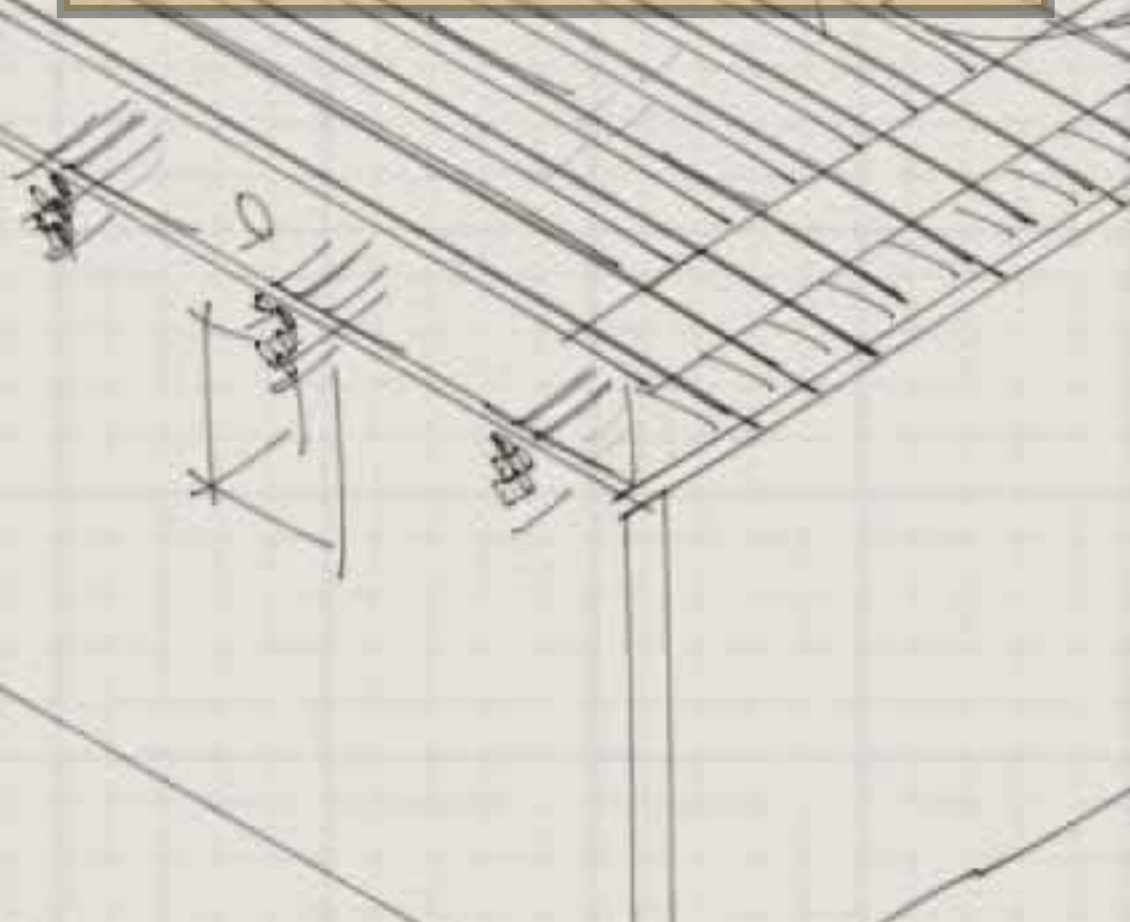


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I. INTRODUCTION

The program “Build Back Safer with Vernacular Methodologies”, was launched in October 2011 from village Mohak Sharif, UC Bukaira Sharif, District Tando Allahyar by Heritage Foundation through its own resources to demonstrate methods for rehabilitation of surviving adobe/mud walls as well as principles for new vernacular construction combined with strong bamboo accessible KaravanRoof. Through support provided by DFID/IOM by building one-room shelter units in 35 tehsils of 8 priority districts in the aftermath of the 2011 floods, the efficacy and acceptability of HF philosophy among the affected population was gauged that resulted in extremely positive feedback. Based on detailed studies, interventions were introduced by reputed architects and engineers associated with Heritage Foundation which have resulted in DRR-compliant, improved and strengthened vernacular structures. The sustainable designs thus developed also incorporate tried and tested methods resulting from HF’s own extensive work in post-disaster areas since October 2005.

Heritage Foundation (HF) as the Technical Advisory Partner for International Organization for Migration (IOM) conducted ORS II from June -September 2012. This included the technical training of ToT’s comprising staff of IOM’s 11 Implementing Partners who were constructing 7,500 shelter units funded by DFID. After the completion of construction, the programme was extended to 2013. ORS III of the project involved the construction of 22,500 shelters, technical trainings for 25 Implementing Partners and IOM staff while funding was scaled up and additional donors, OSDI and USAID were incorporated into the programme. Arguably, this makes the Build Back Safer with Vernacular Methodologies Programme one of the largest almost zero-carbon footprint shelter projects based on vernacular traditions in the world.

Modules designed during ORS III of the project were based on analysis of the vast data gathered by Heritage Foundation teams of architects and students of architecture from remote areas of each district, different kinds of traditional construction techniques prevalent in Lower Sindh (See Annexure A). Through this extensive research Heritage Foundation was able to clearly demonstrate that vernacular forms and construction techniques, based on availability of local materials, expressed the lifestyle and age-old skills of the communities themselves. It was evident that such forms and techniques needed to be retained since they have endowed each area with a sense of identity making it distinct from other, more urbanized solutions based on burnt brick/concrete block. HF’s own belief in retaining tradition and heritage to find solutions for disaster prone areas, was reinforced through research in Sindh and formed the basis of the program to retain and improve vernacular techniques that would clearly lead to individual and community pride, and thus help in making communities self reliant and able to deal more effectively with future disasters.

Thus, in disaster affected areas, instead of using burnt brick and steel girders, all the units being funded by IOM have used earth walls (with its almost zero embodied energy) and bamboo roofs (with low carbon footprint), treated with lime-mud renders. Substantial carbon dioxide emissions, which would have occurred through the use of burnt brick and steel girders, will be prevented, with the added benefit of saving Pakistan’s forest cover (since wood is used as fuel in brick kilns).

When compared to the previous year’s work, it has been observed that there is a marked improvement in the quality of construction and the efficiency of field teams of IOM and the implementing partners. Clearly, the methodology of construction was new and daunting to all members involved during the past year, while during Phase II regular meeting of IOM, HF and Implementing Partner teams led to better coordination and understanding of problems on site and their solutions.

II. MANDATE

Under the agreement with IOM, HF provided the following services:

- a. Design the ORS technical construction manual that include the DRR upgrades from the current traditional practices, incorporating all amendments i.e. logos, additional drawings, typologies, etc.
- b. Design the training materials in a template format which the trainers shall use while demonstrating how to build/construct the 3 steps of the ORS units during the training sessions for the program beneficiaries.
- c. Prepare Training of Trainers for the ORS programme on how to construct vernacular ORS units applying DRR principles and techniques.
- d. Deliver 2 sessions of the refereed TOT each session of 4 days where 3 days are theoretical sessions and 1 day is practical in a model village.
- e. Implement a Technical Monitoring and Mentoring visit plan where HF teams will visit the field work of all 25 IOM IP's at least 4 times. The visits will work as quality verification visit to assess IP training quality.
- f. Provide agenda and training content materials prior to the trainings.
- g. Chair and facilitate the trainings and field visits.
- h. Ensure report writing of each of the trainings and field visits, but also to share the reports with IOM within a week after the training and field visits.
- i. Travelling as needed to deliver the trainings and field visits.
- j. Line management and supervision of the trainers.

III. THE TECHNICAL SUPPORT MANUAL

A Technical Support Manual prepared in 2012, based on the Lari Principles of DRR compliance outlined the following construction prerequisites:

- a. Utilize Heritage and Tradition for involvement of communities and for fostering pride and self confidence.
- b. Use sustainable materials to prevent environmental degradation
- c. Use local skills and techniques for speedy delivery
- d. Incorporate DRR-driven methodologies to withstand next flooding
- e. Utilize the provision of shelters as an entrée into communities for larger benefits and for initiating women's economic empowerment strategies
- f. Develop holistic models aiming at MDGs; hygiene, WASH, food security, nutrition and hygiene.
- g. Develop training modules for IPs, NGOs, volunteers, artisans and communities in order to spread the message as widely as possible.

The Manual describes various materials and methodologies based on a systematic survey carried out during the latter half of 2011. These findings analyze the advantages and disadvantage along with the success and failure of various typologies:

Walls

A closer look into mud, burnt brick and loh-khat constructions found that structures built with adobe/mud walls, withstood rain and flood water if a proper bond had been maintained. It also found that in cases of damage to mud structures, the base was most vulnerable, heavy roofs made of wooden logs or steel girders also added to failure of structures. Where burnt brick had been used, in most cases, bonds had not been maintained, courses were not followed and mortar was missing, thus resulting in unsatisfactory construction. Loh-khat walls displayed resilience towards flooding water where they had been well constructed.

Roof

In most cases the damage to housing was primarily due to poor construction and the use of heavy materials. Heavy wooden logs, wooden rafters, bamboo purlins and steel girders stacked without proper load distribution and tying resulted in complete or partial destruction.

Other Factors

These included the lack of plinths, roof projections and poorly laid lintols.

The above mentioned problems were taken into account with Heritage Foundation's Vernacular Construction Methodology, which derived forms and techniques from local traditions, but improved on them through (See Annexure B):

- Providing a site selection criteria;
- The stabilization of mud with the addition of lime and straw and/or cow dung ;
- Placing an emphasis on constructing shelters with foundations;
- The introduction of plinths and platforms to raise the structure to a safe level;
- The use of a toe to provide additional strength to the base;
- The laying of proper lintols above doors and windows;
- The introduction of roof projections to ensure rain water drainage;
- The tying of the roof members together to form a whole and then attaching it to the walls securely;
- Ensuring that the shelter is finished with a protective layer of plaster

The Manual divides the construction of the ORS into three stages, BASE, WALLS and ROOF. These were divided into the materials being used as well as the types of roofing that would be chosen by the beneficiary. Charts for display for the better understanding of the IP teams and beneficiaries were also developed (See Annexure C).

Site Selection Criteria

A criterion for site selection has been developed to help beneficiaries make an informed choice regarding the location of their shelters.

- Advocacy for choosing a higher ground, a fair distance from any river or water source.
- Organizing shelters in areas to avoid risk of ponding.
- Orientation of structures and placement of doors and windows in the North-South direction. Keeping in mind prevailing wind direction was to allow for proper ventilation.
- Placement of rooms to avoid any smoke from the stoves to make its way inside the house.
- Making adequately sized doors and windows for better ventilation.
- Keeping lintol heights at min. 6'9" to maintain minimum standards.

Other factors included assessing the natural drainage gradient of the site where the construction was to take place; the orientation to ensure privacy of the household; availability of access to facilities and natural and common resources, etc.

Shelter Typologies

The following is a list of various Shelter Typologies discussed during the trainings.

Type A I

The Type A I roof is an accessible KaravanRoof, and follows the standard HF methodology. Since the roof is

accessible (withstands the weight of 15 persons), it does not have to be raised above the highest recorded flood level, as beneficiaries can seek refuge themselves and for their belongings on top of the structure. The use of the toe is, however, advocated extensively. The module employs mud walls with proper lintols and roof projections to ensure resilience.

Type A2

Built with mud walls, the Type A2, is a mono-pitched roof, that is required to be raised 6" above the highest recorded flood level. Thus, the ORS should be constructed on a compacted mud platform together with a toe to ensure stability. The introduction of lintols above doors and windows along with a roof projection is advocated.

Type A3

Similar to Type A2 at the base and walls stage, Type A3 is built with a double pitched roof. The roof structure is configured with a truss system to ensure that the load is evenly distributed throughout the span of the structure.

Type A4

A distinct shelter typology found in most of Lower Sindh, is the Chaura. A circular structure that can withstand rain and flood water has been developed with some additions, such as the introduction of a platform and toes at the base, furthering the strength of the structure. It was observed that the roof was constructed with heavy wooden logs that were the primary cause of damage, thus Type A4, details a light weight solution using a bamboo skeleton that is easier to erect.

Type B1

Shelter Type B1 employs the popular loh-khat tradition. Loh-khat are reeds or stalks that are woven together to form a matting. The bamboo skeleton follows the traditional dhijji formation, to ensure that the structure is tied together thus being more resilient to flooding and earthquakes. The roof being accessible, allows for the plinth to be lower and the foundations 1-6" deep.

Type B2

With a non-accessible Mono-pitched roof the structure, shelter Type B2, is to be raised on a platform 6" higher than the last recorded flood level along with the use of a toe. A bamboo skeleton with loh-khat filling, bamboo lintols above doors and windows allows for the structure to be more resilient.

Type B3

As in the case of Type B2, Type B3, with its double-pitched roof is also required to be raised a minimum of 3' or 6" above the highest recorded flood level. With loh-khat filling the structure is tied together and secured to ensure a resilient structure.

Type B4

The traditional Chaura form is elevated on posts allowing water during monsoons and floods to flow from beneath it. A skeletal structural system is erected and infill is completed in the traditional loh-khat methodology. Flooring of the elevated structure is completed in split bamboo pieces tied to radial members along the internal length of the room. A light weight bamboo roof allows additional resilience to the structure.

Additional Modules:

Upon the request of the Implementing Partners and IOM, HF drew further variations of the various typologies. They were as follows:

Type A5

A smaller span of 10' has been developed for beneficiaries that wish to use a Karavan 4 bamboo-joist configuration. Room sizes that may use this configuration are between 16'x 10' to 18'x10'.

Type A6

For beneficiaries who wish to construct an additional veranda, kitchen and washing area.

Type A7

A two-room configuration has been developed for cases where two beneficiaries wished to construct their shelters as one unit.

Type A1.4

For Smaller room sizes (12'x10' and 13'x10')

Type A1.5

For Smaller room sizes (14'x 10' and 15'x 10')

Type B4

Using the traditional loh-khat methodology, a bamboo skeleton is raised on stilts 3'3" or above (6" higher than highest recorded flood level). The structure uses bamboo flooring, the construction details of which can be provided if any beneficiary chooses to use this typology.

Alternate Bamboo Tying Method

Upon the request of IOM, a method of tying the bamboo roof members together without the use of nuts and bolts has been prepared. This involves the use of kablas and steel wire to ensure that the members can be tied together securely. Heritage Foundation does not advocate this use of tying, as the wire and kablas will be insufficient to provide adequate strength.

Sketches

As part of the technical training programme, a special session for Implementing Partners was held where all participants were to share problems they were facing on site. The technical session held at Moak Sharif was recorded and all specific queries made to HF were resolved with the aid of sketches (See *Key Findings and Recommendations for the week 24th -26th April*).

Checklists

The Manual is supplemented with a series of checklists that should be used while checking the shelter construction for compliance with the prescribed methodology.

Checklists are available as part of the Manual as well as forms (See *Annexure F*) supplied to IOM. These checklists ensure that Implementing Partners would be able to check the progress of the work from the site selection to layout, material and site preparation followed by the construction of the Base, Walls and Roof. Forms were developed to mark each stage of work by HF Mentoring and Monitoring teams. Forms could be used for any of the above mentioned typologies at various stages.

VI. TRAINING SESSIONS

As the programme module had been implemented in the previous year, it was decided that a Technical Refresher session would be held at the IOM office for HF and IOM personnel to reconnect and discuss the problems and successes of the pervious phase. All alterations to the Technical Support Manual and its typologies were discussed and noted. This Refresher allowed better coordination between IOM and HF teams through the course of the project.

As in the earlier programme, Heritage Foundation arranged for Mr. Saad Khan, a highly qualified trainer associated with Heritage Foundation to hold the Technical Training Sessions (See Annexure D). The in-house sessions were held between 20th and 22nd of November, and 27th to 29th November, 2012 while the Field Sessions were held on the 1st and 2nd of December, 2012. The in-house session focused on the theoretical and philosophical basis of the methodology while the field session allowed hands-on experience of working with various materials and methods of observation to evaluate construction quality.

Technical Officers, Social Mobilizers, Project Coordinators and Project Managers from 17 Implementing partners attended the sessions, while HF's monitoring and field teams were on hand during the training programme. The number of Implementing Partners was increased to 25 during later phase of the programme.

During ORS III, it was observed that the technical training session held at the beginning of the programme was not sufficient for the IPs understanding, therefore periodic refresher trainings and material specific, i.e. Loh-Khat trainings were arranged.

The Loh-Khat Training was held on the 4th of February, 2013. The project area in the ORS II was based primarily in areas with a layered mud.mud brick tradition, with an ample supply of soil that could be utilized for construction. During this year it was found that areas such as Badin, where majority of the beneficiary villages were located had a tradition of Loh-khat and mud sources were scarce or soil was highly saline. It was recommended by Heritage Foundation that areas with such material constraints should opt for the Loh-khat typologies, which were more technical to construct. Thus, a training session for all IPs working in Loh-khat areas was held.

It was hoped that the session would help the Implementing Partners understand tying and bolting techniques and thus be able to have the shelters implemented without difficulty. IOM officers were strict to inform all IPs that quality control for Loh-khat typologies should be stricter to ensure a strong resilient structure.

After a series of Mentoring and Monitoring (M & M) visits were conducted, HF teams found that work on site was lacking in some respects. It was also found that trainers, technical teams and social mobilizers were having some trouble in having the work implemented, thus a IP refresher Session was held between the 24th and 26th of April, 2013. The sessions evaluated the IPs representatives' ability to hold a technical session for beneficiaries, their knowledge of the methodologies as well as acting as a platform to discuss the various problems faced by them in the field.

This technical session proved to be successful as it allowed for a marked improvement in the technical training session held for project beneficiaries after the training. IP trainers were more confident about their understanding of the construction methods. In acting as a platform for discussion of various problems found on site by the many implementing partners was discussed, along with specific solutions executed by each individual IP gave way to innovations in tackling problems and sharing of knowledge that was beneficial to all participants.

It is hoped that any future programmes would also involve technical refresher sessions, and field visits of Eco-Village Moak Sharif or Heritage Foundation's Demonstration shed by Focal persons of project areas. This would allow for better understanding of the methodologies while introducing various other methods of eco-building and low-cost solutions that may be implemented by the communities themselves.

V. SITE VISITS AND SCHEDULES

The Mentoring and Monitoring (M & M) process was carried out by Heritage Foundation (See Annexure H), headed by Project Manager, Naheem Hussain Shah. When it was required HF deployed two teams for the visits.

As per agreement, Heritage Foundation began its site visits from 17th December to the different project areas of the after the conclusion of the training sessions. This was undertaken to evaluate the conditions on site, including soil characteristics, the availability of water, the highest recorded flood water levels, and the duration of inundation along with the number of shelters to be constructed.

The following forms which had been developed were formulated to be filled at different intervals of the construction phases.

Advocacy Form

The HF advocacy form was designed to help IPs and beneficiaries choose the best solution for its specified region. It took into account the soil characteristics, flood water levels and duration of inundation, etc.

Shelter layouts and excavations were expected to begin before the release of the first tranche as beneficiaries did not require any funding to carry out the work.

HF Forms – Base

The Heritage Foundation forms to check the base preparations includes the checking of the layout, excavations, lying of PLC and the construction of foundations, toes, platforms and walls to plinth level. All various stages are to be checked for compatibility with HF methodology.

HF Forms – Walls

Walls are to be constructed after checking with a water level and kept straight with the help of a string. In some areas the walls require the erection of a bamboo skeleton, or the prefabrication of mud brick. Prefabrication of elements are also to be checked for compatibility.

HF Forms – Roof

Implementing Partners and beneficiaries are to prefabricate the roofing members and tie them securely to the erected structure. For the accessible KaravanRoof, orders need to be placed with Heritage Foundation as the fabrication of the KaravanJoists can only be done by a certified Karavan Artisan.

It was expected that the mentoring and monitoring programme would allow HF teams to fill out Advocacy during the first visit to the IP's project areas. The second, third, and fourth visits would be supplemented with the HF forms to check Base, Walls and Roof.

Unfortunately, due to various reasons, delay in the release of the first tranche and the refusal of IPs and beneficiaries to begin work till the first tranche was released caused considerable delay in the work. Work Progress even after the release of the first tranche was slow, owing to elections, harvesting and sowing seasons, temporary migrations for work etc.

HF Mentoring and Monitoring Teams

Heritage Foundation Mentoring and Monitoring (M & M) teams made visits based on a schedule provided by IOM and IPs. The responsibility of the teams was to attend the training session held by the IP trainers followed by a round of the village. Attending the technical session allowed HF to observe the quality of the training, and assisting/correcting the trainer if he was unable to explain a stage of the construction correctly. The visit around the village allowed HF to assess the quality of construction and aid the beneficiary in site specific problems.

The First round of M&M visits was held between 17th of December and 8th of January 2013. Heritage Foundation Teams made 15 visits during this period. Unlike the previous year, work progress during the first months of the programme was better. Lime had been procured and slaked and excavations were being made. It was found that IPs were better organized and prepared for the project guidelines. A grave problem that emerged from the first series of visits was that of the Implementing Partners lack of understanding of the Loh-khat typology and its method of construction. Therefore as mentioned before, a specific Loh-Khat training session was held at Eco-Village Moak Sharif, to ensure that all IPs working in areas with Typologies B1, B2, B3 and B4 had a better understanding of the techniques.

Upon the release of the first tranche, Heritage Foundation undertook the second series of site visits to all 25 IP areas, based upon a schedule prepared by IOM. The second visits took place during 26th March – 11th April, 2013 and included a technical training session outlining construction techniques and methodology of walls. The visit around the village HF teams could evaluate the IPs performance in terms of quality of construction and materials used. The M&M team could point out mistakes made during the construction which could be rectified before beginning the next stage of construction. Not much progress was achieved between the first and the second project visit, with most beneficiaries having not completed the base.

It was also found that in various villages, layouts had been marked without the use of a layout template, thus there were many inaccuracies with regard to the dimensions of the shelters. Marking with layout templates was demonstrated again at various sites. Heritage Foundation Teams also made rectifications to many excavations which were not in accordance to the technical guidelines laid down. IPs informed that materials was not available or expensive in various regions, and made a specific demand to IOM to increase the funding per unit. This request resulted in an increased grant of Rs. 3000.00 per unit.

Heritage Foundation teams reminded IPs and beneficiaries of the importance of checking construction at every stage with water level, plumb lines and string to ensure that walls being erected would be straight and not leaning. This request was not followed in many villages resulting in slumping or tapering walls. At the time of the visits, walls had not reached beyond the plinth level. (The field monitoring visit reports are placed as Annexure E). In general, it was found that although in some cases there had been some improvement, however, the work was considerably behind original schedule. In many cases where work has proceeded above the base/toe and walls were in hand, the IPs were not able to provide assurance that the base and toes of the walls had been correctly executed below the ground level.

An assessment of the situation was held at HF Karachi office between HF and IOM, when a review of the situation was made. Although not in the agreement, CE, Heritage Foundation offered to hold meetings with the IPs to discuss their difficulties and to work out ways to, as much as possible ensure compliance with the technical requirements. Heritage Foundation also offered to provide demonstration and guidance at the Karavan Mohak Sharif Training Centre. The IP refresher training session also suggested to ensure that all IPs quality of training and construction could be evaluated.

With experience from the previous year, it had been decided earlier that HF M&M visits would be con-

ducted at the conclusion of each stage of work, thus delays in work and release of payments and IOM extension of the programme deadline from February to June 2013 did not affect the number of visits made by HF teams.

It is to be noted that at the time of the last monitoring visits made by HF monitoring teams and the compilation of this report, majority of the IPs had completed work up to walls. Roofs had been installed in at least one shelter in majority of the project villages as demonstration samples. This allowed for Heritage Foundation to be able to assist IPs in understanding the correct methods for tying roofing members and complete the finishing layers of the ORS.

VI. DISCUSSIONS AND EVALUATIONS

The venue of Eco-Village Mohak Sharif, where a set of demonstration segments for various typologies is available, provided an advantage to all participants of the programme. Construction samples and on-site demonstrations from artisans and HF teams allowed IPs to better understand how work on site should be undertaken. A hands-on experience in marking layouts, using construction tools for checking, fabricating bricks, preparing mortars and mixes gave implementing partners a better understanding of the use of vernacular materials. The tour conducted around the village where various structures have been built helped to allay the misgivings regarding construction in HF specified methods. It was reassuring for them to see a large number of houses built by Mohak Sharif households.

These sessions proved useful because on the one hand, an assessment could be made regarding the obstacles that were causing delays, on the other any misunderstandings regarding technical aspects and any other, could be removed. The aim was to help IPs and their beneficiaries find reasonable alternatives that might be hindering progress.

It was reiterated that HF and IOM were working together for the benefit of the communities affected by the disaster. The necessity of following the technical details which were designed for the safety of the households were detailed and since funding was being made available; there was no longer any reason for substandard work. Quality of construction was the essence of the program and, since all beneficiaries were familiar with work in mud/earth, improvement in the technique only was required. All beneficiaries were requested ensure that details and drawings were followed, which would be in their own interest to provide comfort to their families in case of distress.

A basic evaluation of work was developed by HF and shared with IOM and IPs. (See Annexure G)

VII. IP EVALUATION

IP evaluation was conducted during the Refresher Training session. Forms had been specifically developed to evaluate the IPs technical training performance and then corresponded to the assessments of work on site. This allowed for HF and IOM to pinpoint the IPs who were lacking in understanding or ability to conduct training as well as highlight levels of interest of each IP. Evaluation forms were filled in by Ar. Mariyam Nizam, Heritage Foundation; Naheem Shah, Heritage Foundation and Bilal Hassan, IOM. A database with the findings was developed (See Annexure G).

VIII. CONCLUSION

The success of ORS III can be seen after comparison between previous year's Key Findings and Recommendations reports on Filed visits. Problems encountered with regard to technical and material specifications, community mobilization have been significantly reduced. This may well be that all parties involved had

a better understanding of working together as well as the advantages and success of the methodology of construction.

The rains in 2012, which caused heavy damage in various areas of Sindh, did not affect the shelters constructed during ORS II, and were thus dubbed the KatchaKot (Unfired-clay fortress) by project beneficiaries. The title itself was evidence enough that the shelter units had been accepted by the community. While the exquisite renderings implemented by the women of various villages proved that the community had also begun to feel pride and a sense of ownership of their new houses, these acts were also viewed as a positive impact on the most marginalized communities in the country.

The holding of extra technical sessions during implementation provided a platform for exchange and dialogue between the technical and social mobilization teams. It produced better trainers and allowed an atmosphere of friendship and camaraderie between all implementing partners, IOM and HF teams, resulting in better coordination and construction quality.

The improved performance and wide acceptance of BBSVM for IOM'S ORS III may be attributed to the following:

- a. Intensive ToT Theoretical and Field Sessions with greater focus on challenges encountered during IOM'S ORS II program.
- b. Sessions devoted entirely to HF and IOM Teams.
- c. HF Training Sessions with IOM IPs at Eco-Village focusing on specific construction issues, e.g. Loh-Khat training sessions after the first round of visits had been undertaken and final refresher training after round 2 of HF's M&M visits.
- d. Improved coordination between IOM and HF Teams during M&M Field Visits.

As is clear from foregoing, greater number of training sessions by HF for IPs has lead to a vastly improved product. It is our suggestion that training sessions by HF for focal persons at Eco-village Moak sharif will lead to a greater understanding of the requirements which will reinforce the training by IOM's IPs imparted to the beneficiaries.

The sessions are recommended be held before construction of the various stages of the programme is undertaken. The field training sessions held at HF's Eco-village will allow focal persons to observe the demonstration samples, participate in material fabrication while sharing problems specific to their project areas. This may allow better dissemination of knowledge, and reinforce the trainings that have been undertaken by the Implementing Partners.

IOM teams and executives are to be complemented for diligently pursuing the BBSVM manual and drawings, as well as strict supervision of IPs for the execution of the DRR-driven IOM's ORS III program.

According to the Shelter Projects Report 2011-2012 prepared by UNHCR, UNHabitat and IFRC, "The project had significant impacts on the overall national response. By rapidly engaging experienced architects and engineers and mobilizing highly skilled volunteers to conduct technical assessments the organization was able to rapidly produce accurate and usable information as well as proof of concept pilot projects. This was rapidly adopted as a key component of the national response strategy and the UN / government of Pakistan Initial floods response plan and request for funds. In so doing a relatively small but highly experienced technical organization was able to have a significant impact beyond the scale of its own projects. Many beneficiaries spent time to decorate and beautify their new homes as an expression of pride and sense of ownership, giving each house its own individual character" (Case Study A.23, page 77)



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BUILD BACK SAFER WITH VERNACULAR METHODOLOGIES

Annexure A

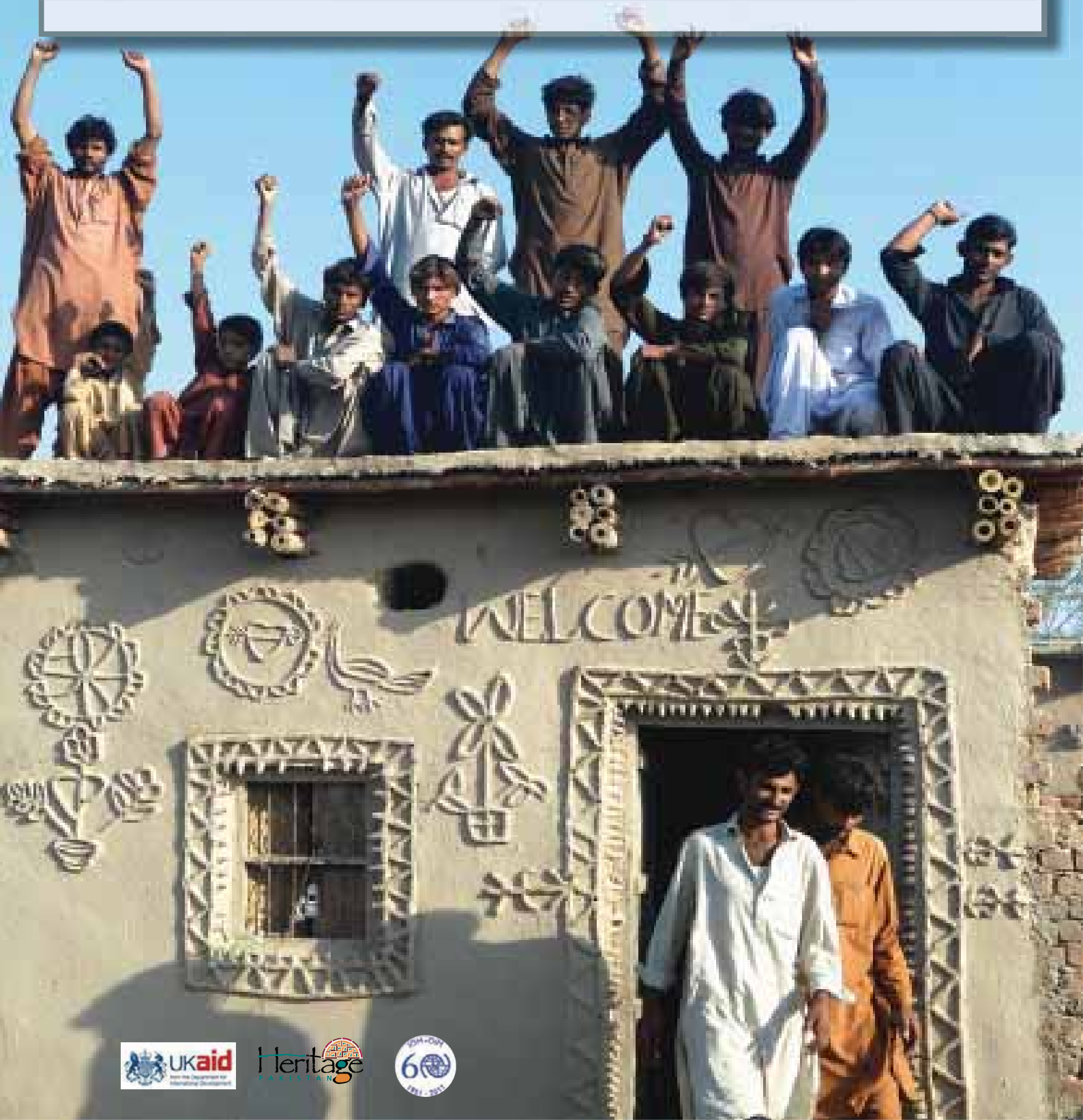
Build Back Safer with Vernacular Methodologies:
Field Survey Report



**HERITAGE FOUNDATION'S
DRR-COMPLIANT SUSTAINABLE CONSTRUCTION**

BUILD BACK SAFER WITH VERNACULAR METHODOLOGIES

DRR-DRIVEN POST-FLOOD REHABILITATION IN SINDH



INTRODUCTION TO HERITAGE FOUNDATION

Heritage Foundation established in 1980 is a Pakistan-based, not-for-profit, social and cultural entrepreneur organization engaged in research, publication and conservation of Pakistan's cultural heritage.

The Foundation has been instrumental in saving a large number of heritage treasures and, as UNESCO team leader 2003-2005, undertook the stabilization of the endangered Shish Mahal ceiling of the 16th c. *Lahore Fort World Heritage Site*.

The Foundation publishes monographs and documents relating to heritage and history of Pakistan as well as guides for heritage safeguarding aspects. It has published a series of inventories of historic assets as *National Register of Historic Places of Pakistan*. In the National Register series, in addition to several Karachi documents listing over 600 historic buildings, documents covering parts of Peshawar, the Siran Valley, Hazara District and Azad Kashmir have been published.

Since 2000, its outreach arm KaravanPakistan has involved communities and youth in heritage safeguarding activities. Since 2005, as part of *Heritage for Rehabilitation and Development Program*, in partnership with Nokia and Nokia Siemens Network, Heritage Foundation has carried out work of rehabilitation of communities, particularly women, affected by the Earthquake 2005 in Northern Pakistan. A 3-year program, supported by Scottish Government Fund, Glasgow University and Scottish Pakistan Association on disaster risk resistance (DRR) focusing on women is currently being carried out in the Siran Valley. The establishment of KIRAT, *KaravanPakistan Institute for Research and Training* in 2008 has helped in carrying out research and training on varied aspect of sustainable construction techniques drawn from traditional materials and vernacular methods. In 2009, the Foundation provided humanitarian assistance to Internally Displaced Persons (IDPs) from Swat; and in early 2010 in partnership with UNESCO-UK Aid, conducted livelihood program in post-conflict Swat based on craft skills for 500 women. The work for post-floods communities includes construction of 400 housing units - the Green KaravanGhar (sustainable low carbon footprint houses) in Swat and Sindh as well as public buildings on stilts in flood-prone katcha area in Sindh, which includes 5 green women's centres, two primary schools, and one health centre, supported by the Scottish Government Fund, Glasgow University, Swiss Pakistan Society, The Tides Foundation and Architecture for Humanity. Since October 2011, a total of 125 sustainable, DRR-compliant shelters and other structures have been built using mud walls and strong safe-haven bamboo KaravanRoofs, the details of which are included in this report.

Recent initiatives include conservation of endangered 19th c. Sethi House, Peshawar for KP Government, the conservation of the Denso Hall (1887), Karachi supported by KESC, saving records of Karachi Municipality dating to 1874 and the Karachi e-Library in partnership with the Consulate General of the Federal Republic of Germany. Other works in 2011 include UNESCO project for tomb of Jam Nizam al Din and a Damage Assessment Mission to World Heritage Site of Makli, Thatta, supported by the Prince Claus Fund, the Netherlands.

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DETAILS OF FINAL REPORT - December 2011

Final Report in pdf form is available from Heritage Foundation.

Section 1: Executive Summary - 8 pages

Section 2: Project Description - 11 pages

Section 3: Process - 11 pages

Section 4: Project Findings - 56 pages

Section 5: Way Forward - 9 pages

Section 6: Survey of Vernacular Methodologies -

Section 7: Analysis of Vernacular Construction - 59 pages

Section 8: Record of Stakeholders' Workshop - 49 pages

Section 9: Annexures - 7 pages

1.0 EXECUTIVE SUMMARY

1.0 EXECUTIVE SUMMARY

1.1 INTRODUCTION

The enormity of the disaster in the aftermath of the 2011 floods requires innovative solutions for providing shelter to a vast majority at an accelerated pace.

The latest figures indicate that at least 0.8 million houses are either fully or partially damaged (PDMA Sindh/OCHA). When viewed in the context of the background of 2010 floods, we know that last year only a fraction of the required housing units could be built due to various constraints. It is clear that conventional approaches are once again likely to prove inadequate in the face of a much greater calamity, where the devastation has spread over a vastly extended area with a much greater number of displaced households.

Clearly, it has become imperative to devise low cost alternative approaches to provide shelter options which would include maximum participation of affected households themselves. At the same time, in view of the danger of annual flooding, it has become increasingly important that DRR capabilities are built-in within the new structures to enable the communities to survive within their original habitat during the course of floods. The strategies and approaches to deal with the present crisis must be worked out with a view to enable the affected households to restart their lives immediately after the waters begin to recede, with minimum dislocation, least loss of life and minimum loss of livestock.

In collaboration with DFID and IOM, Heritage Foundation has undertaken the task of creating a training and implementation framework for innovative architectural/engineering solutions for speedy rehabilitation/reconstruction of shelters, based on DRR cross cutting theme. These methodologies have been developed to enable affected communities, donors and IPOs in undertaking shelter rehabilitation and shelter reconstruction at an accelerated pace. The framework thus developed maximizes participation of households including women by utilizing their own skills and capabilities.

1.2 BASIS OF PROPOSED STRATEGIES

The proposed strategies have been worked out by Heritage Foundation under the guidance of CEO Ar. Yasmeen Lari, in the light of research on construction materials and techniques carried out in various districts of Sindh, as well as experience gained in working in post-disaster communities since 2005

Earthquake in Northern Pakistan. The approach is based on provision of sustainable and low cost options derived from traditional techniques and participatory mechanisms that would lead to attaining immediate shelter by strengthening the capabilities and skills of communities themselves.

The following are the guiding principles:

- a. Utilize **HERITAGE AND TRADITION** for involvement of communities and for fostering pride and self-confidence.
- b. Use **SUSTAINABLE MATERIALS** to prevent environmental degradation.
- c. Use **LOCAL SKILLS AND TECHNIQUES** for speedy delivery.
- d. Incorporate **DRR-DRIVEN METHODOLOGIES** to withstand next flooding.
- e. Utilize **SHELTER PROVISION FOR ENTRÉE** into communities for larger benefits and for initiating women's economic empowerment strategies.
- f. Develop **HOLISTIC MODELS AIMING AT MDGs**: hygiene, WASH, food security, nutrition, literacy.
- g. In the long term **DEVELOP TRAINING MODULES** for Implementing Partners, volunteers, artisans, and communities.

Guidelines for scaling up and speedy implementation are as follows:

- Create an **IMPLEMENTATION STRUCTURE** for speedy delivery.
- Establish **CERTIFICATION PROCEDURES** for artisans for production of technically sound vernacular constructions.
- Form **MOBILE TEAMS** for ease of access to villages.
- Demonstrate **IMPROVED VERNACULAR METHODOLOGIES** through prototype/model units.
- Establish **REPORTING, MONITORING AND EVALUATION PROCEDURES** based on agreed-upon indicators.
- Establish **TECHNICAL BACK-STOPPER ARRANGEMENT** using internet and technology.
- Ensure that each unit has **CERTIFICATION AS A DRR-COMPLIANT STRUCTURE**.

1.3 FINDINGS BASED ON FIELD DATA

The project teams were organized to undertake field work for surveying existing local shelter typologies and vernacular construction methods. The cataloguing of traditional methodologies utilized in Lower Sindh has yielded rare data from all tehsils/talukas of 8 priority districts. The data consists of sketches, notes and photographs of different kinds of structures and other related information regarding selected villages. A brief database of the findings (strengths and weaknesses) of vernacular building



Vernacular construction damaged by standing water.



Partially collapsed mud structure selected by Heritage Foundation for rehabilitation.



Rehabilitated Demo/Model Unit completed during Stakeholders' Workshop.



Woman participating in plastering her own house.

methodologies and materials has been included in this report. From the study of field data it is clear that there are many similarities in the causes of failure, at the same time, the strength and durability of mud walls has also become evident:

- a. **EXTENSIVE USE OF MUD** - layered mud or sun dried brick walls is found throughout Sindh.
- b. **EFFECTIVE SURVIVAL OF MUD WALLS** during floods has been recorded . Most of the time **FAILURE IS DUE TO ROOF COLLAPSE** or disintegration of external mud rendering.
- c. **DISINTEGRATION AT BASE OF MUD WALLS** is among the causes of wall collapse.
- d. **REED WALLS HAVE SURVIVED WELL**, especially if they are treated with mud plaster.
- e. **CIRCULAR PLAN-FORM AND CONICAL ROOF HAVE SURVIVED WELL**, when they are well built.
- f. **ROOF CONSTRUCTION IS GENERALLY UNSATISFACTORY**. It is particularly **DANGEROUS WITH RSJ GIRDERS** when they are placed without due precautions.
- g. **UNSCIENTIFICALLY CONSTRUCTED ROOFS UNABLE TO PROVIDE REFUGE** during floods and are not strong enough.
- h. **SURVIVING ROOFS OFTEN CONSIDERED UNSAFE BY RESIDENTS**. Even the newly constructed roofs are not strong enough to withstand live load of people, thus adding to displaced population. Therefore a great deal of **EMPHASIS IS NEEDED TO MAKE ACCESSIBLE, SAFE ROOFS**.
- i. Considerable deterioration in skills has been noted particularly in Tharparkar's Chora roofs when these are built in other districts. Thus, **SKILL TRAINING IS REQUIRED IN VERNACULAR METHODS** of construction.

1.4 RECOMMENDATIONS FOR SHELTER

The shelter strategy, based on one safe room, to deal with the 2011 flood devastation, should aim for the following:

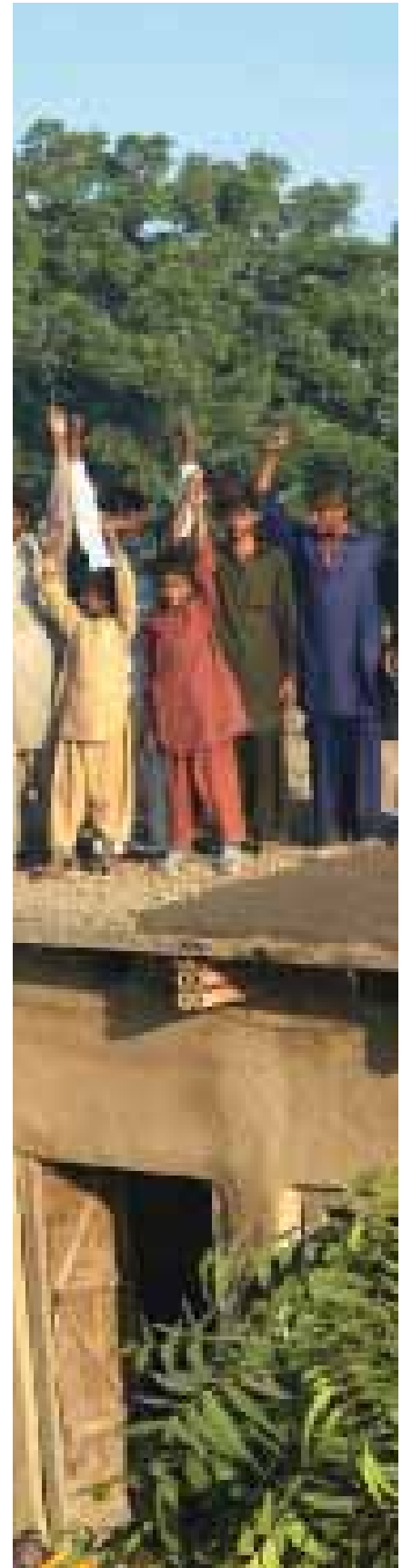
- a. **REHABILITATE SURVIVING MUD WALLS** as much as possible, with suggested treatments through provision of technical guidance.
- b. **Introduce Sustainable DRR-driven Roofs** for providing safe haven during floods by training local artisans.
- c. In the case of complete loss of structure, **USE SUN-DRIED BRICK OR LAYERED MUD WALLS** and DRR-driven KaravanRoof in readiness for next floods.
- d. **ENCOURAGE WIDESPREAD USE OF LIME** for weather resistant roof and wall renderings. This will prolong the life of all structures.

- e. **ENSURE ONE ACCESSIBLE DRR-COMPLIANT ROOF.** Households can build extra verandahs/rooms with the debris and salvaged material such as logs, timber and RSJ joists etc. along with provision of technical help.
- f. In view of lack of toilets, as a first step, **INCLUDE COMMUNITY TOILETS**, with mud walls and bamboo roofs.

1.5 ADVANTAGES OF THE APPROACH

The following are the advantages of this strategy:

- a. This approach makes people part of working out their own solution with added benefits in fostering pride and encouragement to take charge of their own lives.
- b. The involvement of communities in construction of their own shelter on the one hand fosters pride, on the other hand engages them in productive work, forestalling a culture of apathy and dependence.
- c. Since indigenous materials or locally produced items are being utilized, this results in quick economic regeneration within affected communities.
- d. The main material, the clay soil, is available in abundance. It is at no cost and can be used either as layers of mud or sun dried brick, both of which can be made by families themselves.
- e. Lime is available in abundance in Haiderable region.
- f. The bamboo for DRR-driven KaravanRoof is a fast growing reed, and is widely available in Sindh at a reasonable cost. By training local artisans the production of these roofs will provide local workforce with livelihoods.
- g. The DRR-driven KaravanRoofs, because of their strength have been designed for refuge during floods. At the time of writing over 50 roofs have been tested in District Tando Allahyar and another 69 roofs in various talukas of Lower Sindh - all tested with 15 persons each or more than 750 kg load.
- h. Partially collapsed houses with mud walls can be rehabilitated within one-day-and-a-half. Those that are begun from scratch require 3-4 days in construction.
- i. The resultant product is economical and will help in providing shelter to many times more than possible through conventional methodologies.
- j. Mud structures, especially with the use of lime renderings become well insulated and provide comfortable habitat.
- k. The use of local materials ensures that women are able to continue to contribute in home-making. Thus, each house is personalized and acquires its own identity.
- l. Extensive use of lime, bamboo and mud provides eco-friendly habitat, providing comfort in Sindh's extremely hot climate.



A newly stabilized house, being tested by the family for strength to use as refuge during floods.



Retrofitted and rehabilitated houses with strong DRR-driven KaravanRoofs.

1.6 IMPLEMENTATION

Emphasis on training and capacity building will be essential for successful implementation of the programme. The following training programmes are envisaged:

- Workshops for master trainers, master artisans, and artisans.
- Workshops for Mobile Barefoot Karavan Teams.
- Workshops and mentoring arrangement for other partners.
- Workshops for Heritage Control Centre Personnel

Awareness in DRR measures and sensitivities towards gender empowerment and conflict resolution measures will be built-in in the learning outcomes of the training programme.

Throughout the programme, a mechanism of quality control and certification will be put in place, for which **MOBILE BAREFOOT KARAVAN TEAMS (MBKT)** will be trained for field work and monitoring, in coordination with **HERITAGE CONTROL CENTRE (HCC)**. HCC will develop training modules, technical guidance and information, as well as liaison with CSC, MBKT and Implementing Partners.

For smooth functioning of the project and transparent procedures, the disbursement of funds will be the responsibility of the Implementing Partners, and will be distinct from training, monitoring, evaluation and certification, which will be the responsibility of Heritage Foundation.

We are confident that based on improved vernacular construction techniques incorporating DRR methods developed by Heritage Foundation over the years, these sustainable and economical options will provide the critical direction for communities to become strong, self reliant and resilient. The implementation procedures through a process of certification and several monitoring tiers will ensure that all shelters constructed using Heritage Foundation methodology will have strong walls and safe haven KaravanRoofs for safety during next floods. In addition to safety of life, other DRR methodologies being recommended by Heritage Foundation, will provide safety of rations, potable water, livestock and fodder. Such interventions, comprising raised earthen platforms, will also provide the much needed sports and cultural nodes, which we are confident, will lead to transformation in the lives of village communities.

YASMEEN LARI, S.I.

Chair & CE, Heritage Foundation

Hon. Project Director, HF-DFID-IOM Shelter Project for Sindh
Karachi, December 2011

2.0 PROJECT DESCRIPTION

2.1 THE NEED FOR DRR

The 2011 floods have caused great devastation in the Indus Basin. A total of more than 9 million people have been affected by the floods, of which 0.8 million homes have been reported to be fully or partially destroyed.

It is evident that the current methods of disaster management do not give enough emphasis on participatory methods of rehabilitation and disaster resistance. Thus, many interventions from previous disasters have not proven to be effective enough during 2011 floods, with loss of both lives and livestock.

In addition to the reports from the NDMA, the Temporary Settlement Support Unit's assessment of rehabilitation efforts corroborates the fact that disaster management continues to be focused on immediate solutions, rather than long term strategies.

In consultation with project partners, the Heritage Foundation took up the task to demonstrate its DRR driven model to *Build Back Safer with Vernacular Methodologies*, in all 35 Tehsils/Talukas of 8 priority districts of Sindh.

2.2 PROJECT CONCEPTUALIZATION

The shelter project has come about as a result of the experience gained by Heritage Foundation over last several years in responding to the needs of post-disaster communities.

The situation for communities became aggravated due to the large number of people that were displaced by the 2010 and 2011 floods in Pakistan. Of those displaced in 2010, less than 15% of families have been provided with shelter and there has been much suffering with growing deficits in health, literacy and livelihoods.

Due to DFID's interest in Heritage Foundation's DRR driven strategy: *Build Back Better with Vernacular Methodologies*, IOM, being the lead in shelter, provided the necessary support that enabled HF to carry out an extensive review of the kind of vernacular structures prevalent in Southern Sindh. Deriving its design philosophy from heritage and traditions, Heritage Foundation was able to promote its low cost improved vernacular methods for shelter construction with DRR cross cutting theme. Thus, model/demo units in 35 tehsils of 8 priority districts were constructed to propagate the value of strengthened mud walls and safe haven KaravanRoof.



Above. Destruction caused by flood waters.

Right. Table listing the names of districts and tehsils/talukas comprising the project area.



Map of Sindh by PDMA-OCHA.

2.3 PROJECT AREA

The project area consists of 8 districts that have been declared as being the most affected by excessive rains in 2011. Where in most parts due to lack of drainage this resulted in flooding, there were some areas where the rains played havoc with the house structures. In both cases, people were displaced from their homes.

The table below shows the tehsils/talukas where the work of survey of vernacular methodologies and construction of model/demo units was undertaken during the project period from October 10 to 27 November, with report finalization by 8th December, 2011.

District	Tehsil
BADIN	Badin, Matli, FazliRahu, Talnar, TandoBago
MIRPURKHAS	Mirpurkhas, Husain Baukshsh Mari, Sindhri, KotGhulam Mohammad, Digri, Jhuddo
BENAZIRABAD	Benazirabad, Qazi Ahmad, Sakrand, Dour
SANGHAR	Sanghar, Sinjhor, Tando Adam, Khipro, Shahdadpur, Jam Nawaz Ali
TANDO ALLAHYAR	Tando Allahyar, Chambar, Jhando Mari
Tando M. Khan	Tando M. Khan, Bulri Shah Karim, TandoGhulamHyder
Tharparkar	Chachro, Nagarparkar, Diplo, Mithi
Umerkot	Umerkot, Samaro, Kunri, Pithoro

2.4 PROJECT DESIGN & PROCESS

The two distinct stages of the project were carried out by two separate field teams, while the data and report compilation was completed by a team in HF's Karachi office.

The survey of vernacular methodologies that was carried out by the Survey Team while the Workshop (DRR Awareness) and Building Demonstration was conducted by the Construction Team. Both teams were lead by their own team leaders who were responsible for identifying one village in each tehsil. Since all villages had been devastated, it was a difficult task to identify one as being the most representative.

THE SURVEY TEAM consisting of student volunteers, was lead by Architect Zulfiqar Noor. The team documented the existing

conditions of the site and structures, through filling out a survey form. In addition through sketches and photographs, defects were recorded in greater detail to allow more in-depth analysis of the correlation between structural systems and damage. An extensive library of images has been developed during this seed project, so that surveyors could be trained on how to identify structures and defects

THE CONSTRUCTION TEAM consisted of student volunteers accompanied by a team of artisans and was lead by the Project Manager Mr. Naeem Shah. The Construction Team was responsible for conducting Stakeholders Workshops and Building Demonstration at selected villages. Workshops have created awareness for DRR, and building demonstration has educated villagers how to strengthen mud walls and incorporate safe haven roofs so that they are resilient to disasters. These are described in greater detail as part of a description of the HF approach to DRR.

2.5 TIMELINE

From 10th October, Heritage Foundation organized mobilization of human resources and resolving field logistics. Arrangements for student volunteers, building artisans and transport and accommodation were completed within a week. After a workshop conducted by Ar. Yasmeen Lari, the Survey Teams began work on the 17th of October. The field survey of all 8 districts, covering 35 tehsils was completed in a period of two weeks. Compilation of data and its analysis was carried out throughout the project period.

Through daily communication with the Head Office, data collection and organization of the database was an ongoing process. From the beginning work was undertaken on developing DRR techniques for post-flood communities, mobilizing master artisans as well as procurement of material for construction.

Armed with a complete set of drawings and after a training workshop conducted by Ar. Yasmeen Lari, the Construction Teams were dispatched to begin demonstrating DRR driven vernacular methodologies for rehabilitation and construction. Villages were strategically selected to conduct stakeholders workshops and for the making of two HF Demo/Model Units as part of shelter construction demonstration.

Findings, analysis and project updates were also compiled in a speedy manner for the first Interim Report that was presented to



Student Volunteers participating in discussions with the Team Leaders.



View of safe-haven KaravanRoof being installed.



Placement of bamboo purlins on bamboo joists.



View of another KaravanRoof under construction.



Community members examining posters during workshop, Chachro, Tharparkar.



View of a Stakeholders' Workshop held in Mithi, Tharparkar.



A large number of women attending a Stakeholders' Workshop, Kunri, Umerkot.



Gathering in Stakeholders' Workshop in Jhando Mari, Tando Allahyar.

IOM on 28th October, 2011. A second Interim Report was submitted on 7 November in order to present findings for large-scale distribution to shelter cluster by IOM. At the completion of the all aspects of the project, the final report was presented on 15th December 2011. The present document is based on the findings and analysis presented in the final report.

The Project was thus successfully started and completed within the stipulated time. Altogether 170 homes were surveyed, 35 workshops were conducted and 68 units were rehabilitated and 1 built from scratch as part of the HF Demo/Model units. This far exceeds the target number that was proposed in the funding proposal to IOM and has been managed well within the time and allocated budget.

It is important to note that the Heritage Foundation commenced work in the first week of October in village Mohak Sharif where one house was built using IOM funding, while another over 50 units and experimentation for DRR Methodologies has been carried out through the Foundation's own resources. In addition to the input by the Foundation, the good will of volunteers, local landlords and villagers has contributed greatly to the success of the endeavour. The project has successfully demonstrated the willingness of all stakeholders to collaborate for early response and relief for post disaster communities.

WORKSHOPS AND MODEL UNITS WERE COMPLETED IN A 7-WEEK PERIOD – THEY ARE MENTIONED IN MORE DETAIL IN PARAGRAPH 2.7.3: STAKEHOLDERS' WORKSHOPS & BUILDING DEMONSTRATION.

2.6 HF'S DRR-DRIVEN PROCESS

The **HERITAGE FOUNDATION DRR-DRIVEN MODEL FOR REHABILITATION** has been devised in order to provide speedy assistance to households returning to their homes. The greatest need at this time is to help families build their shelters as quickly as possible that are also safe with accessible roofs through provision of required technical input. Among the important aspects is that funding should be directed towards DRR aspects enabling communities to survive the next floods and to remain safe in their own homes without being displaced.

In order to provide fast and effective shelter components, an understanding of local techniques of construction and locally available construction materials is essential to devise methodologies

for improved vernacular construction.

The HF model for DRR has been developed and tested through interventions since the 2005 earthquake, 2010 floods and again in the 2011 floods. The model proposes a holistic solution to disaster risk resistance for vulnerable communities by providing timely, appropriate and sustainable means for rehabilitation and reconstruction.

The aim of Heritage Foundation is to provide technical solutions which will result in improved vernacular building techniques, and to engage and train skilled artisans in order to maintain, repair and build improved vernacular structures. In order to engage the community, workshops and demonstrations have been conducted, to create awareness and pride in local building materials and methodologies. In addition, over the years of humanitarian work, the Foundation has proved that once having made an entree through shelter construction, it has been able to bring about large-scale improvements in community life through a holistic approach encompassing clean water supply, hygiene and health, literacy, permaculture and livelihood through crafts.

2.7 COMPONENTS OF THE PROJECT

- The following components of the project have been developed and implemented as part of the response to the 2011 floods;
- a. Recording existing vernacular methodologies to form the basis for shelter construction recommendations.
 - b. Retrofitting and remedial measures to incorporate disaster risk resistance components.
 - c. Stake-holders Workshops & Building Demonstration to include awareness campaigns. Construction of demo/model units to demonstrate the techniques for strengthening of mud walls and safe haven roofs for taking refuge during floods.
 - d. DRR-driven community structures to provide life safety, food safety, water safety, livestock and livestock feed safety in preparation for next flood disaster.

2.7.1 RECORDING VERNACULAR METHODOLOGIES

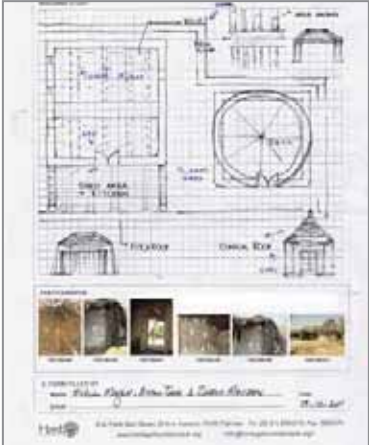
The focus of this survey was to document local building techniques in rural areas to assess the efficacy of vernacular construction. A survey of intangible heritage, e.g. folklore, folk dance, oral histories, should be included as part of future studies to develop a



Prefabrication of bamboo joists in progress..



Demonstrating mixing and use of lime.



Survey forms with sketches and photographs of vernacular construction, duly filled and digitized for analysis.



Collapse of ill-built roof structure.



Above. Major crack in the supporting mud wall due to the point load of a steel girder.

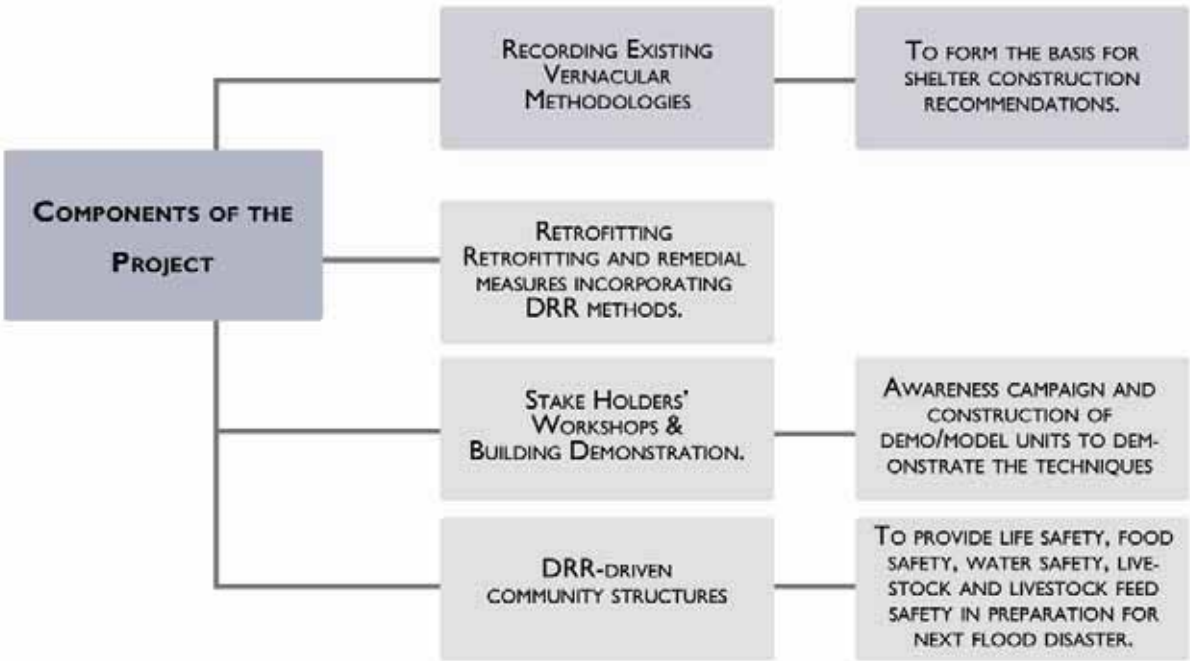
Below. Diagram showing components of the Project.

comprehensive understanding of the communities in the area. As part of creating awareness and appreciation for national heritage, Heritage Foundation believes in engaging the youth while working for rehabilitation of post-disaster communities. To this end, the Foundation has built up networks with local universities.

The project has provided a rare opportunity to student volunteers to gather valuable information from largely inaccessible areas. It has also facilitated their interaction with rural communities to develop a greater understanding of issues that confront them.

At the outset, a workshop by Hon. Project Director, Ar. Yasmeen Lari and the carefully designed form provided them with the procedures to be followed when working with communities. Care was taken to provide a framework for qualitative data obtained in the field to be documented as part of data collection on the condition of vernacular structures, consisting of sketches, photographs and notes. The completed forms were reviewed by the team leader before being sent to the Head Office for compilation and evaluation.

The main purpose of the field survey was to record those vernacular elements that have survived as well as record of other structures, both old and new, that have collapsed. These surveys have formed the basis for analysing the strength and weaknesses of various types of vernacular structures, as well as those structures that have been built in the recent past. The surveys also show the inappropriate use of steel girders, causing failure of many of the roofs and supporting structures.



2.7.2 REMEDIAL MEASURES WITH DRR METHODS

Heritage Foundation believes in following the heritage principle of retaining and preserving all that is valuable. Along with methodologies for the preservation of remains, ways of retrofitting through interventions have also been detailed in order to stabilize surviving structures.

It has been established that most communities are skilled in the use of vernacular materials for construction of their dwelling: a skill that has been acquired over several centuries. After the flood waters receded it was observed that many damaged mud walls have survived. This led to the conclusion that structurally stable mud walls must be repaired and strengthened as well as protected through weather resistant lime mortars.

A. RETROFITTING/REHABILITATION PROCEDURES

For walls that have been damaged but have survived, and are structurally stable, methods for retrofitting procedures, including crack repairs in mud walls and strengthening their base has been effectively demonstrated.

B. NEW DRR-DRIVEN ADOBE CONSTRUCTION

Where walls have entirely collapsed and are completely irretrievable, 18" thick sun dried brick walls or layered mud walls are recommended to be undertaken for immediate construction. Detailed drawings indicate the care that needs to be taken in construction to make them strong and able to withstand future flooding.

C. DRR-DRIVEN SAFE HAVEN/KARAVAN ROOF

The reason behind the collapse of many houses is the unsatisfactory and unscientific construction of roofs. Most roofs were found unable to take their own load let alone the load of family members during floods. The surveys proved that mud walls are strong enough to take the load of a DRR-driven roof. This finding is important since it is essential to provide a roof which can form a safe haven during flooding. For this purpose tried and tested bamboo roof, the KaravanRoof, is being recommended.

The Karavan Roof has been developed by Heritage Foundation through a lot of experimentation and practical application in Northern Pakistan. Almost 300 houses built in Swat have withstood the load of 3'0" of snow. In over 50 shelter units built in Village Mohak Sharif in Tando Allahyar, all these roofs have been tested with the load of 15 persons, thus making them entirely accessible and suitable for refuge during flooding.



Procedure for rehabilitating a highly damaged wall.



Crack repairing procedure using bamboo lattice being demonstrated.



Fixing of bamboo lattice on the damaged area of the wall.

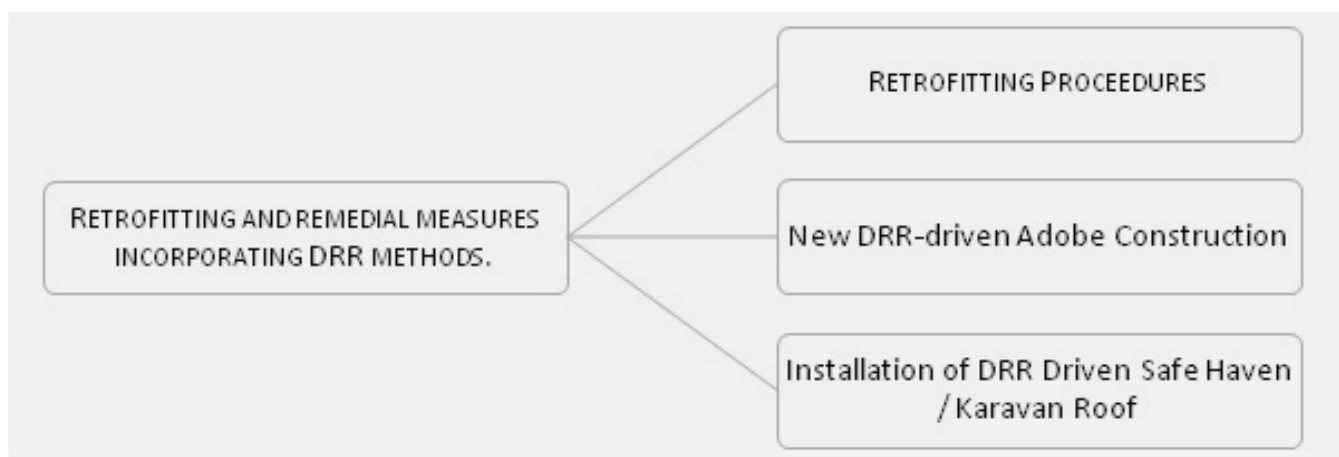


Mud plaster being applied over bamboo lattice, thus saving a damaged wall.

Each time a roof is installed, the family is encouraged to assemble on the roof to test it for loading. The activity of demonstrating construction materials and methodology has provided pride and confidence in communities in rural areas. The act of participating in construction reinforces faith in traditional techniques and skills providing them with a safe haven during floods.

Heritage Foundation has trained a number of master artisans in the fabrication of the KaravanRoof, and continues to undertake the training of local artisans for income generation through building activity.

Below. Process of DRR-compliant construction using vernacular methodologies.



Stakeholders Workshop conducted in Mohak Sharif, Tando Allahyar.

2.7.3 STAKEHOLDERS' WORKSHOPS & BUILDING DEMONSTRATION

AWARENESS CAMPAIGN & CONSTRUCTION OF DEMO/MODEL UNITS TO DEMONSTRATE TECHNIQUES FOR REHABILITATION AND NEW CONSTRUCTION.

In each tehsil efforts were made to choose one through which a widow, orphan or a disabled person could get a house. A preliminary schedule of workshops was issued after the field surveys for the sites where stakeholders' workshops and building demonstration would be carried out.

The first workshop was held on Thursday 27th October 2011 in TandoAllahyar in Village Mohak Sharif. The schedule for workshops and building demonstration was widely circulated through Google groups and shelter cluster. It was attended by approximately 150 men and 70 women comprising the local community, area notables, neighbouring villages as well as Board Members of Heritage Foundation from Karachi, and representatives of UN Habitat and a political party as well as student volunteers. Stakeholders Workshop and Building demonstrations were con-

ducted in all 35 tehsils of the 8 priority districts. For Building Demonstration the Construction Team built a HF Demo/Model Unit to demonstrate the techniques for DRR driven rehabilitation and new construction.

During the workshop the background and methodologies being adopted were explained to the audience. Demonstration of joints was given and construction methods used in the almost finished reconstruction of a house were also explained. Before the workshop was held, the structures were completed up to roof level and some of the bamboo joists were also placed in position. At the time of the workshop the remaining bamboo joists were placed and the process of completion of the roof was demonstrated.

For construction of demonstration units, Heritage Foundation has brought together master artisans and artisans from various parts of Pakistan who have been previously trained by the Foundation in the construction of Green Karavan Ghar in Swat, Mansehra, Siran Valley, Mardan and Khairpur. The trained artisans act as team leaders while local artisans are being engaged on daily wages to be involved in construction of model units. Mohak Sharif Village was also the site for the first HF Demo/Model Unit construction, from ground up, to provide an example of new build in sun-dried brick with all DRR factors built in, in order to make the house flood and weather resistant.

Construction work included a slaking pit for lime at each village. Soil samples were also collected in each village for soil analysis.

The demonstration of techniques to make the structures strong and flood resistant has encouraged others to begin making mud walls with the suggested precautions. It has been noted that villagers have spread the word by mouth and other residents have come to observe and learn from the construction of HF Demo/Model Units. Some villagers have travelled to adjacent villages to instruct in reconstruction. Convinced by the strength of construction and encouraged by the ease and low cost of construction the HF Demo/Model Unit has brought about confidence in mud walls that are now being taken up for construction by villagers themselves. This has been heartening to see, but must also be monitored and checked for quality in the operation of this scheme. It is therefore Important that training units are established as soon as possible to instruct and certify local artisans. This is to ensure that the houses being built follow prescribed DRR-driven methodologies.



View of Stakeholders' Workshop being conducted.



Demonstration of vernacular building methodologies for artisans and villagers.



Training Workshop attended by volunteering students.



Women's interest in Stakeholders' Workshops.



Safety of food and drinking water - DRR-compliant raised earthen platform, Mohak Sharif, Tando Allahyar.



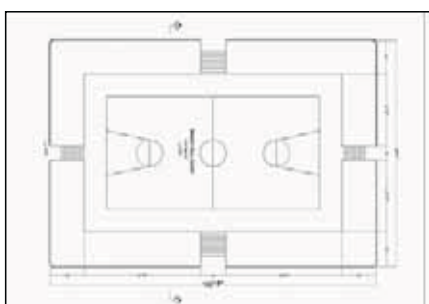
Safety of fodder - elevation of raised earthen platform as cultural activity area.



Earthen platform as a cultural node, to provide safety for livestock feed.



Elevation of basket ball court on an earthen platform - safe haven for l



Basket ball court designed as an elevated earthen platform - safe haven for livestock.

2.7.4 DRR-DRIVEN COMMUNITY STRUCTURES

In her writings Ar. Yasmeen Lari has spelt out the essential DRR-driven community structures to provide safety of life, food, water, livestock and livestock feed in preparation for the next floods. Clearly, in flood-prone areas, it is imperative to provide human security and security to assets, food and water sources to enable families, particularly women and children, to avoid displacement.

Following are the necessary components that need to be built-in to any strategy that is being formulated for early recovery and/or rehabilitation of disaster prone communities.

A. SAFETY OF LIFE

By introducing DRR-driven roof structure – the KaravanRoof – the households can find refuge on the top of the roof during the next flood. At the time of rains additional components can be added, for example, bamboo posts and tarpaulin to provide protection from rain on top of the roof.

B. SAFETY OF FOOD RATIONS

Among the most tragic aspects of floods has been the loss of meagre food rations that the communities possessed. The rations must be saved from being washed away or spoilt during floods. Normally, the family stores its grain in silos. These used to be made of clay but are now available in steel cylinders. Grain must be protected from standing water by placing the silos on a higher level, on earth platforms.

C. SAFETY OF DRINKING WATER

During flooding, water borne diseases are among the chief causes of disease and mortality, especially child mortality. Earthen platforms need to be built to keep water pots or containers well above the flood water level. Water should additionally be treated with chlorine, aqua tab or other purifiers. The Heritage Foundation is actively collaborating with Swiss Pakistan Society (SPS) to bring sustainable and safe methods for water filtration and purification to rural areas.

D. SAFETY OF LIVESTOCK – ELEVATED SPORTS GROUNDS

The worst tragedy in any rural family's life is the loss of their livestock. For this purpose dual purpose elevated sports grounds are being proposed. The ground serves as a place to provide refuge to livestock in case of floods as well as serve as a level playing field for children. In most villages there are hardly any sports grounds, and such a spatial intervention additionally serves to strengthen community spirit. Such recreational spaces will bring about a transformation in the lives of villagers and particularly the youth.

E. SAFETY OF LIVESTOCK FEED – ELEVATED CULTURAL NODES

Along with livestock it is also important to save the straw and other feed that is necessary for the survival of the livestock. A smaller platform is suggested that may be used to safeguard fodder in floods, and otherwise be used as a stage for performance or gathering space.

Usually, there is no space in the village that may work as a public square for the gathering of people. If mud platforms can be erected, they can act as stages for performances and as assembly spaces for the community, thus making them into cultural nodes.

F. COMMUNITY BUILDINGS - PRESERVE HERITAGE & CULTURE

Throughout our work in post disaster communities, Heritage Foundation has responded to the needs of women and communities by building special centres where assemblies could take place. These become the basis for women's empowerment and enabling community activities. In Khairpur Heritage Foundation has built several centres e.g. women's centres for crafts, school and dispensary have been constructed on stilts after the 2010 floods. These elevated, floating buildings have become a source of pride and have provided refuge to the vulnerable groups during the 2011 floods.

2.8 LOGISTICS

2.8.1 LIAISON WITH LOCAL UNIVERSITIES

An invitation was sent out to architecture departments in universities in Sindh and there was very good response received. It was decided that two universities who have earlier taken part in Heritage Foundation activities should be invited at this stage, that is, University of Karachi and Mehran University in Hyderabad. Since time was short, those who had experience in working in remote areas and with disadvantaged communities with Heritage Foundation were likely to get acclimatized more quickly were more likely to carry out this demanding assignment.

2.8.2 LIAISON WITH NOTABLES & COMMUNITIES

Even before undertaking the joint HF-DFID-IOM Shelter Project, on invitation of the notable landlord of the area, Mr. Mahmood Shah, the Heritage Foundation had begun to work on the rehabilitation of housing units in the minorities' communities residing in village Mohak Sharif, where the water had receded after three weeks. This had provided the base where not only experimentation could be carried out but some of the solutions could also be tested. The first workshop for artisans, volunteers were held



Community building on stilts built by Heritage Foundation in village Darya Khan Shaikh, in katcha area, Khairpur.



A view of stilts, ground floor of community building being utilized by children, Darya Khan Shaikh, Khairpur.



The village of Mohak Sharif. Festivity on the occasion of Stakeholders' Workshop.



Construction Team helping villagers, during construction process.



Model shelter constructed with sun-dried brick and KaravanRoof.



Review of work by Hon. Project Director, village Mohak Sharif, Tando Allahyar.



Team leaders and student volunteers with Hon. Project Director, Mohak Sharif.

here, and the first HF Demo/Model Unit was constructed from scratch in the village.

Safe accommodation for volunteers and artisans, although by no means lavish, was arranged through hospitality of Mr. Mahmood Shha and the villagers in Mohak Sharif. Beyond this point, Survey and Construction Teams had to make arrangements for lodging as they moved to different tehsils that were too far away.

2.9 CONSTRAINTS FOR SURVEY & CONSTRUCTION TEAMS

The law and order situation in the interior of Sindh was a cause for concern. This was particularly worrying since the teams consisted largely of young people among whom were five girl students. We had hoped that the strategy of operating in a low key manner would provide the necessary security.

Among other major problems was the lack of adequate accommodation in all tehsils/districts, for which solutions had to be found by the team leaders. Clearly, the accommodation located was quite modest but turned out to be safe.

The area to be covered was also vast. The most difficult to cover were the remote areas such as Umerkot and Tharparkar districts. It is important to note, that these areas are so remote that they are rarely visited and the findings in vernacular building methodologies were exciting and illuminating.

Because of the remoteness of most of the areas and lack of internet connectivity, the information had to be sent through special couriers to the Heritage Foundation's Karachi office who were tasked with speedy compilation. Thus, the time for the work was extremely short, which was all the more strenuous due to loss of several days because of the Eid holidays.

2.10 CONSTRUCTION OF MODEL/DEMO UNITS

2.10.1 SOURCING MATERIALS

Among the first tasks that was to assess the availability of and use of materials such as lime for better weather resistance on walls and roof and of bamboo for constructing strong DRR-driven roofs. As important components which form the basis of the proposed shelter construction, availability was explored in local markets before undertaking construction work. From investigations that were carried out by the Heritage Foundation, in District Tando

Type of Construction	Safe Haven / Karavan Roof	Time / Unit	Cost / Unit PKR	Cost / Unit USD
Rehabilitation / Retrofitting	Yes	1.5 Days	Rs. 16,000/-	\$ 180/-
Rehabilitation / Retrofitting	Yes	3.5 Days	Rs. 30,000/-	\$ 348/-

Allahyar in early October 2011, it became clear that bamboo is widely grown in Southern Sindh. It has also been noted that lime factories abound in the region. In addition to local clay soil, these are the two main elements in achieving the required quality of construction, clearly construction work could proceed speedily and without any hindrance.

Compared to burnt brick (cost of second and third quality is Rs. 4 each), the mud brick could be made locally by the families themselves or if bought, would cost only Rs. 1 each.

2.10.2 DEMO/MODEL SHELTER UNITS

To reconstruct houses that have collapsed entirely, drawings have been prepared with details of construction with sun-dried brick or layered mud. It is suggested that such houses should also use the DRR-driven Karavan Roofs in order to ensure that each family has a safe haven in case of floods. All HF Demo/Model Unit have been constructed with sun dried bricks.

2.10.3 REHABILITATION PROCESS

It is estimated that the walls of at least 30% of the houses are partially standing which can be rehabilitated. In some villages this proportion is higher than in others.

In the work that Heritage Foundation has carried out in the village Mohak Sharif in Tehsil Tando Allahyar, these houses were rehabilitated within a day and a half through guidance and help. A whole rehabilitated house including the DRR-driven Karavan Roof can become safe haven at a maximum cost of Rs. 16,000 (cost of material and labour is estimated at Rs. 13,000, with extra provision for transportation).

2.10.4 FABRICATION OF KARAVANROOFS

In view of the low cost and strength required for accessibility on the roof it was decided to use DRR-driven KaravanRoofs for demo/model units. The methodology being followed by Heritage



DRR-compliant rehabilitated unit with lime rendering, ground toe and Karavan-Roof.



Damaged wall that is structurally stable and can be rehabilitated.



Prefabricated bamboo joists being transported to other locations for use in demo/model units.



Top. A collapsed structure after floods.
Above. The same house after rehabilitation through DRR-driven interventions by Heritage Foundation.

Below. A highly damaged structure.
Bottom. The same house after rehabilitation.



Foundation ensures that the quality and standards are maintained in the production of the main roof members.

The **JOISTS FOR THE ROOFS** were all prefabricated into correct sizes at the workshop established at Tando Allahyar.

KITS FOR EACH HOUSE were prepared that include the following:

- Required numbers of 4-bamboo or 6-bamboo joists
- Required numbers of pre-cut purlins
- Required number of bolts, plates and other hardware
- Matting and plastic sheet for roof covering
- Lime
- Necessary tools and implements

2.11 REPORTING AND MONITORING

Reporting was done directly to the Heritage Foundation's Karachi Office on a day to day basis so that information collected could be shared and analysed quickly to develop appropriate building techniques.

In addition to this direct reporting allowed the Office to monitor the progress of the field teams and to facilitate where possible in any logistical problems encountered in the field.

As internet coverage was weak and inaccessible in most flood affected areas messengers were used to periodically carry filled survey forms and the collection of photographs in CDs and USBs to the Karachi Office.

2.12 DATA COLLECTION AND ANALYSIS

The work of compiling the data collected from completed Survey Forms and collection of photographs was an ongoing process during field survey and continued well after the field survey was completed.

A series of databases were made that summarized findings and analysis of roof and wall systems as well as interventions proposed.

3.0 FINDINGS & RECOMMENDATIONS

3.1 PROJECT ASSESSMENT

The findings and recommendations are based on the results of the field survey of vernacular techniques used in the different districts of Southern Sindh. Due to the time and resource constraint, one village in each tehsil was visited. These findings represent the general construction techniques and forms utilized in different villages visited in the respective districts.

The work of compiling the data collected from completed Survey Forms and collection of photographs was an ongoing process during field survey. The final report comprises a series of catalogues and databases compiled through data cleaning process.

A. CATALOGUE OF VERNACULAR BUILDING METHODOLOGIES

The catalogue is a record of tehsils and villages and the number of houses surveyed. Care was taken to include photographs for individual dwellings in the Catalogue that would illustrate the context of the structure, important structural detail and roof system.

B. ANALYSIS OF VERNACULAR CONSTRUCTION

This catalogue showcases the various types and combinations of roof and wall structural systems found. In addition to this, a brief analysis of the damage caused by the rains and flood has also been included. Structures that have survived well in the disasters have been included as an example of good practice in vernacular building methodology.

C. STAKEHOLDERS WORKSHOPS

This section records the construction of demo/model units and beneficiaries in each village, building demonstration, the number of people who attended the workshops and general observations about living conditions in the villages.

D. DATABASE OF FINDINGS

This section is a record of findings and analysis of wall, roof and community structures. The detailed list of findings has been illustrated by photographs and includes an analysis of the strengths and weaknesses found in existing vernacular building methodology for different structural elements.

E. DATABASE OF INTERVENTIONS

This section is based on recommendations for dealing with structural and non-structural defects comprising a database on appropriate interventions. Sketches and technical drawings illustrate the process of rehabilitating and improved vernacular construction.

3.0 PROJECT FINDINGS / RECOMMENDATIONS



Excavation & tamping for firm ground.



Laying mud brick in mud mortar in plinth.



Sun-dried brick wall construction.



Making a mud toe at base of mud wall.



Placing bamboo reinforced lime concrete ring beam to receive bamboo joists.

3.2 OUTCOME OF CONSTRUCTION

3.2.1 REMEDIAL MEASURES | SUCCESS

The Heritage Foundation began carrying out implementing technical improvements in the Village Mohak Sharif in early October 2011. This allowed the HF technical input to be tested and developed before being implemented as a safe building method. The experience has been gratifying in a truly marginalized community consisting of 125 Hindu and 25 Muslim families.

This entire work has been carried out under the guidance of Ar. Yasmeen Lari with engineering input from Engr. Amin Tariq to ensure that architectural and engineering aspects are fully incorporated for the sake of safety and stability. The process of improvement and testing of interventions is continuing to be carried out even at the time of writing of this report. Extensive architectural and structural drawings have been prepared for all remedial measures and interventions for strengthening and safety of mud structures in order to make them flood and disaster resistant.

Initially, there was some hesitancy on the part of the community members, as they did not know what to expect. However, as soon as the first house was rehabilitated, confidence grew rapidly. Once 15 persons were asked to mount the DRR-driven KaravanRoof, there has been no looking back. During the project period Heritage Foundation was able to complete the construction of over 30 units in village Mohak Sharif (at the time of writing over 50 families have been rehabilitated in the village), at the same time successfully demonstrated the rehabilitation of 68 units and construction of 1 newly built unit. In 35 locations in 8 priority districts

Continued support from the local landlord Mr. Mahmood Shah in Tando Allahyar has made it possible to test interventions and gauge their results for application elsewhere. Other positive aspects of intervention are the great deal of pride that has come about among the inhabitants themselves. Very soon they became busy cleaning up the area, removing debris and decorating their rehabilitated and newly built houses, reflecting their newly acquired pride in their handiwork.

As the project is extended, more manuals and guidelines will be developed to facilitate field teams and to allow local residents to encourage and facilitate greater participation in the rehabilitation and construction of their homes.

3.2.2 REMEDIAL MEASURES | CONSTRAINTS

Data cleaning and compilation was done simultaneously as information was received from sites. Due to the volume of data received this was an intensive task. However, this was considered necessary to quickly develop appropriate retrofitting methodologies for implementation. Drawings and photographs had to be compiled to illustrate successful and weak or damaged structural components in order to develop appropriate techniques.

The problem of lack of internet connectivity was an additional impediment in the process of issuing drawings. A messenger was used to send hard copies of the completed Survey Forms and collection of photographs in the field through electronic media such as USBs and CDs.

3.2.3 CONSTRUCTION OF DEMO/MODEL UNITS | SUCCESS

One of the key components of the project has been the construction of Demo/Model units in 35 tehsils in Sindh. This has been a success story for the Foundation as well as the community.

At the inception of the project it had been decided to build either one complete unit from scratch or rehabilitate 2 units. As part of building demonstration two structures were rehabilitated in each village to the prescribed building requirements of the HF Demo/Model Unit, except In Mohak Sharif here one Unit was constructed as a new build which demonstrated the procedures to be adopted for constructing new walls. The KaravanRoof workshop set up in Tando Allahyar trained local artisans in producing and fabricating sustainable and DRR-driven roofs.

Master artisans have successfully trained local artisans in the use of lime in mud renders as well as crafting of strong earthen/mud walls including corner jointing, crack repairs, treatment of bases with extended toes and use of ring beams. The use of local materials and building methods has been a source of pride and encouragement for the local community in taking ownership and actively participating in the rebuilding process.

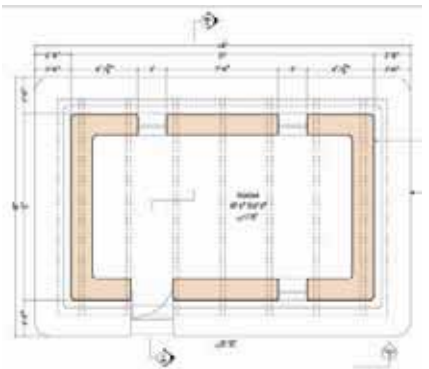
The Foundation is keen to have the role of women acknowledged in rural construction. Women have been instructed and have actively participated in the plastering of walls and their decoration. There are beautiful examples of decorative patterns in lime and mud plaster. In addition, creating an opportunity to express creativity and individuality has uplifted the morale of villagers.



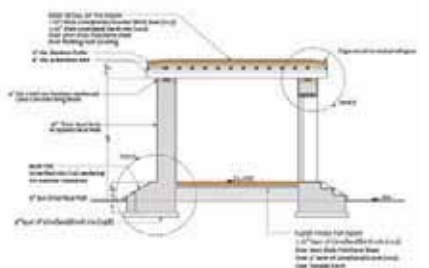
Installation of KaravanRoof in place.



A completed unit with lime-mud rendering.



Plan of a unit with 18" thick mud walls.



Section showing precautionary measures.



Elevation of a sun-dried brick structure.



A model/demo unit with mud walls, mud toe base and KaravanRoof.



Family outside its rehabilitated house.



Woman participating in the construction process - mixing lime in a lime pit.



Printed banners used as educational material for rehabilitation.

Encouraging participation in the building process has had a spin off effect in adjacent areas where villagers have been both observed and reported to have begun the repairing of their mud walls after the field teams have demonstrated the methodology of strengthening them, and by dispelling the notion that mud walls are unsafe. The community has been actively involved in rebuilding instead of waiting for an alien or more hi-tech solution. This is yet another example of the resilience of rural residents in the face of disasters and difficult conditions.

3.2.4 DEMO/MODEL UNITS | CONSTRAINTS

During construction of Heritage Foundation Demo/Model units, the main problem encountered are described below.

- a. Spread out nature of the sites on which they were constructed. A great deal of time was required for construction, conducting workshops and to travel to remote areas.
- b. The selection of villages to conduct a workshop and building demonstration units. Because of standing water in many locations, sometimes a whole day had to be spent in identifying the right location.
- c. Constrained time for carrying out construction. Initially, it was planned that one workshop per day will be held. Due to the above reasons and the long Eid holidays further cutting short construction time, it was decided to conduct two or three workshops on most days to be able to meet the target. Extra travelling time as well as expenses needed to be arranged for those who conducted the workshops and building demonstration.
- d. Due to resource constraint, the workshop procedures were simplified. For example PowerPoint presentations were replaced by printed banners that show the techniques as well as site demonstrations of what needed to be done.
- e. In order to ensure quality of strengthened mud walls and strong bamboo roofs – the Karavan Roof – all possible monitoring mechanisms are required to ensure that the work is carried out according to laid down principles and guidelines. Since these methodologies have been worked out by Heritage Foundation, the Foundation is keen that all quality control measures are built into the production and monitoring systems. This is essential so that the final built product is up to a standard which can be certified as having fulfilled the requirements for safe and DRR driven structures.

3.3 PROJECT FINDINGS | WALL & ROOF SYSTEMS

Findings that have been described are based on the select villages that were visited in each district. Most of the beneficiaries for whom homes were rehabilitated are farmers. Unable to hire skilled labour for construction most houses are built by the resident or with the help of experienced members of the community. As an exception, a few cases in the village at Sanghar and Nawabshah were noted, where the local landlord had intervened and assisted by providing building materials such as steel girders. In such cases, labour might have been out-sourced too.

Steel girder construction that was found had been poorly administered. In most cases due precautions had not been taken, with point loads being inflicted on walls. Inadequately supported steel girders have caused the collapse of mud walls that have been otherwise observed to be strong enough to withstand the rains and floods. Steel girders are also a greater hazard in the case of collapsed roofs and in the current situation there is no case for the promotion of steel girders in the rural environment.

The typology of vernacular roofs noted is as follows:

- a. **FLAT ROOF CONSTRUCTION:** Observed predominantly at District Tando M. Khan/Nawabshah/TandoAllayar/Sanghar, as well as other districts except Tharparkar.
- b. **PITCHED ROOF:** Few examples are found in Districts Mirpurkhas, Umerkot, Tharparkar, Sanghar and Nawabshah, with the majority found in Badin.
- c. **CONICAL ROOF (CHORA):** It is native to Tharparkar District, while some examples are found in Mirpurkhas/Badin/Umerkot.

Another interesting structure was found in Tehsil Chachro and Nagar in District Tharparkar. It is a large enclosed compound constructed of Khippo and wood Interlacement for keeping livestock safe at night. Typically, though in all areas, livestock share living space with the family with little or no consideration for hygienic conditions for the family.

Due to a shortage of water, the traditional practice of creating water reservoirs was found in some places. At Chachro, Thar District the traditional technique of building a reservoir has been recorded. In district Umerkot the largest human-made reservoir in the area was seen, reported to be over 100 years old.



Collapsed wall and roof due to use of heavy steel girders.



Usual rural flat roof construction.



Usual pitched roof construction supported by poorly laid burnt brick walls.



Well finished conical roof construction.



Proud owners of a rehabilitated model/ demo shelter unit completed in District Tharparkar.

Women travel large distances to work out of their Tehsil and District to work in cultivations. They are otherwise busy in handi-crafts, decorating their homes, repairing plaster and floor finishes. They are active in the collection of kippo (thatch). Women also aid in the construction of mud walls. The women in Tharpakar are seen to be more engaged in community life than other villages.

Generally, it has been found that literacy levels are extremely low, sometimes going down to zero literacy. There is a lack of primary schools and other educational facilities, and hardly any healthcare units.

Observations about each village in which building demonstrations were done, have been added as part of the Record of Stakeholders Workshops.

3.4 RECOMMENDATIONS

There are two sets of recommendations proposed. The first is for retrofitting or remedial measures and new construction. The second is a general set of recommendations for designing and implementing a DRR project that have been included as part of the strategy proposed for Way Forward.

3.4.1 REMEDIAL MEASURES FOR MUD STRUCTURES

A. USE OF MUD IN STRUCTURES

- a. Mud Wall construction is widespread and common techniques for building in adobe are layered mud or sun dried mud bricks.
- b. Mud Plaster is commonly used, as well as for plastering burnt brick and reed walls.
- c. Mud plaster is also typically used as the final later on roof structures, above thatch or other structural systems.
- d. Plastering with mud is commonly carried out by women, who have become skilled in this practice.
- e. Mud is used for insulation. The temperature change between indoor and outdoor environments has been noted to be several degrees.

B. PRECAUTIONS FOR MUD CONSTRUCTION

Mud is an extremely versatile material and can be used effectively for the purpose of building speedy shelters. It is a sustainable material that is locally available and all villagers are familiar with its use. It can be utilized very well for walls, whether in layers or by making sun dried bricks, the production of which is also very fast. The sun dried bricks are laid in mud mortar.

Mud plaster provides protection from normal rains; however, once the plaster is lost the wall become vulnerable. Thus, the wall is prone to disintegration if it loses its external rendering.

In the construction normally carried out in villages, it has been found that there are no bed plates or ring beams that would distribute the load of the roof evenly over the top of the wall. Often it has been found that heavy steel or wooden joists are placed directly on the walls, resulting in failure.

The following precautions are recommended for mud walls to provide a long lasting and a satisfactory option for shelter construction. As has been mentioned earlier, this methodology is based on enabling methods for widespread community participation:

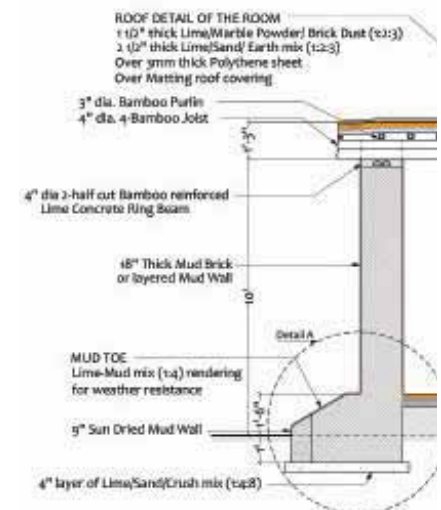
- a. Mud walls should be at least 18" thick.
- b. In new construction, the walls should rest on firm soil; if the soil is loose, the mud layers should be tamped to ensure a firm footing for the walls.
- c. Old and damaged walls can be rehabilitated through the use of bamboo lattice over cracks, and finished with mud plaster.
- d. Use of lime concrete ring beam reinforced with split bamboos can provide a firm bed for placement of joists.
- e. The base of existing walls requires special care. Through the placement of extra plinth in the form of a toe helps keep the flood water away from the base of the wall, helping to avoid disintegration of walls.
- f. If the stipulated precautions are taken in construction of mud walls, there is no requirement of standard foundations.
- g. The use of lime is essential in making the walls weather resistant. A mixture of lime and mud as well as bhoosa (straw) well mixed and fermented for 24 hours will provide a layer that will make the mud fabric of the wall safe from rains and flooding.
- h. Most lintels have been found to be in a deflected state. It is important to remove them and replaced by 4-bamboo lintels that can take the load of the wall above them. The removal of lintel will also allow the possibility of raising the floor.
- i. Precautions must be taken to ensure that bamboo joists are not placed above door or window openings. If necessary, door and/or window openings should be moved to provide a solid wall all the way from ground up for taking the load of bamboo joists.
- j. All floors should be at least 6" above the ground level for rehabilitated units. In the case of new units, the floor level should be raised to 1'-6" above the adjacent ground level.



Heavily eroded base of a mud wall, making the structure vulnerable.



Extra plinth in the form of a toe to provide protection to the base of a mud wall.



Section showing details of a sun-dried brick wall and correct placement of safe haven KaravanRoof.



Beneficiary family in front of its rehabilitated shelter.



Raised floor from the ground level provides protection from flood waters.



Student Volunteers interacting with the community.

3.4.2 REMEDIAL MEASURES FOR FLAT AND PITCHED ROOFS

A. FINDINGS

Most of the roofs are found to be flat; however, sloping roofs are also encountered in many places. As has been indicated earlier, the weakest portion of almost all structures is found to be the roof and which has been the cause of collapse of many of the structures. The construction of flat or sloping roof is usually constructed in the following manner:

- Joists are found in the form of rough wooden logs and even RSJs. However, no evidence of proper bed plates, levelling the top of walls or other measures for spreading the load have been found. The point load of heavy members such as the RSJ has resulted in major cracks in mud walls.
- The purlins are found to be either of tree branches or even bamboo that are usually found in a deflected state due to the weight above.
- Some times clay tiles are found above purlins; however, in most cases, the purlins are spanned with reed matting. This matting seems to have survived well in most cases in spite of the ingress of water.
- Reed matting is often covered with thatch with or without a layer of mud plaster.
- Due to lack of water proofing the rain lashing on the roof makes it extremely dangerous. Additionally, in a mistaken hope of stopping leakage of water, several mud layers are added, that increase the dead weight and result in making roofs even more unsafe.
- There is a lack of projection and slope in the roof to shed rainwater effectively. This allows water to collect on the roof, gradually seeping in the roof finish and adding extra weight, which results in collapse of the structure.

B. PRECAUTIONS REQUIRED FOR FLAT & PITCHED ROOFS

So far no vernacular roofs have been found that are strong enough to allow accessibility and take the live load of people.

Technical assistance needs to be provided so that even the roofs that are usually built can be made safer with the following safety factors:

- Levelling the top of the wall with water level.
- Introduction of a bamboo reinforced lime concrete beam at the top of the wall.
- Proper jointing of joists with purlins.
- Arranging for eaves or roof projection to avoid collection of water on the roof.

- e. Use of lime in the final layer of mud covering as well as introduction of a layer of tarpaulin sheeting.

3.4.3 REMEDIAL MEASURES FOR REED STRUCTURES

Among some interesting findings is the construction technique of walls and roofs made with reeds and Lou wood. Although further studies are needed to work out ways for strengthening them; however, the following preliminary findings will be useful.

A. REED WALLS

Most of the reed walls are found constructed in a circular form, although rectangular rooms constructed with this technique have also been found. Many of the reed walls, particularly if they are well built, seem to have survived the flood onslaught and as such appear to be resilient structures.

Those that had a covering of mud seem to have fared better. However, in the case of many the onslaught of floods has resulted in loosening of the reed wall due to damage to the reed rope that encircles and ties the vertical reed formation.

There are reports of the structure being affected by termite which shortens the life of the walls.

B. PRECAUTIONS REQUIRED FOR REED WALLS

The following precautions in construction will prolong the life of such structures:

- a. Since the damage is found largely at the base, it is therefore important that the floor and the base of the reed structure is fully covered by providing a toe like mud base.
- b. The damage to the reed rope that encircles the vertical reed structure shows that the fastening arrangement has to be much stronger. Studies need to be carried out in fastening methods for the reed rope with the vertical reeds structure.
- c. The disintegration of the outer mud plaster cover results in damage to the main reed wall structure. The use of a lime-mud mix for plaster will provide the necessary protection to the inner reed structure.
- d. Since the reeds directly touch the earthen surface, it is important to treat the base of the reed wall with termite treatment. Since it can be an expensive proposition, the soaking of the bases with lime, will prolong the life of these structures.



Seepage of water through badly constructed roof making the structure vulnerable.



Extra dead weight on a roof causes the collapse of the entire structure.



Reed wall construction. Eroded mud plaster render and lack of protection at the base.



Picturesque reed/ conical roof structure, that has survived well.



Disintegration of mud plaster on walls. The base is entirely vulnerable.



Local soft wood joists prone to termite damage, and unable to carry extra load.



Conical roof structure with well plastered reed walls.

C. REED / CONICAL ROOFS

The reed roofs are mostly conical and are used with circular plan form. If well built they are beautiful to behold and add to the character and picturesque setting of the place. The construction in this form is complicated, but very interesting. Wooden logs are utilized in a concentric fashion and that terminate at the apex of the cone. Many a time reed ropes are used as structural members. These are then spanned with matting and finished off with thatch. The quality of thatch varies; sometimes it is carried out with a great deal of care and is very tight in its implementation. When loose, it tends to get damaged easily.

The structure consists of the following







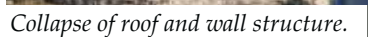



- 4 Joists placed on the wall with centrally key joint tied on the top where Joists meet called *math* locally
- These Joists are tied with "*dhori math*" on the upper part of the wall where this roof rests.
- In the middle of these joists, 3 battens are placed that are tied with *dhori math*.
- These battens are called Kaya of Akh wood, and are used to create the primary surface of the roof.
- The final covering of 4" thickness called *khipo* (thatch) is laid, which is tied / held together with *naridi* (*dori*/Thread).

D. PRECAUTIONS REQUIRED FOR REED ROOFS

The well built and well thatched roofs need to be studied with greater attention. Although this roof is not accessible and as such does not provide safety during floods, however, these roofs are quite strong and if well built can survive flood disasters. The techniques used for thatching should be promoted for water proof conical roofs. Since they cannot be used for refuge during floods, but the form and technique are so remarkable, that it is important to find ways to use this form for community buildings. Such forms will add colour and identity to the character of communities.

The data that has been collected can be used to build many kinds structures for many purposes, especially for community use, that are based on the vernacular construction techniques.

ANALYSIS OF VERNACULAR METHODOLOGIES

FINDINGS		IMAGES
A	ROOF – OVERVIEW	
1.0	EXTRA DEAD LOAD	
1.1	Accumulated straw bale or other discarded household items on the roof.	
1.2	Extra layers of mud plaster applied to the roof over the course of time.	
2.0	DETERIORATION OF MUD PLASTER	
2.1	Exposed structural members to rain and moving water.	
3.0	ROOF CONSTRUCTION FAULTY	
3.1a	The selection of the size, form and weight of structural members demonstrates little know how in the making of vernacular buildings. In addition to this, there is often no clear structural grid in which roof elements have been laid out.	
3.1b	There are some dwellings in which the order and organisation of beams, joists and purlins has been skilfully made.	
3.2a	Joists and purlins are not tied together. Especially in flat and pitches roofs, there were few cases in which more than one or two main members were tied or braced.	
3.2b	Where the roof has been successfully braced it has survived.	
3.3a	The roof structure is often not tied to the wall. This causes water damage at the top of the wall and allows water to seep into the interior of the dwelling. Without adequate tying the roof has caved, and/or shifted.	
3.3b	Where necessary connections between the roof and the wall are skilfully made, both structures have survived.	
3.4a	Use of new materials such as the RSJ girder without necessary structural support from walls.	
3.4b	More successful use of RSJ with wood, bamboo bracing and thatch and reed cover. It is evident that mud walls, if well constructed, are strong enough to support the RSJ girder.	
3.5	Even for those flat, single or double pitched roofs that have survived, they are not structurally strong enough for residents to take refuge during floods. There is an inadequate transfer of knowledge and skill in building.	
3.6	Beams are not adequately supported by walls. Walls show signs of deflection and cracking. No proper bed plates, levelling of top or measures for spreading the load.	
4.0	OVERHANG OF ROOF STRUCTURE	
4.1	No overhang of roof structure to protect the top of the walls from weathering and deterioration	
4.2	No overhang above openings to prevent water from coming in, or lentils from weathering and deteriorating.	
5.0	WEATHERPROOFING	
5.1	Water seepage through roof thatch. There is no clear understanding of weatherproofing.	
5.2	Residents often apply extra layers of mud plaster to the roof in an attempt to waterproof the structure. Without adding a layer of lime this is an ineffective measure. This activity also adds to the dead weight of the structure.	
5.3	Tarpaulin been used in some homes. Incorrect installation has rendered this intervention for water proofing useless.	

Over loaded roof structure.

Lack of mud plaster covering.






Collapsed steel girders.

Joists and purlins not ordered.







Weak connection between wall and roof structures.

Collapse of roof and wall structure.

ANALYSIS OF VERNACULAR METHODOLOGIES

FINDINGS		IMAGES
B	ROOF – MATERIALS	
1.0	BAMBOO - USED FOR BOTH THATCH AND FOR STRUCTURAL SUPPORT IN ROOF SYSTEMS.	 <p><i>Inaccessible and weak bamboo roof.</i></p>
1.1	In most bamboo roofs, there is a deflection in bamboo purlins. This is due to a number of reasons observed; overloading the roof structure, incorrect tying of members, absence of grid in laying down elements and water damage.	
1.2	Bamboo roofs have generally survived better than other materials used for structural members.	
2.0	REED, WOOD INTERLACE, STRAW OR THATCH	 <p><i>Loss of mud plaster.</i></p>
2.1	Where thatch laying is unsatisfactory, there is often a displacement of the roof structure, in addition to water ingress	
2.2	Growth of mold and fungus where thatch has soaked up and retained water.	
2.3	Has survived despite the floods and poor quality of construction.	
3.0	FABRIC	
3.1	Woven rope	
4.0	MATERIALS USED FOR TYING	
4.1	Cloth, cane rope, rope	
C	ROOF – FLAT AND PITCHED ROOF STRUCTURES	
1.0	LACK OF RING BEAMS OR BED PLATES Resulted in increased load concentrations at support points causing local crushing and damage to mud or masonry walls.	 <p><i>Weak and inaccessible roof structure.</i></p>
2.0	In most cases PURLINS are spanned by reed matting.	
3.0	MATTING is often covered and jointed to the structure by mud plaster.	
4.0	UNABLE TO TAKE THE LIVE LOAD of people, livestock or belongings	
D	ROOF – CONICAL ROOF STRUCTURES	
1.0	CONICAL ROOF STRUCTURES. Survived well and withstood rain water seepage.	 <p><i>Conical roof structure - skilfully built.</i></p>
1.1	The roof itself is usually skilfully built and, when thatched properly, it has survived well and withstood rainwater seepage.	
1.2	Buildings are not erected on elevated ground. As the roof is conical in shape it does not provide a solution for refuge in times of flood.	
1.3	Badly constructed thatch has deteriorated.	
		 <p><i>Poorly woven thatch.</i></p>

ANALYSIS OF VERNACULAR METHODOLOGIES

FINDINGS		IMAGES
E	WALL – OVERVIEW	
1.0	TOP OF THE WALL EXPOSED AND UNTREATED.	
1.1	Absence of over hangs exposes the top and the face of the wall to weathering and deterioration.	
2.0	NO SUPPORT FOR DISTRIBUTING THE LOAD OF THE ROOF.	
2.1	No bed plates or ring beams found that may distribute the load of the roof evenly. Structure placed directly on adobe and reed walls has caused structural failure.	
2.2	Cracking in walls due to point load of roof structure. Top of the walls are not levelled. Beams are often propped up by an external wooden post.	
3.0	POOR CONSTRUCTION OF WALLS	
3.1	Walls built in adobe, reed and wood construction and survived considerably well.	
3.2	Although the structures have survived, they are not strong enough to take the load of accessible safe haven roofs.	
3.3	Innovation in the selection and combination of materials in building walls	
3.4	Connections between building elements (roof, foundation) as well as openings (windows, doors, ventilators) are not watertight or strengthened.	
4.0	BASE OF THE WALL EXPOSED & UNTREATED.	
4.1	Disintegration of mud walls at the base is among the causes of wall collapse.	
4.2	Where toe or footings are found they are often not built well enough to protect the base of the wall.	
4.3	There is no foundation for the building or practice of compressing the soil in preparation for wall construction.	
5.0	MUD PLASTER USED WIDELY AND INADEQUATE FOR WEATHERPROOFING.	
5.1	Mud plaster is widely used and washes away easily in rain or flood water leaving the structure of the wall exposed.	
6.0	GROUND FLOOR LEVEL LOWER THAN ADJACENT GROUND LEVEL.	
6.1	In almost all cases the floor levels of the houses are found to be lower than the adjacent ground.	
7.0	LINTELS	
7.1	The log or wood plank used for making openings is too weak to support the weight of the roof.	
7.2	There are no chajas (over hand & projection) over lintels and lintels are not adequately protected.	
8.0	USE OF LOCAL MATERIALS ALLOWS VILLAGERS TO EXPRESS CHARACTER AND AESTHETICS IN THE ORNAMENTATION OF DWELLINGS	
8.1	The community expresses art and craft through the finishing and ornamentation of local materials such as mud plaster and jafiris.	
9.0	INVOLVEMENT OF WOMEN IN CONSTRUCTION & FINISHING	
9.1	Provides opportunities for employment and engaging women in community life and decision making	
10.0	EASE OF AND SPEED IN PROCURING MATERIAL	
10.1	All of these are procured locally and at minimal cost. In addition to this, there is little time taken to prepare these materials for construction.	

Deterioration of mud plaster.

Cracking of wall due to weight of beam.







Exposed top of the wall vulnerable.

Well constructed mud wall.

Dampness at the base of walls.

Displaced building structure.

ANALYSIS OF VERNACULAR METHODOLOGIES

FINDINGS		IMAGES
F	WALL – MATERIALS, MUD	
1.0	WIDESPREAD	 <p>Well constructed mud wall.</p>
1.1	The use of mud in walls is widespread in almost all areas.	
2.0	STRUCTURALLY STRONG	
2.1	Well constructed mud walls have not only survived, but have supported the weight of RSJ girders.	
3.0	INSULATION	
3.1	Mud walls are a source of good insulation.	
G	WALL – MATERIALS, WOOD	
1.0	TERMITE DAMAGE	 <p>Reed rope used to tie roof and wall structure.</p>
1.0	Reed walls are susceptible to termite damage	
2.0	MOLD GROWTH	
2.1	Standing water has caused mold growth in reed and wooden structures	
3.0	REED WALL CONSTRUCTION	
3.1	Skilfully woven reed walls that have survived water damage, but are not strong enough for accessible roofs	 <p>Unsafe placement of RSJ girders.</p>
3.2	Poor weaving of reed, both vertically and horizontally, has led to structural collapse.	
3.3	The reed rope, that encircles the vertical reed structure, has mostly been found in a damaged state.	
3.4	Reed walls are found in circular and rectangular construction.	
4.0	WOOD INTERLACE	
4.1	Wood interlace, made with branches or reed, has survived but has generally been found to be damaged by the floods.	 <p>Good use of wooden fretwork jafri.</p>
5.0	BAMBOO	
5.1	Used as structure for walls, or supporting structure in reed walls.	
6.0	WOOD FRAMES & JAFRI	
6.1	Wooden frame construction is not commonly used due to the availability and cost of wood.	
6.2	Painting geometric patterns on wooden <i>jafris</i> as a way to express identity and as building ornamentation.	 <p>Disintegration of mud plaster.</p>
7.0	MUD PLASTER	
7.1	Disintegration of mud plaster results in damage to wood, reed and mud Walls	
H	WALL – MATERIALS, BRICK	
1.0	BURNT BRICK HOUSES WERE FOUND IN CLUSTERS	 <p>Unsafe burnt brick construction.</p>
1.1	Although mud plaster has washed away, generally brick walls have survived.	

4.0 WAY FORWARD

4.1 HERITAGE FOUNDATION APPROACH TO DISASTER RISK RESISTANCE

The goal is to make communities strong and resilient and able to deal with the next flood disaster in an efficient manner. Accordingly, all methodologies for construction require that all structures are capable of withstanding anticipated disasters. That disaster risk reduction and disaster management must be an inherent and irrevocable part of any shelter, reconstruction or rehabilitation strategy requires no elaboration.

In the present situation, many believe that the flooding will be a recurring theme. Therefore, all funding should be directed towards enabling communities to be safe themselves as well as to build in safety factors to achieve safety of life, food rations, drinking water, livestock and livestock feed. These aspects can be built into community life as interventions that will improve their quality of life, foster pride, and engage youth and community into productive activities such as sports and cultural events. The Heritage Foundation's model for DRR ensures:

- a. Appropriate and timely mobilization of human and monetary resources for relief. Strategy for systems and networks to facilitate organization in case of emergency.
- b. Rehabilitation and construction should be strong enough to withstand future disasters (rain, flood and standing water). Method to include the installation of Safe Haven or Karavan Roof units, to provide an elevated platform for refuge during floods. DRR driven community structures for food, water, livestock & fodder (asset) and community buildings.
- c. Strategy for community and cultural support. Strategy to allow for further modules to be plugged in to the emergency response. Modules maybe delivered through collaboration with specialists. Currently modules for literacy, health, permaculture, forestation and community and cultural support have been designed into the HF Model for DRR for vulnerable communities.

4.2 PROJECT DESIGN & IMPLEMENTATION

4.2.1 RESOURCE MOBILIZATION

Appropriate and timely mobilization of human and monetary resources for relief. The more time communities spend displaced there is an increasing risk posed to their security and health.



Local community participating in rehabilitation, tamping the soil well to create a firm base.

Therefore, care must be taken to ensure that DRR response is quick and provides early recovery for post disaster communities. Foreign aid or funding must be supplemented to reduce dependency in the case of emergency. Local organisations have the advantage of interacting with communities with greater ease. This understanding and appreciation of local culture and heritage must not be lost in programme design and implementation.

The Heritage Foundation has developed a DRR model that incorporates an extensive training programme. The training programme is to disseminate local skills and knowledge in building, through the training of master artisans, local artisans and villagers.

4.2.2 DESIGNING AND IMPLEMENTING DRR PROJECTS

The project must be designed so that it is sustainable. An important part of sustainable models is the strategy to scale up the project. Scalability strategies need to be carefully executed. Low cost methods are urgently required for mass deployment through mobilization, training and implementation. To reach the enormous number of households dispersed in a vast area stretching from S. Benazirabad and Mirpurkhas to Tharparkar, the usual methods of partnerships and contractor-driven deliveries are unlikely to provide speedy results.

As mentioned earlier, today's emergency requires innovative procedures that are based on the concepts such as the Heritage Foundation's mobile Barefoot Karavan Teams, composed of university student volunteers, local trained artisans and villagers as social mobilizers. By marshalling the highly motivated youth of the country and placing reliance on enterprising community members including women, the entire effort can be scaled up and deliveries ensured in a surprisingly short period of time.

In addition to this, considering the insufficient funding so far available through national allocations and international donor response, the unprecedented disaster requires a combination of approaches for fund mobilization:

- a. International funding if limited to US\$ 200-300 can double the number than was originally envisaged.
- b. Matching grants by international donors/government for landlords can double the number of units in the village – for example, 20 units underwritten by the landlord can translate into 40 units.
- c. Partnering with Chambers of Commerce and Industries to encourage adoption by corporate sector. A large number

of affected villages can benefit from CSR (Corporate Social Responsibility) programmes taken up by all reputable corporations and multinationals.

- d. Matching grants for households – 50% cost provided by households through labour or material to be matched by international donors/government.
- e. New bamboo roofs for old steel girders – because of insufficient knowledge in its use, the steel girder did not translate in to a safe house during excessive rains and flood. Thus, sale of two or three girders could purchase an environmentally friendly entire safe haven roof.
- f. With elections round the corner, all political parties can multiply their votes by helping their potential voters build strengthened mud walls and safe haven roofs.

A crucial part of the design of DRR projects is to provide an appropriate framework for interaction with the community.

- a. All personnel should travel in low-key vehicles, so as not to attract attention.
- b. As in the case of the Barefoot Karavan Experts of Heritage Foundation teams should wear coordinated uniforms or clearly identifiable markers. This aids the spirit of teamwork as well as provides a face of the organisation that the community can relate to and identify.
- c. To show solidarity with the people, all possible care will be taken not to in any way hurt or harm the sensibilities of the local people.
- d. Through workshops urban residents should learn to respect traditions and norms of communities which are visited or are helped.
- e. To help aid community and cultural regeneration in post disaster communities, teams must be educated about the diverse issues and problems that the communities are faced with. Through this teams are not only able to understand the context and people, but also engage in informally imparting some correct knowledge about issues.
- f. The spirit of caring and sharing will be instilled among all those who have elected to work.
- g. Impart the importance of living values, conservation of environment and heritage, and respect for rule of law.

4.2.3 SHELTER UNIT

Rehabilitation strategies should incorporate the use of elevated/floating structures to provide refuge during future disasters. The biggest issue today is how to provide families with shelter that



Student Volunteers interacting with the community.



Mode of transport for HF field teams.



Trained HF artisans demonstrating fabrication of bamboo elements.



Children proudly showing clean hands, in HF project in Khairpur.



Families in HF project in Khairpur growing their own vegetables.



Children communicating information about the natural and built environment through drawings, in HF project in Khairpur.

provides safety from rising waters in their homes. Another important aspect is to motivate communities to drive the process of shelter construction themselves. As soon as communities feel that they are able to make safe shelters, they stop waiting for other agencies to intervene and thus, transform their outlook from a culture of dependency to a culture of self reliance.

Bringing about this change in mindset will itself make communities strong and resilient and enable them to make all the preparations required to combat the next flood disaster. This change in mindset can be brought about through a motivational campaign coupled with provision of technical information. The details of this campaign will be discussed as part of community and cultural support.

It is clear from the recent activities that have been carried out by Heritage Foundation that rehabilitation of houses can be achieved at the rate of a day and a half each. The ease of construction and the understanding developed by watching the methods for strengthening their mud structures encourages others to undertake various works themselves. The community has also understood the efficacy of strong roofs that can provide them refuge. Thus, if 30% of houses are partially standing, they could be stabilized and rehabilitated at an extremely fast pace.

4.2.4 COMMUNITY AND CULTURAL SUPPORT

Other aspects such as forestation, literacy, clean water, health and hygiene as well as livelihoods aspects need also to be built as a sequel to the implementation of this project. As in the case of the Foundation's other projects, this holistic approach can be pursued after communities build a relationship of trust with Heritage Foundation through implementation of successful examples of rehabilitation work being carried out. Once the community is engaged other activities for the benefit of the community can easily be undertaken.

Mobile Karavan Barefoot Teams with diverse specialisations will be trained to provide advice on hygiene, health, literacy, family planning, economic empowerment of women through crafts and agro-based products, vegetation and plantation, creative and performing arts etc, which are necessary to make communities strong. As a methodology for DRR, cultural support in the form of playgrounds, performance stages and cultural nodes for gathering have been proposed. This provides the community, particularly youth and women with recreational spaces as well as for them to develop systems and networks for interaction and development.

4.2.5 APPLICATION OF GIS IN DRR

Participatory mapping is being proposed as an activity to help communities better understand resources and networks in their natural and built environment. This will allow communities to share relevant and important information about the terrain, including mapping resources, hazardous sites, income generating activities (such as agricultural fields, business centres) and land-based or environmental concerns for the community. This activity will facilitate accessing and analysing the area for emergency response in disasters and post disaster rehabilitation efforts.

By identifying high risk areas through remote sensing satellites, villages can be evacuated well in time to higher and safer ground so as to minimize loss of life and livestock.

MITIGATION / PREPAREDNESS

Through participatory GIS, communities can help identify important existing resources and facilities in the region that may need to be accessed or protected in case of flooding. An example of this might be a hospital or detention facility. In addition to this, communities can identify potential sites that can aggravate the damage and devastation caused by a flood. Thus, effective management would be possible in protecting a source of potable water or preventing communities from using it in the case of contamination.

RELIEF RESPONSE / RECOVERY

Having an effective DRR GIS system in place can facilitate coordination between organizations involved in relief work as well as the appropriate allocation and effective distribution of resources, even without an effective internet connection. Spatial data collection through participatory mapping can also enable communities to help relief workers navigate into otherwise inaccessible areas.

ACCESS TO INFORMATION

The activity will help communities to better understand their own terrain and the availability of resources.

4.3 SCALABILITY OF HERITAGE FOUNDATION'S DRR MODEL

Heritage Foundation DRR Model is built on the principles of participatory action and the use of local materials and methodologies in interventions. Thus by nature the basic framework of the model is easily scaled up from villages to tehsils and districts to provinces. Based on our experience, we believe



Vernacular techniques allow widespread participation of family members.



Learning to place bamboo posts.



Making mud-lime mix for wall rendering, allows participation of women in rehabilitation of their houses.



Understanding vernacular building construction.



HF Team documenting vernacular structures.



Women in villages participating in rehabilitation of their mud walls after being assured safety of mud walls.

that much of the arrangement for combating the disaster can be achieved by the communities themselves. What is always missing is technical advice which if available will improve their own capability. Heritage Foundation has worked out the concept of building **DISASTER RISK RESILIENCE AND MANAGEMENT** in all structures that are constructed in the future. In addition to this a **TRAINING AND MENTORSHIP PROGRAM** has been designed to allow the program to be scaled up quickly.

In view of the experience in working in post-floods communities in Sindh, the following aspects need to be considered:

- a. Even though marginalized and largely non-literate, they are able to comprehend critical aspects of self protection. Advice on building correctly, adopting better hygiene practices or other possible improvements, is taken seriously when and if it is conveyed in a sympathetic manner.
- b. Although the disaster area is spread over a vast expanse, it would be possible to reach out to each village and indeed each house through a well worked out stratagem.
- c. The provision of technical information to all households is essential, which needs to be provided in the form of workshops, demonstrations and advisory sessions.
- e. It is important to create teams for providing supervision and monitoring of the works being carried out.
- f. Training and capacity building of all groups and institutions interested in providing shelter is essential.

4.4 TRAINING AND CAPACITY BUILDING BY HERITAGE FOUNDATION

4.4.1 COMPONENTS OF THE PROGRAM

The extensive task requires detailed planning for effective delivery. Developing and investing in training and mentoring programmes are essential in order to scale up the model for extensive delivery. Detail of components are as follows:

COMPETENCY & SERVICE CENTRES (CSC)

These will be run by Certified Entrepreneur Artisans with an important role in regeneration of local economy. They will act as a roof and lime hub in the area, and as business ventures for production, selling, installation and support for sustainable construction.

MOBILE BAREFOOT KARAVAN TEAMS (MBKT)

Throughout the project period, a mechanism of quality control and certification will be provided by MBKT in the field, in coordination with Heritage Control Centre.

HERITAGE CONTROL CENTRE (HCC)

HCC will develop training modules, technical guidance and information, as well as backstopping arrangement and liaison with CSC, MBKT and IPs. It will maintain all records and track progress as well as evaluation of performance by CSC and CEA Teams.

For smooth functioning of the project and transparent procedures, the disbursement of funds will be the responsibility of the Implementing Partners, and will be distinct from training, monitoring, evaluation and certification, which will be the responsibility of Heritage Foundation.

4.4.2 OUTLINE OF TASKS AND ROLES

The following roles are envisaged for implementation.

TASKS FOR IMPLEMENTING PARTNERS

- Identifying regions for shelter construction.
- Mobilizing communities.
- Listing eligible households.
- Arrangement for disbursement of Cash for Work programme.
- Settling price with Competency/Service Centres for supply and shelter completion.
- Payment against vouchers to Competency/Service Centres.
- Controlling, Measuring and Evaluation of their part.

TASKS FOR HERITAGE FOUNDATION

- Training Master Trainers (MT). A detailed set of drawings will be provided as technical guidance.
- Training Certified Entrepreneur Artisans (CEA). Assisting in venture support and on going training to the head of each CSCs, including maintaining close rapport with CSCs.
- Setting up Mobile Barefoot Karavan Teams (MBKT) for design/technical input, monitoring and evaluation, and issuance of completion certificate.
- Setting up Heritage Control Centre (HCC) for training module development, technical guidance, liaison and feedback.
- Controlling Measuring and Evaluation of their part.

4.4.3 TRAINING PROGRAMS BY HERITAGE FOUNDATION

CERTIFIED MASTER TRAINERS (CMT) TRAINING PROGRAM

- Each team will comprise two Master Artisans and one architect/engineer.
- CMT Teams will continue to guide and check quality of work in Competency/Service Centres.



Artisans being trained in prefabricated bamboo joist production.



Master Artisans' training session conducted by Saad Khan and Naheem Shah.



Modules for Master Artisans' Training.



Barefoot Karavan Team - Coordinated Uniforms.



Audience listening with rapt attention how to rehabilitate their own collapsed houses.

CERTIFIED ENTREPRENEUR ARTISANS (CEA)

- Workshops to be held in all tehsils by CMTs.
- Each workshop to be attended by artisans and helpers.
- Awareness in DRR measures and sensitivities towards gender empowerment and conflict resolution measures will also be built-in in the learning outcomes of the training programme.

MOBILE BAREFOOT KARAVAN TEAMS

- Arrangement for student volunteers, village mobilizers and artisans teams to be made. MBKT to continue throughout the project.
- Workshops Student volunteers to be mobilized in batches for 3 weeks/batch.
- Workshops to be conducted for each new batch.

MENTORING PROGRAM FOR IMPLEMENTATING PARTNERS

- Monthly workshops to be conducted for training, liaison and information sharing procedures

4.5 AWARENESS-RAISING THRU MASS MEDIA

Mass media such as radio and television should be used to spread awareness of DRR driven building methodologies, cultural renewal activities and to instil a sense of pride in the community. Media such as radio and television can be used effectively;

- a. As an early warning system to alert communities of the risk of disasters and how to better prepare themselves.
- b. Promoting information about hazards in disasters. For example electrocution, water borne diseases etc.
- c. Disseminating information about good practice in building DRR compliant structures.
- d. Creating community support action, such as sharing interviews of households that have demonstrated courage, resilience and innovation in times of severe loss and distress.
- e. Helping villagers locate training centres, roof production hubs or emergency centres in the area.

Television should be used to air programs:

1. Incorporate characters that villagers can relate to, to discuss issues, impart knowledge and promote living values.
2. Demonstrate vernacular methodologies for rehabilitation as well as impart practical information for community and cultural support.



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*This page: Barefoot Karavan Team Training Centre, Mohak Sharif, Tando Allahyar: sustainable structure built with bamboo, mud and lime.
Back Cover: Kanta, in her rehabilitated DRR-compliant sustainable shelter, lovingly decorated by herself, Oct. 2011.*



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UN Recognition Award 2002 for promotion of culture and peace.



HERITAGE FOUNDATION'S DRR - COMPLIANT SUSTAINABLE CONSTRUCTION

BUILD BACK SAFER WITH VERNACULAR METHODOLOGIES

Annexure B

Build Back Safer with Vernacular Methodologies:
Technical Support Manual



HERITAGE FOUNDATION'S DRR - COMPLIANT SUSTAINABLE CONSTRUCTION

BUILD BACK SAFER WITH VERNACULAR METHODOLOGIES

Technical Support Programme



INTRODUCTION TO HERITAGE FOUNDATION

Heritage Foundation established in 1980 is a Pakistan-based, not-for-profit, social and cultural entrepreneur organization engaged in research, publication and conservation of Pakistan's cultural heritage.

The Foundation has been instrumental in saving a large number of heritage treasures and, as UNESCO team leader 2003-2005, undertook the stabilization of the endangered Shish Mahal ceiling of the 16th c. *Lahore Fort World Heritage Site*.

The Foundation publishes monographs and documents relating to heritage and history of Pakistan as well as guides for heritage safeguarding aspects. It has published a series of inventories of historic assets as *National Register of Historic Places of Pakistan*. In the National Register series, in addition to several Karachi documents listing over 600 historic buildings, documents covering parts of Peshawar, the Siran Valley, Hazara District and Azad Kashmir have been published.

Since 2000, its outreach arm KaravanPakistan has involved communities and youth in heritage safeguarding activities. Since 2005, as part of *Heritage for Rehabilitation and Development Program*, in partnership with Nokia and Nokia Siemens Network, Heritage Foundation has carried out work of rehabilitation of communities, particularly women, affected by the Earthquake 2005 in Northern Pakistan. A 3-year program, supported by Scottish Government Fund, Glasgow University and Scottish Pakistan Association on disaster risk resistance (DRR) focusing on women is currently being carried out in the Siran Valley. The establishment of KIRAT, *KaravanPakistan Institute for Research and Training* in 2008 has helped in carrying out research and training on varied aspect of sustainable construction techniques drawn from traditional materials and vernacular methods. In 2009, the Foundation provided humanitarian assistance to Internally Displaced Persons (IDPs) from Swat; and in early 2010 in partnership with UNESCO-UK Aid, conducted livelihood program in post-conflict Swat based on craft skills for 500 women. The work for post-floods communities includes construction of 400 housing units - the Green KaravanGhar (sustainable low carbon footprint houses) in Swat and Sindh as well as public buildings on stilts in flood-prone katcha area in Sindh, which includes 5 green women's centres, two primary schools, and one health centre, supported by the Scottish Government Fund, Glasgow University, Swiss Pakistan Society, The Tides Foundation and Architecture for Humanity. Since October 2011, a total of 125 sustainable, DRR-compliant shelters and other structures have been built using mud walls and strong safe-haven bamboo KaravanRoofs.

Recent initiatives include conservation of endangered 19th c. Sethi House, Peshawar for KP Government, the conservation of the Denso Hall (1887), Karachi supported by KESC, saving records of Karachi Municipality dating to 1874 and the Karachi e-Library in partnership with the Consulate General of the Federal Republic of Germany. Other works in 2011 include UNESCO project for tomb of Jam Nizam al Din and a Damage Assessment Mission to World Heritage Site of Makli, Thatta, supported by the Prince Claus Fund, the Netherlands.

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1.1 IMPORTANCE OF TRADITIONAL CONSTRUCTION TECHNIQUES

In the aftermath of the 2011 flood in Lower Sindh, widespread research was carried out by Heritage Foundation (HF) in 35 union councils (talukas) of 8 priority districts: Badin, Tando Allahyar, MirpurKhas, Benazirabad, Umerkot, Tando M. Khan, Tharparkar and Sanghar. This research formed the basis for determining the strengths and weaknesses in the face of flood waters of vernacular construction such as the adobe/mud and Loh Khat as well as recently introduced modern/expensive materials such as burnt bricks and rolled steel joist girders.

After carrying out analysis of the vast data gathered by Heritage Foundation teams of architects and students of architecture from remote areas of each district, different kinds of traditional construction techniques prevalent in Lower Sindh have been determined. Clearly vernacular forms and construction techniques, based on availability of local materials, expressed the lifestyle and age-old skills of the communities themselves. From the outset it was evident that such forms and techniques needed to be retained since they have endowed each area with a sense of identity making it distinct from others; and are thus important as a source of pride at both individual and community level.

In developing implementation methodologies, among the most important considerations has been the necessity to maintain various vernacular attributes, while developing technical recommendations for strengthening them in order to withstand future disasters.

Based on detailed studies, interventions were introduced by reputed architects and engineers associated with Heritage Foundation which have resulted in DRR-compliant, improved and strengthened vernacular structures. The sustainable designs thus developed also incorporate tried and tested methods resulting from HF's own extensive work in post-disaster areas since October 2005.

The program 'Build Back Safer with Vernacular Methodologies', was launched in October 2011 from village Mohak Sharif, UC Bukaira Sharif, District Tando Allahyar. It was undertaken to demonstrate methods for rehabilitation of surviving adobe/mud walls as well as principles for new vernacular construction combined with strong bamboo KaravanRoofs. By building one-room shelter units in all 35 tehsils of 8 priority districts the efficacy and acceptability of HF philosophy among the affected population

1.0 INTRODUCTION



Structure displaced due to a highly damaged base.



Incorrect construction techniques lead to cracks in walls.



Badly constructed Loh-Khat walls suffer damage



Fired brick walls built without proper bonding or mortar

brought back extremely positive feedback. The designs and methodology thus devised are the focus of this document for speedy, economical and sustainable construction to respond to the needs of affected populations in Lower Sindh.

1.2 FINDINGS

The following findings have determined the direction leading to sustainable and safer construction in flood-prone areas:

1.2.1 Wall Construction

i. Adobe/mud walls withstood the flood waters even when immersed in it for several weeks. However, the adobe/mud (mud brick or layered mud) are vulnerable at the base and at the top if exposed to rain water. Heavy roof loads consisting of wooden logs or rolled steel girder joists are among the main causes of failure. These have resulted in collapse of the roof itself, in addition to being a major cause of damage to the wall structure.

ii. Loh Khat walls, if well built, withstood standing water for several weeks. The Khat i.e. reed walls are mostly well constructed and eminently suitable for areas where due to salinity in the soil adobe/mud walls cannot be constructed. However, the weak points are the base of Khat reed and supporting local wood posts. Due to the absence of adequate protection at the base, the structure is prone to termite attack.

iii. Burnt brick masonry appears as a more recent introduction in rural areas. It is found mostly in foundations and built up to three foot height according to recommendation of various agencies. It has withstood the flood waters, however, lack of bond and poor quality of bricks laid in mud mortar have resulted in a weak product. Because of these reasons, burnt brick masonry, which is otherwise considered strong, is highly prone to damage. Instances of collapse or major cracks have been largely due to point loads of heavy wooden logs or rolled steel girder joists. Thus, burnt brick masonry, at three times the cost of adobe/mud brick, even with strong burnt brick foundations, has not fared much better.

1.2.2 Roof Construction

Almost all roofs, except conical roofs, are found to be poorly constructed. Whether flat, mono-pitched or double pitched forms, they have been found to be equally unable to withstand rain water seepage.

Due to inherent weaknesses in the roof, even those structures that were constructed with burnt brick or cement concrete walls, became uninhabitable because of roof collapses or large scale leakages.

The following materials have been used in roofs.

i. Steel joist girders, wooden rafters and thatch

The steel joist girders have been found to be particularly dangerous. Due to lack of technical knowledge, they have been placed mostly without any bed plates or ring beams. In spite of their higher cost, they have failed to provide a strong roof and have been the major cause of structural collapse, and as mentioned earlier, even when the supporting walls consisted of burnt brick masonry. Because of their excessive weight, the use of steel girders can result in loss of human lives. In future their use in roofs should be discouraged.

ii. Heavy logs, bamboo or wooden purlins and thatch

Because of lack of technical guidance most of the roofs are constructed using heavy wooden logs. These roofs are poorly constructed and almost all were found to be unliveable during rains. Single bamboo purlins are often used but are mostly found to be of insufficient diameter. In most cases the jointing is faulty and poorly laid thatch covering makes the entire structure vulnerable. None of these roofs has been found to be strong enough to provide refuge during a flood disaster.

iii. Conical Chaura Roof

Among the most successful roofs found has been the conical Chaura roof. The traditional form is not only picturesque; it is well suited to shedding rain water. It is mostly built with wooden logs and purlins laid in a conical form with a steep slope, the entire roof structure tied with concentric rope rings and covered with thatch. Although disintegration was found at the base of Chaura walls, the roofs are mostly found to be in a reasonable condition. Chauras that have been constructed on high ground provided sufficient safety to the families as they were able to withstand both flood and rain.



Collapsed roof due to poor construction



Collapsed steel girders.



Heavy logs and bamboo used for roof construction damage walls



Conical Chaura construction with disintegrated plaster



Damage to walls due to lack of plinth



Damage to unit due to lack of ring beam



Damage to walls due to lack of lintol



Well constructed mud walls.



Building a toe for extra support to walls

1.2.3 Other Factors

Among other drawbacks that have been found are:

i. Lack of plinths.

Most of the floors are lower than the surrounding ground level, thus making the shelter prone to insects and water even during normal rains.

ii. Lack of projection over roof

Most roofs terminate on the top of the wall with no overhang or eaves – even in those designs that were promoted by various agencies after 2010 flood a roof parapet is advocated – which, due to lack of proper drainage allows ponding on the roof, making the top of the walls prone to water seepage and disintegration.

iii. Missing Ring Beam

Most roofs that had collapsed was due to missing ring beams that anchored the roof structure to the walls.

iv. Poorly laid lintols

The doorways have been found to use rudimentary wooden lintols for spanning door and window openings. These are prone to collapse due to excessive weight they have to carry.

1.3 USE OF VERNACULAR METHODOLOGIES

The following factors are important when designing shelters and other construction in disaster-prone areas in rural Sindh:

- i. Human safety during floods;
- ii. Ability of the structure to withstand flood waters;
- iii. Durability of materials used in the supporting structure, platform, roof and external rendering;
- iv. Lowering internal temperature (cooling the building);
- v. Sustainability of materials used.

1.3.1 Materials Used for the Wall Structure

Adobe/mud has proven its strength in Pakistan through the many ancient and historical structures that, even after centuries of neglect, are extant even today. Improved and strengthened adobe/mud walls can provide necessary resistance to flood waters - particularly if outer and vulnerable surfaces are rendered with a lime-mud mix, which has been tested over the last several years by Heritage Foundation. Accordingly, strengthened adobe/mud walls with an extended 'toe' base and with lime-mud render are being strongly recommended.

Khat (reed) has been used successfully in certain areas. This is due to the light weight of the structure and added support provided by reeds infill. The reeds also provide a rough surface to which the outer plaster can readily adhere to for increased durability. Accordingly, the Khat walls with lime-mud render are strongly recommended. In order to discourage the use of wood (even the local soft wood Lou), a bamboo supporting structure has been designed which will introduce added strength to the Khat infill.

For improved weathering and better insulation, the Khat walls, as in the case of adobe/mud walls, should be treated with a lime-mud render.

The introduction of a bamboo skeleton structure, (used by the Heritage Foundation in Swat and Sindh but considerably simplified) provides added strength and resilience to the Khat wall, and is able to carry a strong bamboo roof for accessibility.

1.3.2 Materials Used for Roof Structure

Rolled steel joist girders are not recommended for construction in post-disaster rural areas due to their extensive failure and the danger of casualties in case of collapse, as discussed earlier. Similarly, the use of heavy, unseasoned wooden logs is also not recommended as it results in poor roof construction. Clearly, there has been no advantage in the use of these materials, as during a flood, the roofs remained inaccessible and unable to provide refuge. Additionally, steel girders and wood are nonrenewable resources that increase the carbon footprint of a structure enormously and should be avoided as much as possible. Loss of tree cover in most areas of Pakistan is cited as among a major cause for floods and other disasters e.g. earthquake slides.

It is due to above reasons that the use of scientifically assembled bamboo joists is recommended for construction of roofs. Such roofs have been utilized extensively from Swat to Upper and Lower Sindh by Heritage Foundation with great success. Since bamboo is a fast growing grass it is a renewable resource. A bamboo plant is ready to be used in construction in a little over two years. The material is lightweight and sturdy and in case of collapse, will cause only minimal damage.

The continued construction of the conical Chaura roof is strongly recommended, however, it is worthwhile to replace the usual wooden joists with bamboo joists and purlins, as shown in accompanying drawings.



Conical roof structure - skilfully built.



Well-constructed Chaura

I.4 HUMAN SAFETY DURING FLOODS

Based on HF's research the following roof configurations have been noted in Lower Sindh:

- i. Flat roof
- ii. Mono-pitched roof
- iii. Double pitched roof
- iv. Conical Chaura roof

From the studies carried out, it is clear that the roofs constructed in the affected areas, even those built during the recent past, are not strong enough to provide refuge during floods. The result has been large-scale displacement of communities who had to move into tent villages as flood waters entered the houses, the roofs leaked and the structures began to collapse. The lack of refuge within the village left no option to the households, except to be relocated during the intervening period.

In order to minimize dislocation, so that communities can start rebuilding their lives as soon as waters begin to recede, Heritage Foundation has prepared recommendations so that people could be safe within their settlements.

The choice of one or the other of the two options detailed below is considered essential. The two options will ensure that refuge is available during a flood disaster that will provide safety without displacement of families:

- i. Strong and accessible flat roof as an elevated platform for refuge with 1'6" (450 mm) plinth.
- ii. For all other types of roof i.e. mono-pitched, double-pitched or conical roofs that cannot provide refuge due to their form, construction of 3'3" (1m) platform (or 6" above the highest recorded flood level) is essential. These should be constructed with strengthened adobe/mud base and mud-lime render, so that the shelter floor itself provides the mandatory refuge and safety from flood water.

I.4.1 Flat Roofs

Flat roofs, if well constructed as strong accessible roofs, on the one hand can be used as an extension of the house, on the other as an elevated refuge platform during floods. The scientifically designed KaravanRoof, fabricated with multiple-bamboo joists, provides an economical, safe and sustainable roof, which can be used as a safe haven during flood.

- i. The KaravanRoof has been tested with several feet of snow in Swat and with a load of 750 kg (15 persons) in Lower Sindh.
- ii. The use of lime concrete bamboo reinforced ring beam provides adequate anchoring for multiple bamboo joists.
- iii. Built with a slope and extended overhang, the Karavan Roof ensures proper drainage of rainwater.
- iv. In case of the use of KaravanRoof, only a plinth 1'6" high (450 mm high) is required.

Because of the above features, at the time of flood, the family can find refuge on the roof instead of having to relocate in tent villages.

1.4.2 Pitched Roofs

Pitched roofs do not appear to be a traditional form, and are likely to have been introduced into the rural construction vocabulary by villagers wishing for more effective rainwater drainage. Although pitched roofs are better at rain water disposal, it has been observed that they are poorly constructed where heavy point loads have resulted in failure of the entire structure.

Clearly, mono-pitched or double-pitched roofs are not accessible and cannot be used as additional house space or for taking refuge. However, if pitched roofs are chosen, instead of the use of heavy wooden logs, bamboo trusses and joists, designed by HF are recommended.

In order to fulfil DRR requirements, if pitched roofs are chosen, a minimum 1m (3'3") high platform (or 6" above highest recorded flood level) must be constructed so that the family can be safe inside the house.

1.4.3 Conical Roofs

These are highly recommended due to the ease and speed of construction and as a highly prized traditional form. When constructing conical roofs, instead of wooden joists and purlins, scientifically designed bamboo joists by HF and bamboo purlins are recommended while the remaining assembly may be carried out according to traditional methods.

Since the roof is inaccessible, it is important that, as in the case of pitched roofs, it is constructed on an earthen platform 1m (3'3" high), as described above, to provide safety during flood.



Community members testing Karavan Roof



Destruction caused by the flood.



Heritage Foundation's Karavan Roof Retrofitting Programme



Community gathering to understand the importance of vernacular construction



MKBT members discuss DRR methods

1.5 DISASTER RISK REDUCTION (DRR) COMPLIANCE

In view of the danger of recurring disasters, it has become increasingly important that DRR capabilities are built-in within the new structures to enable the communities, to survive as much as possible, within their original habitat during the course of floods.

The strategies and approaches that are devised to deal with the present crisis need to be worked out with a view to enable affected households to restart their lives immediately after the waters begin to recede, with minimum dislocation, least loss of life and minimum loss of livestock.

1.5.1 Lari Principles for DRR-Compliance

In order to prepare communities to withstand disasters it is imperative to make communities strong and resilient through the following:

- i. Utilize Heritage and Tradition for effective involvement of communities and for fostering pride and self confidence;
- ii. Use sustainable materials to prevent environmental degradation;
- iii. Use local skills and techniques for speedy delivery and local economic regeneration;
- iv. Incorporate DRR-driven methodologies to withstand next flooding;
- v. Utilize the provision of shelters as an entrée into communities for larger benefits and for initiating women's economic empowerment strategies;
- vi. Develop holistic models aiming at MDGs; hygiene, WASH, food security, nutrition and hygiene.
- vii. Develop training modules for IPs, NGOs, volunteers, artisans and communities in order to spread the message as widely as possible.

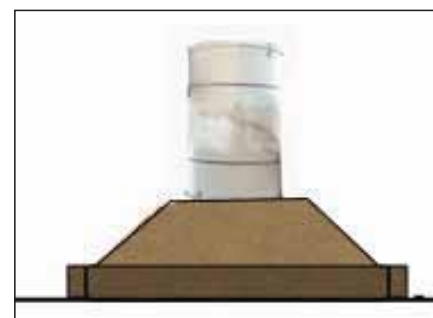
Thus the following are essential components in any strategy that is being formulated for early recovery and/or rehabilitation:

1.5.1.1 Safety of Life

Traditionally roofs have been used as an extension of the house; if strongly built they provide additional space at no cost e.g. for sleeping cots during summer. Thus, the tried and tested bamboo KaravanRoof provides a low cost safe haven refuge during floods to at least 15 family members (or 750 kg) of a family. These roofs are designed to also accommodate a tarpaulin cover to withstand rain.

1.5.1.2 Safety of Food Rations

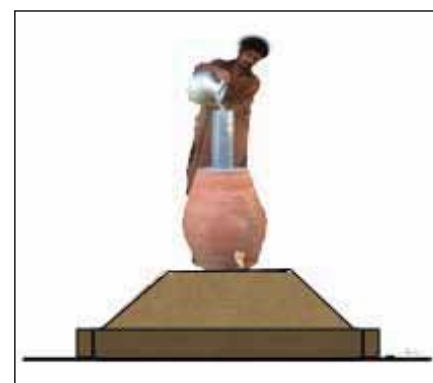
The loss and washing away of food rations can be prevented by building earthen platforms at least 3'3" (1 m) high, on which food silos can be placed. Since they are constructed with adobe/mud, these can be built by each household close to the house.



Grain silo on elevated platform

1.5.1.3 Safety of Drinking Water

During flooding, among the major causes of disease and loss of life of children are water borne diseases. All possible efforts should therefore be made to store drinking water on elevated platforms, well above the highest recorded flood level, so that it is available for use even when flood waters rise. Additionally, all hand pumps should be elevated for ease of use during flooding.



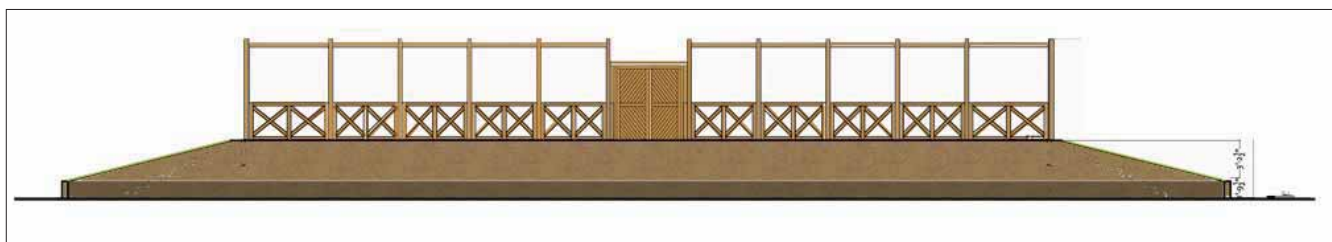
HF-SPS Clay water filter on earth platform

1.5.1.4 Safety of Livestock - Elevated Sports Grounds

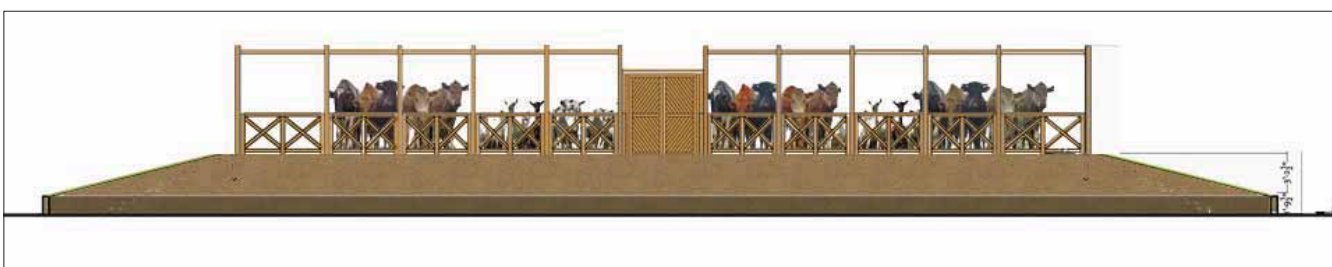
To a villager, livestock is dearer than his/her own life. Large earthen elevated platforms with a minimum 3'3" (1m) height and the size of basketball courts should be built in villages to provide refuge to livestock during flooding. In addition, under normal circumstances, the earthen platform provides the much needed sports facility in the village.

1.5.1.5 Safety of Livestock Feed - Elevated Cultural Nodes

Fodder, which is essential for the survival of livestock, must also be kept safe. 3'3" (1m) high earthen platforms of size 9'9"x13' (3m x 4m), if strategically placed around the villages, will provide safety for livestock feed during flooding. Under normal circumstances, these raised earthen platforms will provide the much needed cultural nodes that will help in encouraging performances and other cultural activities in the village.



Design of elevated sports ground to double as refuge for livestock.



Elevated sports ground used as livestock refuge during floods



Green Women's Centre, Khairpur



Karavan Health Centre, Khairpur



Karavan Primary School on stilts, Khairpur

1.5.1.6 Community Buildings

Community buildings e.g. village centres or women's centres can be built at low cost for assembly and discussion among community members, also acting as training for livelihoods and DRR centres. These provide a community space to conduct programs for skill training for improved livelihood, particularly women's crafts and agro-based products. In addition these centres provide venues for training for DRR preparedness/first aid. While community buildings can be raised on earthen platforms, HF's designs of structures on stilts have been popular among communities, contributing to pride and motivation for an improved village environment.

Such structures have been found to bring about a change in mind set. By creating pride and identification, the communities can be put on the path of recovery where the effort would be largely by the community itself.

1.6 ETHICAL APPROACHES

The areas in which work is to be carried out have large-scale deficits: high poverty levels, extremely low literacy rates, lack of even primary health care and primary education, environmental degradation, feeling of incapacitation and trauma under debilitating circumstances. Accordingly, it is extremely important to demonstrate empathy and compassion towards affected households, without being condescending. HF concept is based on uplifting community spirit and enabling affected populations to become self reliant. The low carbon footprint, sustainable structures being promoted by HF are extremely low in cost but each detail is required to be executed carefully for successful implementation. It is critical that execution is carried out as faithfully and honestly as possible. Accordingly, for the success of the programme ethical approaches towards work are essential.

Each one of the team members needs to strive for the following:

- i. Demonstrate integrity showing good judgment and adherence to ethical principles.
- ii. Implement the work with honesty i.e. truthfulness, fairness, and sincerity.
- iii. Exhibit fidelity by showing allegiance to public trust and loyalty to the profession.
- iv. Employ a charitable spirit with kindness, caring, goodwill, tolerance, and compassion.
- v. Show responsibility e.g. reliability, accountability, and trustworthiness.

During the work undertaken it is of utmost importance that Implementing Partners promote a culture of peace with subject communities. The following principles should be emphasized:

- i. Respect for life, so that there is no violence and a spirit of tolerance is promoted.
- ii. Respect for human rights particularly women's and children's rights; promotion of a nonviolent environment, and encouragement for more children in school particularly girls.
- iii. Right to improved environment: environmental conservation by encouraging reforestation and restraining tree felling.

1.7 COMMUNITY RESILIENCE

The aim of rehabilitation goes beyond construction of houses and community buildings. It must go further than tangible assets for education and hazard awareness, in order that communities become self reliant. A focus on resilience means putting greater emphasis on what communities can do for themselves by strengthening their own capacities, rather than concentrating on their vulnerability to disaster.

- i. Reducing vulnerability of communities by undertake risk assessment activities, for example, developing a knowledge base of the hazards in the locality, i.e. land sliding due to flood water ingress, higher river banks, etc.;
- ii. Using prevention and mitigation as key ingredients of Disaster Risk Reduction e.g. through early warning systems and the introduction of elevated structures and storage spaces as well as storage for items for emergency response and recovery;
- iii. Poverty alleviation schemes and women empowerment strategies through crafts and agro-based activities for creating jobs opportunities and encouraging awareness of education and the importance of self reliance;
- iv. Encouraging communities to understand the significance of environmental and natural resource management and its effect on land mass and livelihood sustenance;
- v. Introduction of HF's volunteerism and participatory communal building activities to encourage communities to not only construct shelters and communal spaces, but also fostering a sense of pride in order to counteract the affect of trauma while restructuring their lives for disaster preparedness.



Gathering community members by playing drums in the village streets



Village women gather to attend the demo session



Karavan Volunteers demonstrate the advantages of a DRR compliant shelter



Posters displayed in the village to help understand the Disaster Risk reduction strategies

1.8 GENDER EQUALITY AND STRATEGIES FOR FEMALE EMPOWERMENT

As part of community development, women empowerment strategies through livelihood programmes based on handicrafts and agro-based activities should be encouraged. These not only strengthen the household's financial base, but also give women the confidence to participate in productive activities and elevate their standing within the community and their own family.

Gender equality in developing countries is always a source of constant struggle, thus activities that generate equal opportunity encourages communities to rethink their social hierarchy, raises awareness for education, health and hygiene.

In the various regions where Heritage Foundation has developed schemes for women's empowerment, changes in social and economic cycles has been noted. Increase in hygiene awareness, literacy, and social equality has been achieved by giving women gathering and assembly spaces along with equipment to develop handicrafts and agro-based products which they are able to market in the vicinity.



2.1 SITE SELECTION

2.1.1 Criteria

While selecting a site, the following factors must be kept in mind

- i. Avoid low lying terrains/river beds;
- ii. Build on higher ground;
- iii. Raise platform if higher ground is not available;

2.1.2 Other Considerations

- i. Sufficient space and protection from cold, damp, heat, rain, wind or other threats to health, including structural hazards and disease vectors;
- ii. Availability of services, facilities, materials and infrastructure, habitability, accessibility, location and cultural appropriateness;
- iii. Sustainable access to natural and common resources; safe drinking water; energy for cooking, heating and lighting; sanitation and washing facilities;
- iv. Means of food storage; refuse disposal; site drainage; and availability of emergency services;
- v. Availability of primary healthcare, schools and other social infrastructure in close proximity of the village.

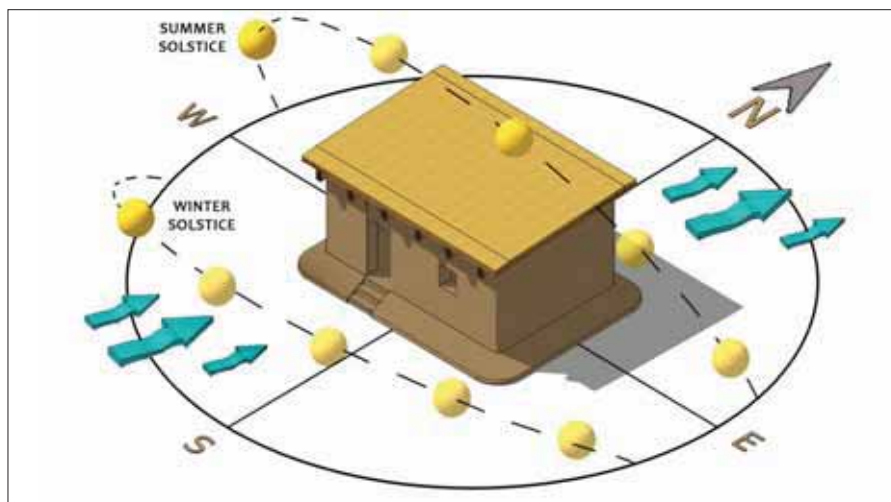
2.1.3 Risk Factors

Checking site conditions for the following factors:

- i. Assessment of risk of ponding or flooding;
- ii. Requirement of drainage or erosion control measures depending upon site gradient;
- iii. Check site for natural rainwater drainage (minimum one per cent gradient is required);



Site Selection



Orientation of Housing unit based on sun and wind patterns

- iv. Check possibility of making drainage channels to minimize flooding;
- v. For toilet pits, maximum level for underground water level is required to be at min. 10' (3m) depth.

2.1.4 Spatial Planning

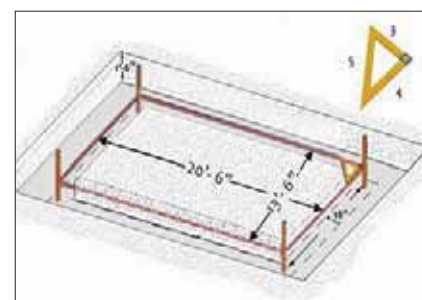
Where it is possible to reorganize spatial structure of the village, the following should be kept in mind:

- i. Maintain existing family and group relationships for enhanced security and self management mechanisms;
- ii. Privacy of neighbouring households when carrying out shelter layout;
- iii. Possibility of clustering houses around common open space for community interaction especially suitable for women and children;
- iv. Determining public spaces for erection of elevated earthen platforms for storage of fodder and refuge for livestock in order to create cultural and sports nodes.

2.2 SHELTER DESIGN CONSIDERATIONS

- i. As much as possible structures should be aligned north-south in order to avoid strong sunlight and heat;
- ii. Prevailing wind direction needs be kept in mind for alignment of windows and doors and the placement of areas for cooking;
- iii. The flow of heat and smoke from the stove into the housing unit should be avoided;
- iv. Advantage of trees should be taken to provide shade to the structures in order to minimize the intake of heat.

Shelters should be designed to maximise ventilation and minimise entry of direct sunlight. The roof should have a minimum slope of 1:20 for rainwater drainage with minimum 15" (375mm) overhang on all sides. The use of lime-mud layer on roof recommended by HF provides insulation and weather resistance. The recommended bamboo roof provides a lightweight structure which minimizes casualties in case of a severe catastrophe. Other considerations are adequate slopes to ensure rain water drainage from the roof and in case of an accessible roof, a minimum 1'6" (450 mm) plinth to prevent rain water seepage.

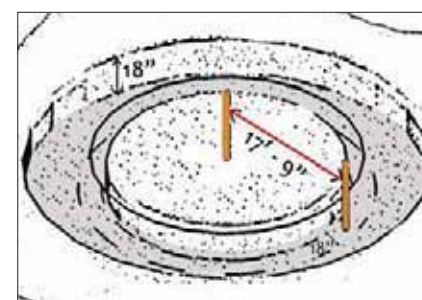


Marking layout for rectangular shelters

2.3 SIZE OF ONE-ROOM SHELTER

Recommended area of one-room shelter is 21 sq m or 224 sq ft. Recommended size of room is 12'x19' (3.65m x 5.75m).

It is important to note that in Lower Sindh, rooms are generally found to be quite small e.g. size 120 sq ft. Most of the shelters built by HF since 2010 flood consist of room size 10'x18', considered by communities to be adequate. The smaller shelter size results in considerable savings, and therefore information has been developed for those households who would like to opt for smaller sized shelters.



Marking layout for circular shelters

2.4 OPENINGS

Most door openings in surviving houses are found to be of low height. A height of 6'9" is recommended for all doors, with a width of 3' to 3'6".

Windows are recommended to be kept comparatively small to prevent strong sunlight and heat entering the shelter. These should be designed keeping individual family's privacy in mind.

In HF designs for one-room shelters one door and three windows are designed to ensure sufficient ventilation by placing them on opposite sides. 2 to 4 small apertures are also left just below the roof level for escape of hot air. Smaller openings on the windward side with larger ones on the opposite or leeward side ensure better movement of air with greater cooling effect. Determining the prevailing wind direction will help in designing better circulation to provide cooling inside the house.

2.5 HEIGHT OF ROOMS

The minimum height of rooms below joists is recommended to be 8' (2.44m).

3.0 MATERIALS & PROCEDURES

3.1 IMPROVED VERNACULAR METHODS

The following are the advantages of using vernacular methodologies recommended by Heritage Foundation:

- i. The shelter will be safe in the next flood disaster if adobe/mud walls are strengthened according to details;
- ii. The application of lime-mud plaster makes adobe/mud wall weather resistant and prevents disintegration, particularly at the base where it is the most vulnerable;
- iii. The introduction of a ring beam/bed plate provides an even and strong base to which the roof structure can be fixed;
- iv. A strong flat roof is recommended, for example, DRR-driven KaravanRoof, which provides accessibility to an entire family to take refuge with goods for their immediate needs. The scientifically assembled multiple bamboo joists can be securely fixed to a bamboo reinforced lime concrete ring beam. Special filling in bamboo voids protects the joists from termites;
- v. A lime-sand-brick dust layer on a flat, accessible roof provides a strong weather resistant roof finish. In case of any damage, repairs can be easily made since the required skills are easily available;
- vi. The use of local materials and skills encourages community participation leading to speedy construction. What cannot be achieved through building contractors, can be achieved almost immediately by motivating and involving the community in the construction of their own shelters, with techniques and skills that they are proficient with;
- vii. The use of sustainable bamboo and lime means that the usual price hike in materials such as cement or steel can be avoided, and thus there will be little hindrance even when the project is scaled up;
- viii. Since all materials used are locally available sustainable materials, most of the funds allocated for shelters will thus be spent locally, thus regenerating local economy;
- ix. Construction with local materials provides opportunities for women to participate in the activity, especially as the findings show their proficiency in plastering and wall construction. This is an added source of pride for the household as women tend to beautify their homes;
- x. Local artisans can be trained to fabricate bamboo roof units. The production of DRR-driven roofs themselves will provide opportunities for income generation to local workforce;
- xi. The resulting products foster pride, as evident by the decoration and care lavished on their shelters.

3.2 MATERIALS

3.2.1 Mud Brick/Layered Mud

Mud is an extremely versatile material and can be used effectively for the purpose of building speedy shelters. It is a sustainable material that is locally available and most rural residents are familiar with its use. It can be utilized very well for walls, whether in layers or by making sun dried bricks, the production of which is also very fast. The sun dried bricks are laid in mud mortar, while layered mud is laid in lumps of 12" height.

Mud plaster provides protection from normal rains; however, once the plaster is eroded the wall itself becomes vulnerable. Thus, the core of the wall becomes prone to disintegration if it loses its external rendering. For this reason use of lime in external renders is being recommended. For added safety it is advisable to use lime in internal rendering as well. Renders must be protected from direct heat and sunlight and kept damp by hanging gunny bags, plastic sheets, blankets or any other protective layer for 8 days to ensure proper curing.

Soil should be checked with a simple testing method known as the 'Bottle Test' to ensure that the material being used has adequate clay content of 20%-40%. Instructions of the bottle test are as follows:

A clean bottle is filled with a cup of prepared soil and two cups of clean water. The bottle is shaken well and left for a few minutes. It is to be shaken again, and left to sit for about eight hours. The clay, silt, sand and gravel can be measured with a ruler as it settles in different layers in the bottle.

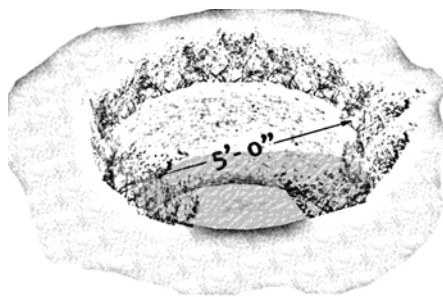


Bottle test to check clay content in soil

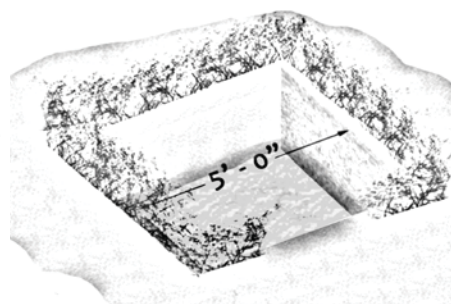
3.2.2 Lime

In view of the effectiveness of lime renders in post-disaster construction as demonstrated by Heritage Foundation over the last 6 years, it is clear that lime renders on the roof and walls provide adequate protection from rains and snow with sufficient weather resistance. Accordingly, the lime which is easily available in Sindh is being promoted for use in plasters and roof layers. It is recommended that the use of cement should be entirely discouraged. Not only is the cost of lime comparatively low, it also provides good insulation hence keeping the structures cool during summers and warm during even severe winters.

Lime must be selected based on its calcium content. Limes with high content of calcium will take longer to slake. The best variety of lime is found in lumps, locally known as *Patharwala Choona*.



Circular lime pit excavation 5' in diameter, surrounded by bushes to ensure safety



Lime pit excavation 5' x 5', surrounded by bushes to ensure safety

3.2.2.1 Process for slaking lime

- i. Make a 4' (1200mm) deep lime pit near the construction sites about 4'x 4' in size.
- ii. Pour water and wait for it to absorb into the ground.
- iii. Refill the pit with water after 3 to 4 hours.
- iv. Pour 2 bags of lime into the lime pit.
- v. Stir and mix the mixture with a wooden stake.
- vi. Allow for reaction to take place. It takes 3 hours for the lime to lose its heat and about one week for the lime to be completely slaked.
- vii. Leave the lime for a minimum of one week before using it.



Mixing lime for slaking

Communal lime slaking pits can also be excavated. These pits must be larger, 5'0"x9'9" (1.5mx3m) and 4' (400mm) deep and be protected on three sides with thorny bushes.

IMPORTANT: Slaking is an exothermic reaction (releasing heat); therefore, no one should touch or stand too close to the mixture during the time of and directly after the reaction. Take due precautions to keep children away.

3.2.3 Khat (reed arrangement)

Khat is readily available in Lower Sindh. Khat is mostly dried stalks of fast growing grasses or branches and twigs of bushes or short thorny trees. Stalks of the cotton plant are also used. Bushes older than a year old should not be used as stalks lose their malleability. The practice of reed weaving has been passed on from generation to generation, with women carrying out most of the work. The value of use of reed for walls and roof, where the practice has been part of vernacular construction is emphasized. Khat is weaved in lengths of 6' to 7' in height; its thickness varying from 3/4" diameter at the bottom to 1/2" at the top.

3.2.4 Bamboo

Selection of bamboo should be carried out with great care. All bamboo lengths are required to be at least 2 years of age and must be kiln dried and cured, before being accepted for use in construction. The acceptable nodal spacing for 4" bamboos is 1' (300 mm) and 1'6" (450 mm). Bamboo sections with cracks or bamboo that is green in colour should be rejected.

Bamboo lengths should be checked for acceptability for 4" diameter bamboos:

- i. 4" (100mm) diameter, 13'-17' (3900mm - 5100mm) long, should have a wall thickness of 1.5" (38 mm), and a minimum diameter of 2.5" (62mm) on the other end with a wall thickness of minimum 1" (25mm)
- ii. The other end to be minimum 2.5" with wall thickness of 1"
- iii. If well seasoned the tapping of walls will give a hollow sound.

All bamboo should be stored in a dry place; in case of danger of flooding, the bamboo lengths should be placed in an elevated place to avoid dampness or seepage of water.

Bamboo ends that are anchored into brick/lime concrete bases are required to be immersed in lime to prevent termite infestation. All bamboo ends used in KaravanRoof or other roofs should be plugged with special HF's anti-termite biodegradable compound to inhibit termite growth.

Bamboo can be easily transported from various areas in Sindh, the best quality being available in Hyderabad, known as Bengal bamboo or Java bamboo.

3.2.5 Others

3.2.5.1 Polythene sheets

Polythene sheets used for roof covering should be of minimum 3mm thickness. They should be stocked in rolls to minimize damage. Any sheets that have been damaged or have developed holes must not be used in construction. All efforts must be made to cover the entire roof area including overhangs with polythene in order to provide effective water proofing.

3.2.5.2 Matting

Matting sheets used as roof covering is locally produced matting of 1/2" (12mm) thickness. It is procured in rolls of size 21'x16' (6300mmx4800mm) and 21'x13' (6300mmx3900mm).



Selecting the correct bamboo



Locally produced matting



Making Mud Bricks



Tamp earth to ensure firm footing



Mud walls should be at least 18" thick

3.3 PROCEDURE FOR USE

3.3.1 Adobe/Mud Bricks and Layered Mud

3.3.1.1 Method for making mud bricks

- i. Select clean soil, free of stone, leaves, grass and debris.
- ii. Add sand in case soil has too high a percentage of clay (refer to 'How to check clay content in soil' in section 2.1).
- iii. Add required quantity of water and knead it thoroughly.
- iv. Pour kneaded mud into brick mould and compact it.
- v. Take out the brick from the mould and allow it to dry on a sand platform.
- vi. On the second day turn the bricks over.
- vii. On the fourth day stack the brick in order that uniform drying can be achieved.
- viii. Bricks will be ready for use within seven days during hot weather.

3.3.1.2 Method for Layered Mud Construction

- i. Select clean soil, free of stone, leaves, grass and debris
- ii. Add sufficient sand and straw in clayey soil to reduce shrinkage and cracking in mud.
- iii. Start mud masonry above the toe base and construct a 1.5 ft high layer in one day.
- iv. Wet the surface before placing the next layer.
- v. Apply water proof lime plaster on both sides of the wall up to flood level for flood water resistance.
- vi. Build all corners together to have strong corner joints.

3.3.1.3 Building Improved & Strengthened Mud Walls

The following precautions are suggested for mud wall construction for shelter construction in order to withstand flooding. As has been mentioned earlier, this methodology is designed to enable and encourage community participation:

- i. Mud walls should be at least 18" thick.
- ii. The walls should rest on firm soil; if the soil is loose, the mud layers should be tamped to ensure a firm base for wall construction.
- iii. The base of existing walls requires special care. The design extended base, in the form of a toe, will help keep the flood water away from the base of the wall, and also help avoid disintegration of the inner core of the wall. The layered mud filling in the toe should consist of lime:mud (1:4) mixed with straw. As long as these precautions are taken, there is no requirement of foundations.
- iv. Use of a lime concrete (1 lime :4 sandy gravel) ring beam reinforced with split bamboos is recommended in order to provide a firm bed for placement of joists.
- v. The use of lime is essential in making the walls weather

resistant. A mixture of lime and mud as well as bhoosa (straw) well mixed and fermented for 24 hours will provide a layer that will make the internal mud fabric of the wall safe from rains and flooding. Addition of dung in the mixture improves weather resistance of the plaster.

vi. External renders must be kept damp and protected from sunlight by hanging gunny bags, plastic sheets or any protective layer for minimum of 8 days to ensure proper drying.

vii. All floors should be at least 6" above the ground level for rehabilitated units. In the case of new units with strong accessible roofs, the floor level should be raised to a minimum 1'6" above the adjacent ground level.

viii. Floors should have a minimum of 2"(50mm) slope towards opening.

3.3.2 Lime

For use of lime, clay content of soil should be more than 20%. Topsoil should not be included and grains larger than 10mm should be removed by sieving.

3.3.2.1 Preparing Lime for Renders

- i. Use a ratio of 1 lime: 2 sand: 3 soil mixture for renders. These should be measured in *tagharis*;
- ii. Addition of straw @ 2 tagharis per 1 taghari of lime should be encouraged;
- iii. Addition of cow dung @ 1 taghari per taghari of lime should be added in slurried form, as an additional binder which will improve plasticity. It provides added stabilization and noticeable improvement in weather resistance.
- iv. Brush down surface to remove loose matter;
- v. Prepare a good key before application – use chicken wire, spikes, nails, rake out joints to 3/4" (15 mm) – the rougher the surface, the better the adhesion;
- vi. Dust and dampen the surface before render application;
- vii. Renders should be smoothed and pressed on firmly by hand to adhere well to rough surface (women normally do an excellent job in villages).

3.3.2.2 Precautions in mixing lime

- i. The use of lime is essential in making the walls weather resistant.
- ii. A mixture of lime, mud as well as bhoosa (straw) well mixed and fermented for 24 hours, provides a layer that will make the internal core of muds wall safe from rain and flooding.
- iii. Damaged brick is recycled by mixing brick dust in the mud and lime mortar and provides additional weather resistance.



Mixing lime with soil to prepare mortar



Mixture of lime, mud and bhoosa (straw)



Lime render to be applied by hand



Lime render must be smoothed after application



Cutting bamboo with electric saw



Using an electric drill to bore holes for jointing bamboo



Tighten and secure nut and bolt

3.3.3 Bamboo

3.3.3.1 Precautions

The following precautions must be taken when constructing in bamboo

- i. Mature, well cured bamboo (2 years and over) must be used;
- ii. Do not use bamboo poles with vertical cracks;
- iii. Use bamboo with the right diameter and wall thickness;
- iv. Do not use conventional wood nails in bamboo joinery, they will cause the bamboo to split;
- v. Bamboo posts or beams need to have a node at both ends (or as close as possible towards the ends), if not the pressure of a structure on the joint may crush the bamboo;
- vi. Only basic carpentry, masonry tools and skills are necessary.
- vii. Bamboo ends are leached in lime cream.

3.3.3.2 Bamboo Cutting procedure

- i. Two bamboo stakes are nailed side by side into the ground at regular intervals, to provide a stable base and hold the bamboo poles in place;
- ii. An electric or handheld saw is placed at one end;
- iii. A stencil can be used to draw the different angles that will be required for jointing;
- iv. Ensure holding the saw straight in order to cut through the bamboo using equal pressure throughout;
- v. Discard any poles that have been damaged during the cutting or have developed splits or cracks.

3.3.3.3 Bamboo Jointing procedure

For KaravanRoof joists, a special anti-termite biodegradable mix for protection against termites is used to fill all exposed voids; however, for normal use, if the exposed ends of bamboo are leached will lime it will provide adequate protection.

- i. Bamboo lengths are joined by drilling holes through their sturdy walls. Markers are made at the exact point where the hole is required;
- ii. Similar stakes as for the cutting procedure are arranged;
- iii. After placing the bamboo between the stakes, a drill is used to make a hole in the walls. The drill must pass across through the entire bamboo width. Ensure that the weight of the drill machine is constant throughout the process;
- iv. Once holes have been drilled in the required position, the bamboo poles of similar size are laid together for jointing;
- v. For attaching one bamboo member to another, use a stainless steel nut and bolt.
- vi. Secure and tighten all joints.

For additional strength binding wire at intervals is used to tie bamboo members together.

- i. A binding wire of 3/32" thickness is used;
- ii. The wire is tied at minimum 2 feet (600 mm) intervals;
- iii. For additional strength tie the wire securely.

3.4 SAFETY AT SITE

Special care must be taken to avoid injury by falling into the excavated lime pit. Such pits should be protected by bushes and children must be told to maintain a safe distance.

Lime is a very caustic material when wet, and precautions must be taken when handling the material. These include:

- i. Protection for face and hands during lime handling;
- ii. Clean water must be immediately accessible for first aid purposes;
- iii. Excessive skin and eye exposure should be avoided.

Although medical attention is required in case of severe exposure to lime it is important to be aware of first aid procedures:

- i. Skin exposure to lime can be neutralized with a mild acid such as vinegar or lemon juice;
- ii. Eye exposure can be treated by flushing the eye with fresh water.

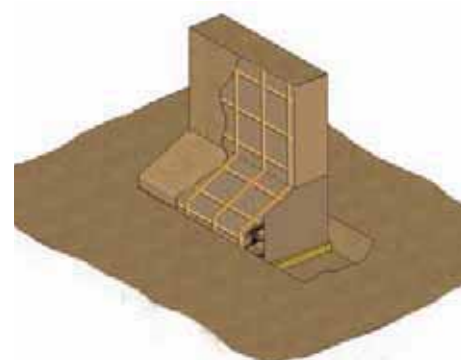
3.5 RECOMMENDATIONS FOR CONSTRUCTION

3.5.1 Advantages of HF Methodology

By following the HF methodology, the shelter will be safe in the next flood disaster:

3.5.1.1 Walls

- i. Build strengthened adobe/mud wall with widened base and formation of toe.
- ii. Use widened adobe/mud base and toe for Lou Khat walls as well.
- iii. All wall surfaces in superstructure should also be treated with mud and lime render to provide insulation and protection. This provides weather resistance and helps prevent disintegration of wall particularly at the base where adobe/mud is most vulnerable. The use of a bamboo lattice along the base of the structure provides added resilience.
- iv. Use a ring beam/bed plate to provide an even and strong base to which the roof structure can be securely fixed/anchored. An inexpensive solution using lime concrete reinforced with split bamboo is recommended.



Bamboo lattice provides extra strength and resilience



Excavation to 450mm below ground level



Ensure alignment of wall with a rope at all layers of mud courses



Demo sample, mud brick base with toe for inaccessible roofs



Bamboo joists and ring beam must be tied securely

3.5.1.2 Strengthened Adobe/Mud Walls

- i. Remove topsoil (about 150 mm) around excavation.
- ii. Excavate to at least 1'6" (450 mm) below ground level.
- iii. Tamp the earth in the base before laying lime concrete 1:4:8, i.e. 1 lime: 2 sand and 4 coarse aggregate.
- iv. Make toe at the base of the wall.
- v. In case of strong accessible roofs (KaravanRoof) or when constructing on high ground, recommended plinth is 1'6" (450 mm) high.
- vi. In case of pitched or conical roof or inaccessible weak flat roof, recommended raised platform height is 3'3" (1 m) or at least 6" (150 mm) above the highest recorded flood level.
- vii. For best results in the base, use mud brick in the front of the toe, while the remaining filling of mud layers should preferably also contain lime, mud and straw of ratio 1:4, i.e. 1 lime: 4 mud and 1 taghari of straw.
- viii. Use water level to ensure correct level of walls.
- ix. Ensure alignment of wall by the use of dori (string) at all layers/mud brick courses.
- x. Make wall as straight (in plumb) as possible.
- xi. Protect the top of the wall by providing a roof projection of minimum 15" (375 mm).
- xii. Ensure the use of a ring beam before placing roofs. A bamboo reinforced 4" (100mm) thick lime concrete beam is recommended.
- xiii. Ensure that the roof is fully anchored to the wall.
- xiv. Ensure use of lime in all renders. Encourage the use of bamboo lattice at base and up to 3'3" (1 m) height for improved adherence of mud-lime mortar to the base.
- xv. Ensure that render is kept damp and protected from sunlight by hanging gunny bags, plastic sheet or any other protective layer.

3.5.1.3 Strengthened Lou Khat Walls

- i. Replace soft local wood with bamboo skeleton consisting of 4" (100 mm) dia. posts and plinth (dassa) beam and 3" (75 mm) dia bracing.
- ii. Securely anchor bamboo posts into lime concrete pads.
3. Ensure that Khat ends are protected from coming in contact with soil.

3.5.2 Roofs

In the next chapter different profiles of roofs that are prevalent in Lower Sindh have been designed to provide strengthened and strong shelter typologies. An improved roof structure, through

the use multiple bamboo joists or trusses along with ring beams, is recommended in order to provide secure construction of roofs.

3.5.2.1 Strong Bamboo Roofs

- i. In case of flat roofs, KaravanRoofs with scientifically designed multiple bamboo joists, securely fixed to ring beams are recommended as accessible roofs during flood.
- ii. In case of mono-pitched roofs, multiple four-bamboo joists fixed to ring beams are recommended. Although they will be stable, they will not be accessible during flood.
- iii. In case of double-pitched roofs, bamboo trusses securely fixed to ring beams are recommended. Although they will be stable, these will not be accessible during flood.
- iv. In case of conical roofs, strong specially designed bamboo joists enabling secure fixing to ring beams have been designed. The Chaura form is highly recommended as a valuable traditional form and, although they are not accessible during flood, their construction should be encouraged.

3.5.2.2 Strong, Accessible KaravanRoofs

Since accessibility to higher ground or roofs during flood is of extreme importance, a great deal of effort has been expended on fabrication of strong roofs. The multiple joist KaravanRoofs have been tested to withstand rain and snow as well as load of 750 kg to provide refuge during flood disaster.

- i. The KaravanRoof joists, fabricated by certified artisans, are prefabricated for ease of transportation and use.
- ii. They are made of strong, good quality bamboo for endurance and long life.
- iii. The voids at the end of bamboos are plugged with special treatment compound to prevent termite attack.
- iv. They are designed for ease of secure fixing to bamboo reinforced lime concrete ring beams when used with adobe/mud walls or two-bamboo ring beams when used with bamboo frame and Khat walls.
- v. Bamboo purlins can be easily fixed to the joists with binding wire. Roof finishing with recommended matting, polythene and lime-mud-brick dust layers provide weather resistance and strength for use during flood.
- vi. KaravanRoof joists are lightweight and easy to carry. In case of a more severe disaster than anticipated, there will be minimum loss in case of a collapse.



House owners test their own Karavan Roof in different regions of Sindh

3.5.2.3 Roof Construction Considerations

Whichever roof profile is chosen for shelter the following should be kept in mind:

- i. As much as possible, use recommended construction techniques for the roof to avoid collapse or leakage of rain water.
- ii. Always place a ring beam, either a bamboo reinforced lime concrete or a two-bamboo ring beam depending upon whether the supporting structure consists of adobe/mud or bamboo-Lou Khat walls.
- iii. Always provide a roof projection extending at least 15” (375 mm) all around the walls.
- iv. Wherever possible use bamboo instead of wood in construction of roofs or walls. For example, as recommended by Heritage Foundation, for mono-pitch use four bamboo joists; for double pitch use a bamboo truss, and for conical roof, use special bamboo joists to form a secure base along the wall.
- v. Use purlins of bamboo wherever necessary, rather than wood sections.
- vi. Use layers of matting and polythene sheet above purlins.
- vii. In case of flat roofs, always use a layer of lime-mud-brick dust to provide a strong water proof finish.
- viii. In case of mono-pitched or double-pitched roof, the use of lime-mud finishing layer will prevent water seepage.
- ix. In case of a conical roof, double layer of well laid thatch will provide sufficient protection from rain water.



Completed KaravanChaura, Mohak Sharif

4.1 SHELTER TYPOLOGIES

A series of shelter typologies has been devised aimed at providing a choice to the households. The typologies have been listed in Table 1.1 and have been designed to be DRR-compliant. Accordingly, since a flat KaravanRoof provides refuge during floods, the base plinth is only 1'6" (450 mm) high; however, if a choice is made of pitched or conical roofs, the base is required to be at least 3'3" (1m) to provide refuge in case of flooding.

The adobe/mud supporting structures consist of adobe/mud low plinth bases to high platforms, with adobe/mud walls combined with either flat KaravanRoof, mono-pitched, double pitched or conical roof. The Bamboo-Lou Khat supporting structures consist of a combination of adobe/mud and lime concrete bases with Khat (reed) assembly fixed to a bamboo skeleton frame combined with either flat KaravanRoof, mono-pitched or double pitched roof. In all cases the use of lime in external render is strongly recommended. Various types of shelters have been especially designed incorporating bamboo instead of wood in all structural members, thus discouraging utilization and cutting of trees.

Table 1.2 shows Shelter typologies sub-divided into 3 sections each that are numbered according to the kind of construction required for bases, walls and roofs.











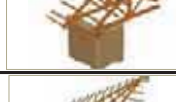

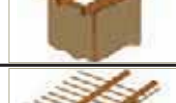


4.2 CRITERIA FOR SELECTION OF SHELTER TYPES

As has been mentioned earlier in order to be DRR-compliant and ensure safety of life and prevent any displacement of populations during floods the following two principles must be adhered to:

- i. If the flat roof is strong enough to provide refuge during floods to the family i.e. at least 750 kg of loading, the plinth level with the toe base is recommended to be 1'6" (150 mm) above adjacent ground level.
- ii. Where the roof is not strong enough to provide refuge or is inaccessible because of its slanting or conical form, the shelter should be constructed on a raised platform at least 3'3" (1m) high or minimum 6" (150mm) above the last recorded maximum flood level.

The following pages show the salient features of shelter typologies and their segments designed by Heritage Foundation.

TYOLOGY	BASE	WALL	ROOF	IMAGE
TYPE A1	1.1	2.1	3.1	
TYPE A2	1.2	2.1	3.2	
TYPE A3	1.2	2.1	3.3	
TYPE A4	1.3	2.1	3.4	
TYPE B1	1.4	2.2	3.5	
TYPE B2	1.5	2.2	3.6	
TYPE B3	1.5	2.2	3.7	
TYPE B4	1.6	2.2	3.4	

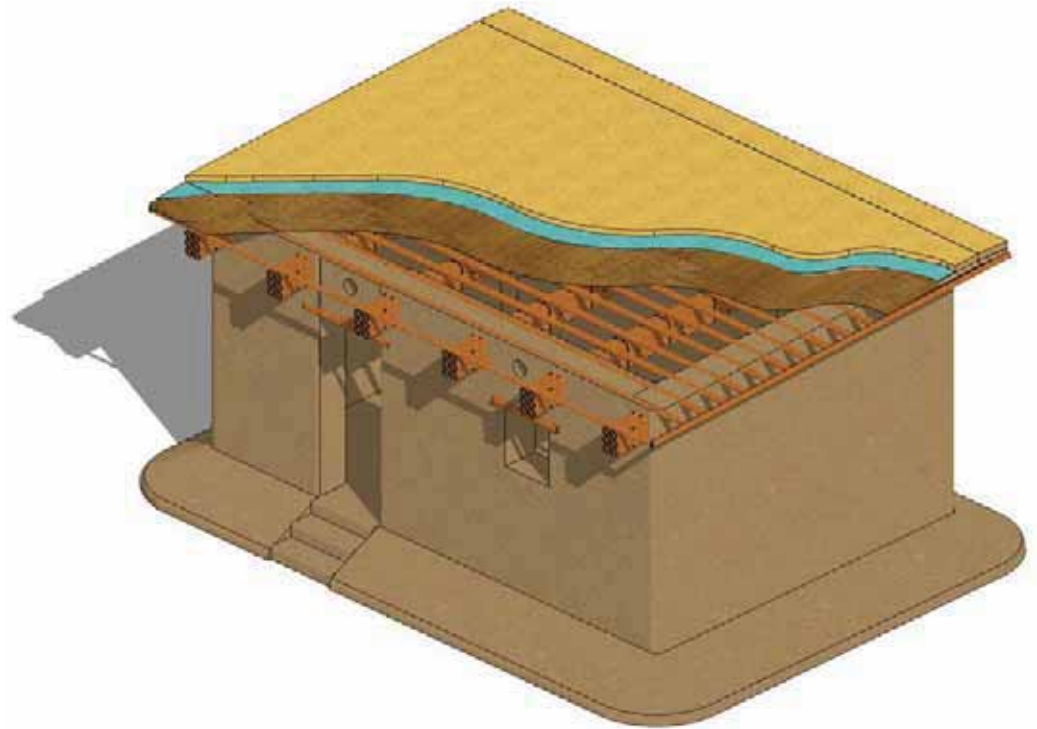
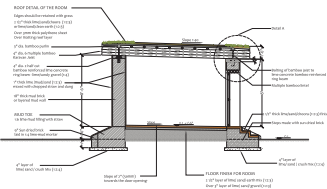
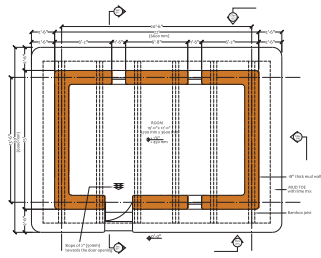
	Element	No	Description	Image
1	BASE	1.1	1'6" (450mm) adobe/mud plinth.	
		1.2	3'3" (1m) adobe/mud platform.	
		1.3	3'3" (1m) circular adobe/mud platform.	
		1.4	1'6" (450mm) adobe/mud and pad plinth.	
		1.5	3'3" (1m) adobe/mud and pad platform.	
		1.6	1'6" x 1'6" (450mm x 450mm) lime concrete/burnt pads with 4" Bamboo anchors	
2	WALLS	2.1	1'6" (450mm) adobe/ mud wall with bamboo lintol.	
		2.2	Loh Khat wall with bamboo skeleton.	
3	ROOF	3.1	KaravanRoof with prefabricated multiple bamboo joists and lime concrete ring beam.	
		3.2	Bamboo Mono-pitch with double bamboo joists and lime concrete ring beam.	
		3.3	Bamboo Double-pitch with bamboo trusses and lime concrete ring beam.	
		3.4	Karavan Chaura Roof with special bamboo joists and lime concrete ring beam.	
		3.5	KaravanRoof with multiple bamboo joists and bamboo ring beam.	
		3.6	Mono-pitch with two-bamboo joists and bamboo ring beam.	
		3.7	Double-pitch with bamboo trusses and bamboo ring beam.	

TYPE AI

Base: 450 mm mudbrick plinth.

Wall: 450 mm mud brick or layered mud.

Roof: KaravanRoof



This is considered among the most appropriate types, which has also gained popularity among various villages where Heritage Foundation has carried out shelter construction after 2011 floods. While it will provide refuge in case of a disaster, under normal circumstances it is being used as extension of the house, for example, for sleeping at night or for drying vegetables etc.

Characteristics: Adobe/mud brick base with toe, 1'6" (450 mm) adobe/mud wall (mud brick or layered mud), bamboo lintols, strong safe haven KaravanRoof, lime-mud rendering.

Base: The base with toe, being 4'-6" (1350mm) wide is strong as it is built with mud brick laid with mud mortar and is carried down 1'-6" (450mm) into the ground with a plinth of 1'-6" (450mm).

Wall: The wall above the base is constructed with adobe/mud (either mud brick or layered mud) of 1'6" (450mm) thickness and incorporates bamboo lintols for all door and window openings.

Roof: The KaravanRoof is composed of prefabricated multiple bamboo joists that are securely tied to the walls and bamboo reinforced lime concrete ring beam. The purlins are laid at specified centres and the entire roof projects 1'-3" (380mm) to

provide protection to the top of walls. The laying of matting, polythene sheet finished with lime-mud-brick dust layer provides protection from rain water. The top layer must be cured in specified manner.

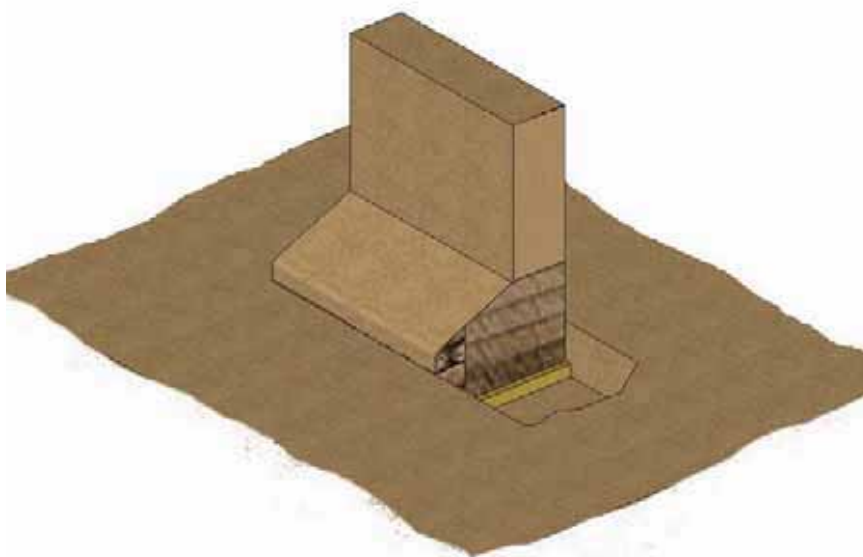
Render: The entire wall surfaces are plastered with lime-mud render to provide weather resistance. For further protection, the external base of the wall and up to about 3'3" (1 m) can be treated with a bamboo lattice before the application of the render/plaster. Provide curing of plaster for a week after application.

TYPE AI

BASE No. 1.1

1'6" (450 mm) Adobe/mud plinth

- i. Excavate trench 4'6" (1350mm) wide, 1'6" (450 mm) below ground level.
- ii. Tamp the base of trench.
- iii. Lay 4" (100mm) thick 1:4:8 lime concrete.
- iv. Make adobe/mud brick toe up to 1'6" (450mm) height.
- v. Apply lime-mud render after completion and cure it for a week.



TYPE AI

WALL No. 2.1

1'6" (450 mm) Adobe/mud

- i. Construct 1'6" (450mm) mud brick or layered mud wall.
- ii. Make door and window openings as shown on drawings.
- iii. Provide 4-bamboo 4" (100mm) dia. lintel tied together with binding wire.
- v. Apply lime-mud render after completion and cure it for a week.

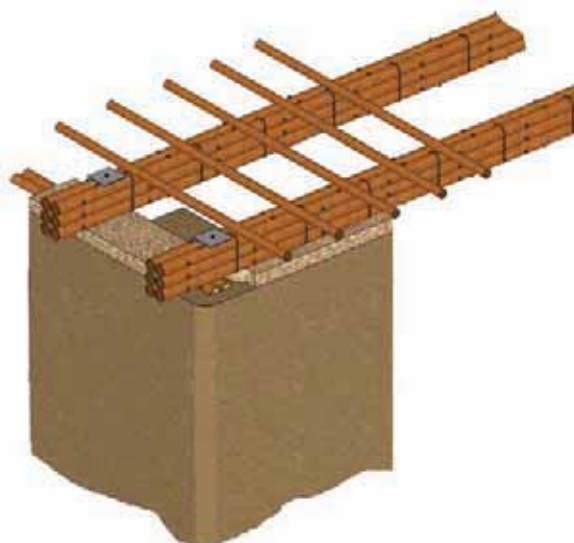


TYPE AI

ROOF No. 3.1

KaravanRoof

- i. Procure 6-bamboo prefabricated joists from HF Karavan Centres.
- ii. Ensure the levels of the top of the walls; one long wall to be 8" (200mm) lower than the other.
- iii. Place 4" (100mm) thick lime concrete bamboo reinforced ring beam.
- iv. Use the required plates and bolts to anchor and fix the joists to the ring beam. Fix bamboo purlins to joists with binding wire.
- vi. Place layers of kana matting, polythene sheet with a final layer of lime-mud-brick dust. Provide curing for a week.

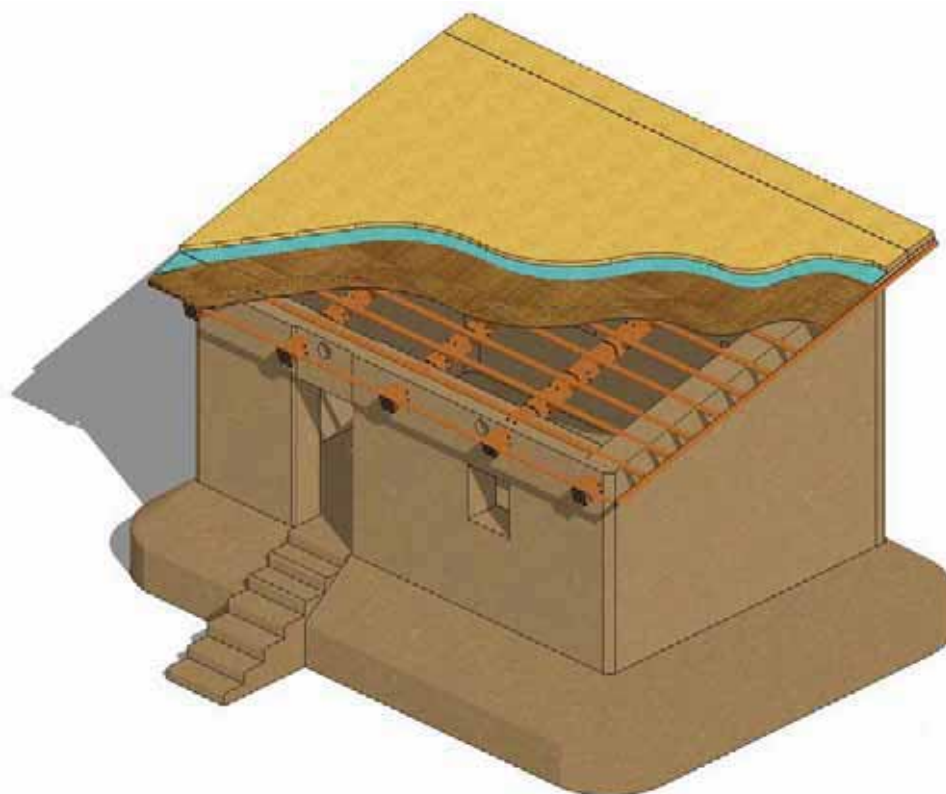
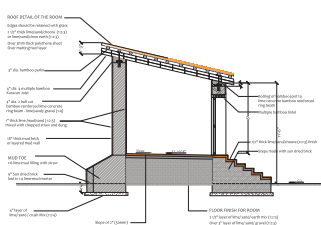
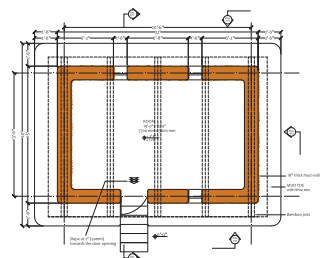


TYPE A2

Base: 1m mudbrick platform

Wall: 450 mm mudbrick or layered mud.

Roof: Bamboo Mono-Pitch



This is a single-pitched roof option i.e. sloping on one side only. The roof is not accessible and requires a minimum 3'3" (1m) high platform to avoid the ingress of flood water into the house.

Characteristics: Adobe/mud brick high platform with toe, mud brick or layered mud wall, bamboo lintols, bamboo mono-pitch roof using 4-bamboo joists.

Base: The base being 4'6" (1350mm) wide with toe is strong as it is built with mud brick laid with mud mortar and is carried down 1'6" (450mm) into the ground. The platform rises minimum 3'3" (1m) above ground or 6" (150mm) above the highest recorded flood level.

Walls: The wall above the base is constructed with adobe/mud (either mud brick or layered mud) of 1'6" (450 mm) thickness and incorporates bamboo lintols for all door and window openings.

Roof: The mono-pitch roof composed of 4-bamboo joists is tied to the walls and bamboo reinforced lime concrete ring beam. The purlins are to be laid at specified centres and the entire roof should project 1'3" (375mm) from the walls to provide protection to the top of walls. The laying of matting, polythene sheet, mud/lime layer finished with thatch or grass will provide resistance to rain.

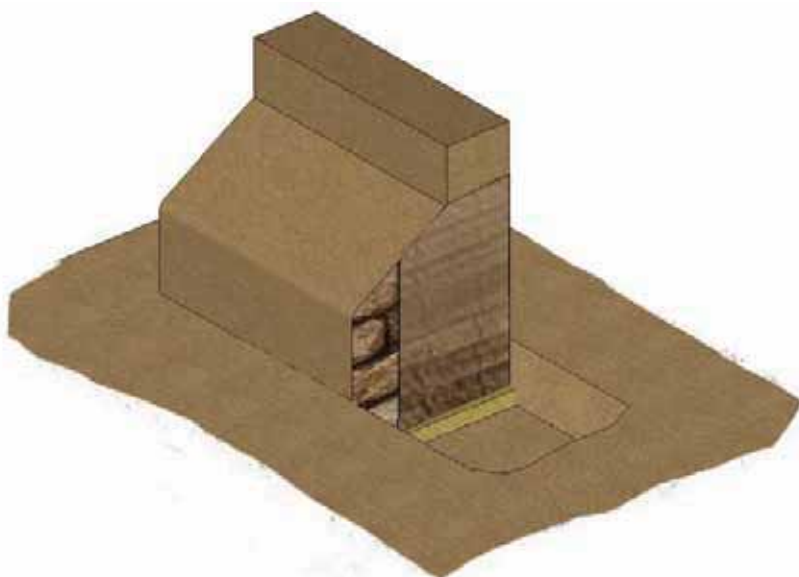
Render: The entire wall surfaces are plastered with lime-mud render to provide weather resistance. For further protection, the base of the wall and up to about 1 m can be treated with a bamboo lattice before the application of the render/plaster. Provide curing of plaster for a week after application.

BASE

No. 1.2

450 mm mud platform

- i. Excavate trench 4'6" (1350mm) wide, 1'6" (450 mm) below ground level.
- ii. Tamp the base of trench.
- iii. Lay 4" (100mm) thick 1:4:8 lime concrete.
- iv. Make adobe/mud brick toe up to 3'3" (1m) height.
- v. Apply lime-mud render after completion and cure it for a week.



WALLS

No. 2.1

450 mm mud with lime

- i. Construct 1'6" (450mm) mud brick or layered mud wall.
- ii. Make door and window openings as shown on drawings.
- iii. Provide 4-bamboo 4" (100mm) dia. lintel tied together with binding wire.
- v. Apply lime-mud render after completion and cure it for a week.



ROOF

No. 3.2

Bamboo Mono-Pitch

- i. Prefabricated 4 bamboo joists using binding wire or string.
- ii. Ensure the levels of the top of the walls; one long wall to be 3' (900mm) lower than the other.
- iii. Place 4" (100mm) thick lime concrete bamboo reinforced ring beam on all walls.
- iii. Use the required plates and bolts to anchor and fix the joists to the ring beam.
- iv. Fix bamboo purlins to joists.
- v. Place layers of kana matting and polythene sheet with a final layer of lime-mud-brick dust.
- vi. Provide curing for a week.

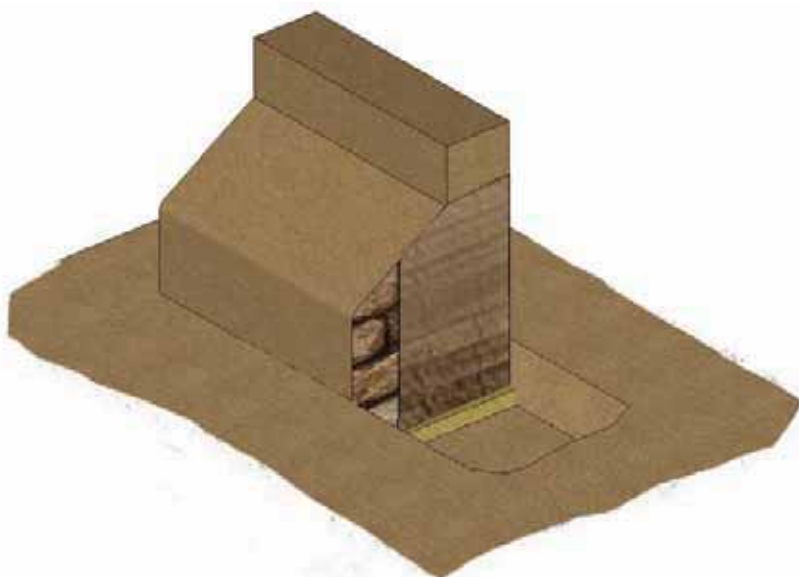


BASE

No. 1.2

450 mm mud platform

- i. Excavate trench 4'6" (1350mm) wide, 1'6" (450 mm) below ground level.
- ii. Tamp the base of trench.
- iii. Lay 4" (100mm) thick 1:4:8 lime concrete.
- iv. Make adobe/mud brick toe up to 3'3" (1m) height.
- v. Apply lime-mud render after completion and cure it for a week.



WALLS

No. 2.1

450 mm mud with lime

- i. Construct 1'6" (450mm) mud brick or layered mud wall.
- ii. Make door and window openings as shown on drawings.
- iii. Provide 4-bamboo 4" (100mm) dia. lintol tied together with binding wire.
- v. Apply lime-mud render after completion and cure it for a week.



ROOF

No. 3.3

Bamboo Double Pitch

- i. Prefabricated 2 bamboo trusses with proper jointing.
- ii. Ensure the levels of the top of the walls; all top levels to be uniform.
- iii. Place 4" (100mm) thick lime concrete bamboo reinforced ring beam on all walls.
- iii. Use the required plates and bolts to anchor and fix the joists to the ring beam.
- iv. Fix bamboo purlins to joists.
- v. Place layers of kana matting and polythene sheet with a final layer of lime-mud-brick dust.
- vi. Provide curing for a week.

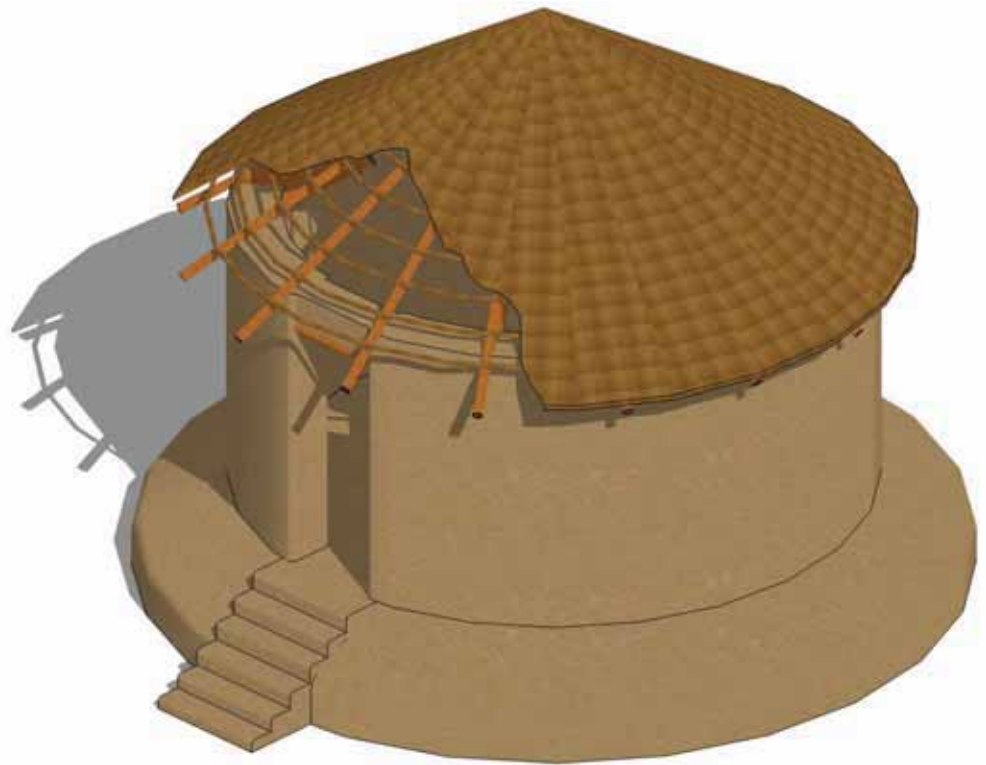
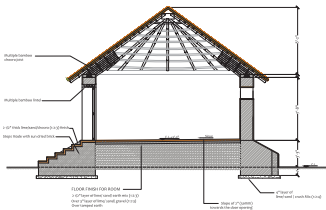
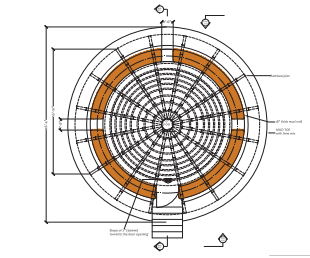


TYPE A4

Base: 1m circular mud platform

Wall: 450 mm mud with lime

Roof: Karavan Chaura Roof



The KaravanChaura, built with a mud brick platform, strong circular mud walls and a technically crafted conical roof is considered one of the safest shelter units. The KaravanChaura has been inspired by the vernacular construction methods from the Lower Sindh region.

Characteristics: Circular adobe/mud brick platform with toe, 1'6" (450 mm) circular adobe/mud wall (mud brick or layered mud), bamboo lintols, special bamboo joists laid in conical form with traditional reed and thatch finishing.

Base: The base being 4'6" (1350mm) wide with toe, is strong as it is built with mud brick laid with mud mortar and

is carried down 1'-6" (450mm) into the ground and is being constructed on a platform 1m above ground.

Walls: The wall above the base is constructed with adobe/mud (either mud brick or layered mud) of 1'6" (450 mm) thickness and incorporates bamboo lintols for all door and window openings.

Roof: The conical roof of the KaravanChaura not only increases the height of the internal space, but with the use of 1'3" (375mm) projections along the circumference allows for proper rainwater drainage. Configured with four nos. joists composed of 6 bamboo base and tied together with horizontal reed woven rope at

regular intervals ensures fabrication of a technically sound roof.

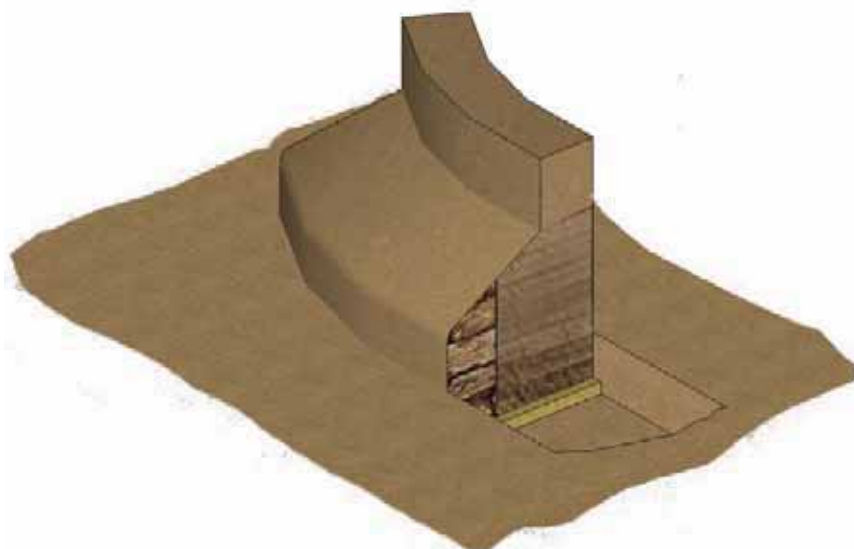
Render: The entire wall surfaces are plastered with lime-mud render to provide weather resistance. For further protection, the base of the wall and up to about 1 m can be treated with a bamboo lattice before the application of the render/plaster. Provide curing of plaster for a week after application.

BASE

No. 1.3

1m circular mud platform

- i. Excavate trench 4'6" (1350mm) wide, 1'6" (450 mm) below ground level in a circular form.
- ii. Tamp the base of trench.
- iii. Lay 4" (100mm) thick 1:4:8 lime concrete.
- iv. Make adobe/mud brick toe up to 3'3" (1m) height.
- v. Apply lime-mud render after completion and cure it for a week.



WALLS

No. 2.1

450 mm mud with lime

- i. Construct 1'6" (450mm) mud brick or layered mud wall.
- ii. Make door and window openings as shown on drawings.
- iii. Provide 4-bamboo 4" (100mm) dia. lintol tied together with binding wire.
- v. Apply lime-mud render after completion and cure it for a week.

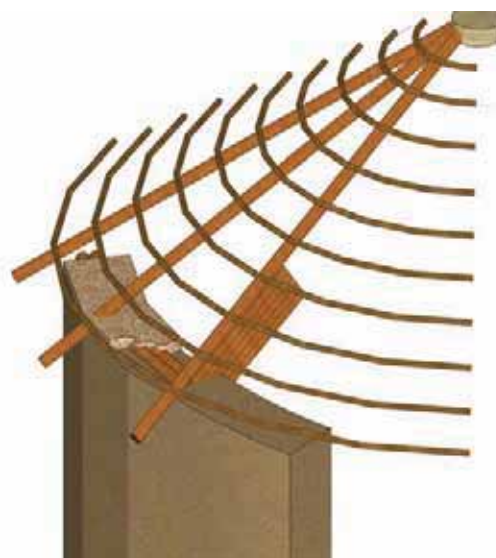


ROOF

No. 3.4

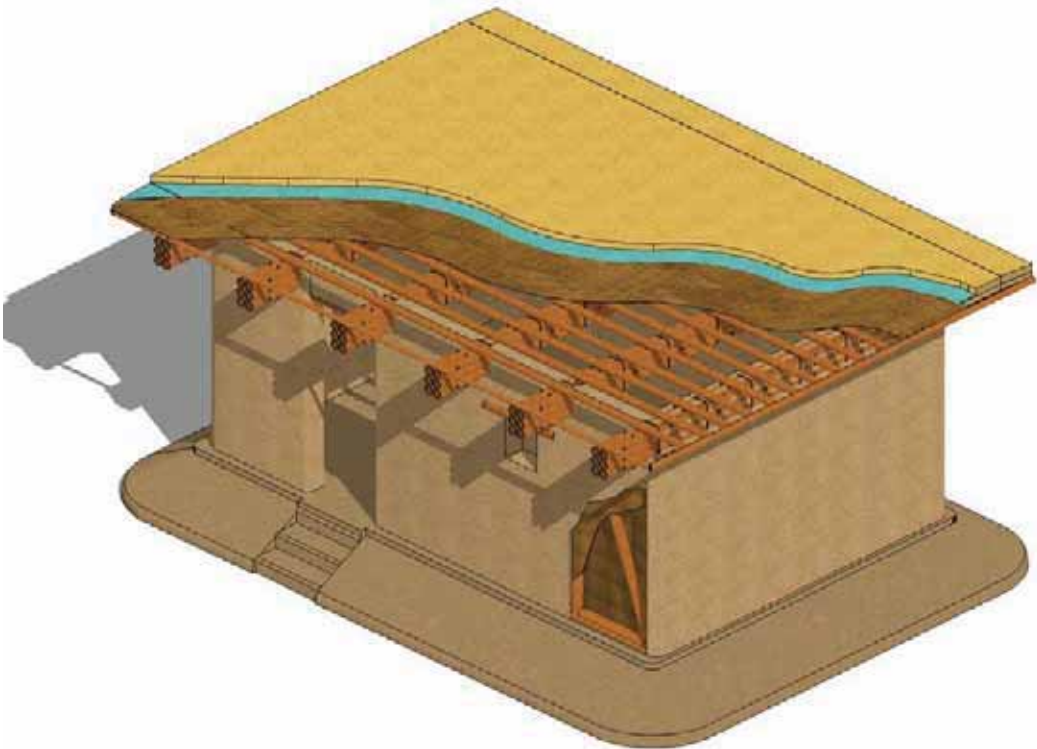
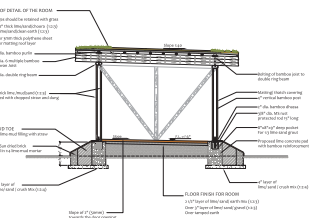
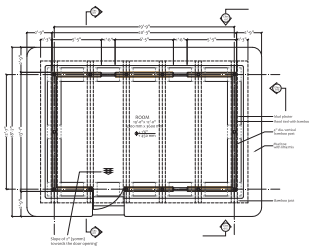
Karavan Chaura

- i. Align 4 nos. prefabricated bamboo joists and ring beam together to form a conical roof.
- ii. Ensure the levels of the top of the walls; all top levels to be uniform all around.
- iii. Place 4" (100mm) thick lime concrete bamboo reinforced ring beam on all walls.
- iv. Tie horizontal reed woven rope at regular intervals
- iii. Raise wall to embed six bamboo joists
- iv. Place layers of polythene sheets and a double layer of thatch



TYPE BI

Base: 450 mm adobe/mud and lime conc. pad plinth.
Wall: Loh Khat wall with bamboo skeleton.
Roof: KaravanRoof with bamboo ring beam.



The Type BI shelter unit is designed as an improved vernacular Loh Khat construction. The introduction of a bamboo skeleton makes the structure strong, while retaining the special Khat or reed filling.

Characteristics: 1'-6" (375mm) adobe/mud brick plinth with toe and pad base, 4" (100mm) bamboo skeleton with 50mm reed infill on both sides finished with mud/lime plaster, bamboo lintols, and Karavan-Roof

Base: The adobe/mud base with toe, laid in mud mortar is 4'6" (1350mm) wide and incorporates lime concrete

pads at regular intervals, both being carried down 1'-6" (450mm) and providing a 1'6" (450 mm) plinth.

Walls: The wall above the plinth consists of a 4" (100mm) bamboo frame skeleton with diagonal framing with bamboo posts grouted and anchored in lime concrete pads. Bamboo dassa acts as plinth beam. Khat or reed assembly tied with woven rope is used as infill on both sides of the bamboo skeleton.

Roof: The KaravanRoof is composed of multiple bamboo joists that are securely fixed to 2-bamboo ring beam. The purlins are laid at speci-

fied centres and the entire roof projects 1'3" (375mm) to provide protection to the top of walls. Layers consisting of matting, polythene sheet finished with lime-mud-brick dust provide protection from rain water. The lime layer should be cured in the specified manner.

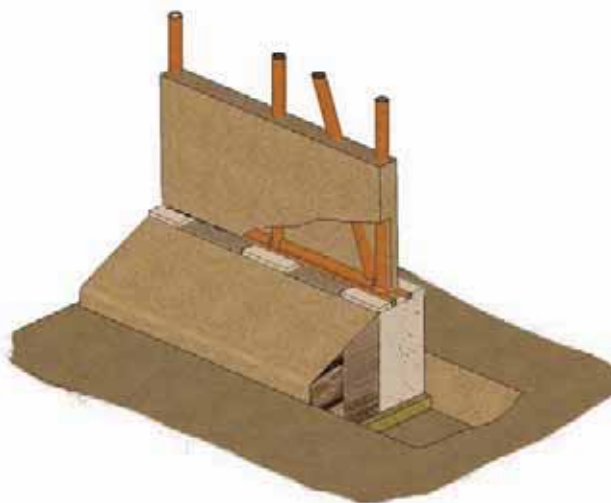
Render: Provide lime-mud render for weather resistance to Khat wall. For further protection, the base of the wall and up to about 1m should be treated with a bamboo lattice before the application of the render/plaster. Provide curing of plaster for a week after application.

BASE

No. 1.4

450 mm mud and pad plinth

- i. Excavate trench 4'6" (1350mm) wide, 1'6" (450mm) below ground level.
- ii. Tamp the base of trench.
- iii. Lay 4" thick 1:4:8 lime concrete.
- iv. Make lime concrete pads size 1'6"×1'6" (450×450mm) that should rise up to the top of the plinth.
- v. Make adobe/mud brick toe in mud mortar up to 1'6" (450mm) height.
- vi. Apply lime-mud render after completion and cure it for a week.



WALLS

No. 2.2

Loh Khat wall with bamboo skeleton

- i. Anchor 4" (100mm) bamboo posts into lime concrete pads.
- ii. Secure bamboo dassa along plinth.
- iii. Fix bamboo diagonal bracing between vertical posts for strength.
- iv. Tie entire structure with 2 bamboo ring beams.
- v. Secure matting along both edges with woven rope.
- vi. Provide 4-bamboo 4" (100mm) dia. lintol tied together with binding wire.
- vii. Apply mud-lime render after completion and allow curing.

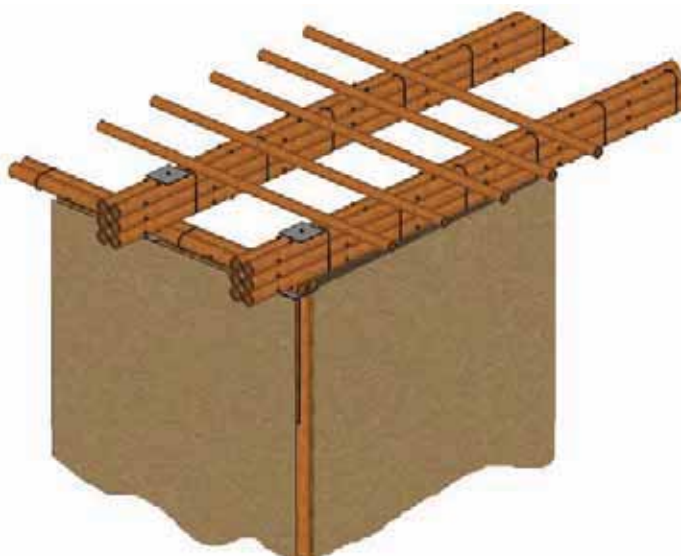


ROOF

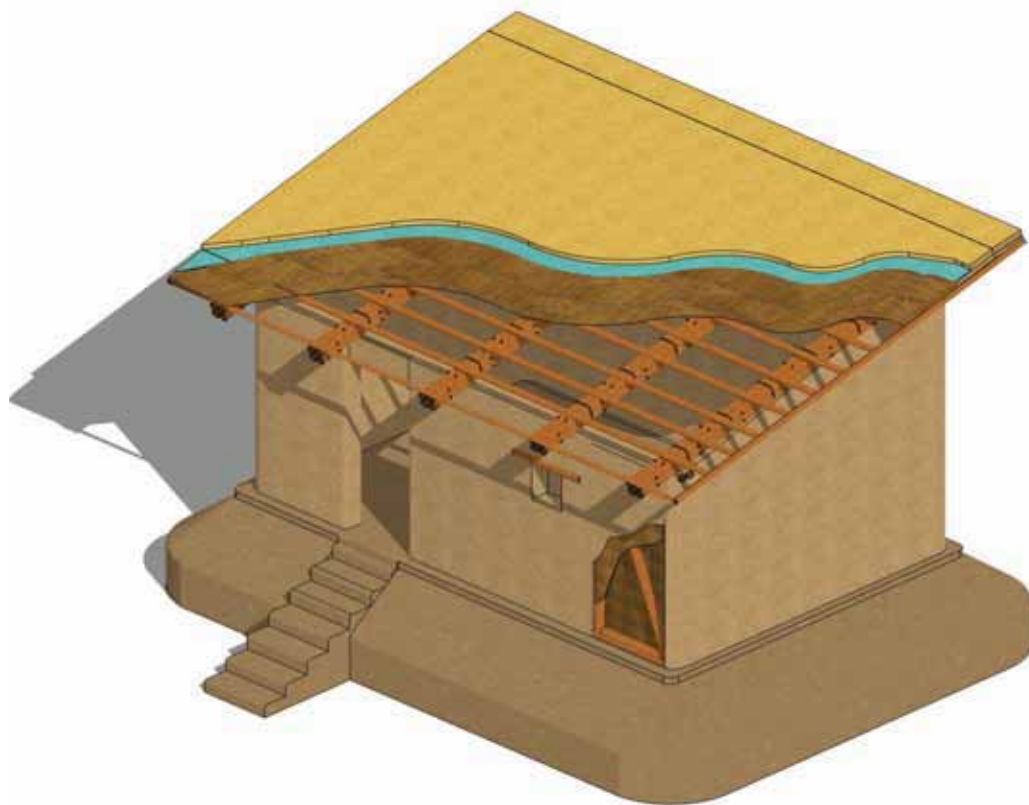
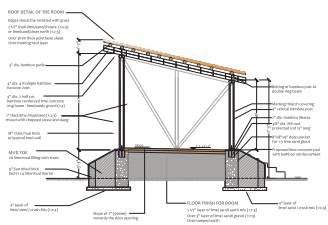
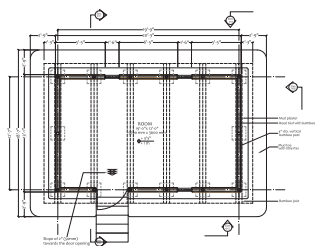
No. 3.5

Karavan Roof with bamboo ring beam

- i. Procure 6-bamboo prefabricated joists from HF Karavan Centres.
- ii. Ensure the levels of the top of the walls; one long wall to be 8" (200mm) lower than the other.
- iii. Use the required plates and bolts to anchor and fix the joists to the ring beam.
- iv. Fix bamboo purlins to joists with binding wire.
- v. Place layers of kana matting, polythene sheet with a final layer of lime-mud-brick dust.
- vi. Provide curing for a week.



Base: Im adobe/mud brick and lime conc. pad platform
Wall: Loh Khat wall incorporating bamboo skeleton
Roof: Mono-pitch with bamboo ring beam



Characteristics: 3'3" (1m) adobe/mud brick platform with toe, and pad bases, 4" (100mm) bamboo skeleton with 50mm reed infill on both sides finished with 1' (25mm) thick mud/lime plaster, bamboo lintols, and single-pitched roof.

Roof: The mono-pitched roof employs multiple 4 bamboo joists that are required to be anchored securely to 2-bam-

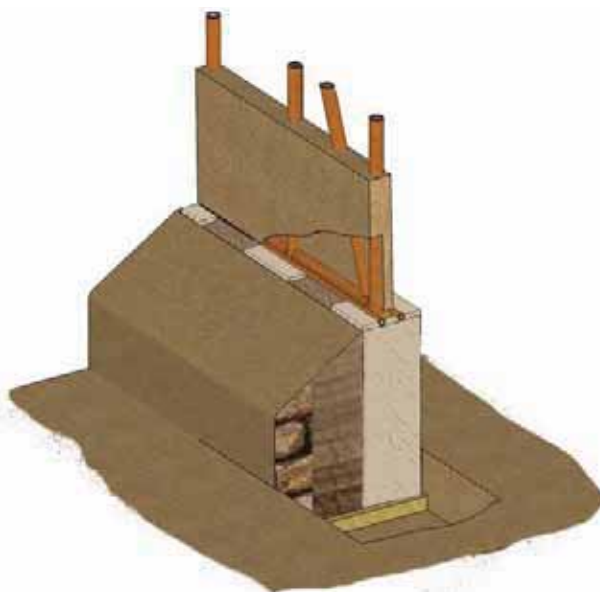
Render: Provide lime-mud render for weather resistance to Khat wall. For further protection, the base of the wall and up to about 1m should be treated with a bamboo lattice before the application of the render/plaster. Provide curing of plaster for a week after application.

BASE

No. 1.5

1m mud and pad platform

- i. Excavate trench 4'6" (1350mm) wide, 1'6" (450mm) below ground level.
- ii. Tamp the base of trench.
- iii. Lay 4" thick 1:4:8 lime concrete.
- iv. Make lime concrete pads size 1'6"x1'6" (450x450mm) that should rise up to the top of the plinth.
- v. Make adobe/mud brick toe in mud mortar up to 1'6" (450mm) height.
- vi. Apply lime-mud render after completion and cure it for a week.



WALLS

No. 2.2

Loh Khat wall with bamboo skeleton

- i. Anchor 4" (100mm) bamboo posts into lime concrete pads.
- ii. Secure bamboo dassa along plinth.
- iii. Fix bamboo diagonal bracing between vertical posts for strength.
- iv. Tie entire structure with 2 bamboo ring beams.
- v. Secure matting along both edges with woven rope.
- vi. Provide 4-bamboo 4" (100mm) dia. lintol tied together with binding wire.
- vii. Apply mud-lime render after completion and allow curing.

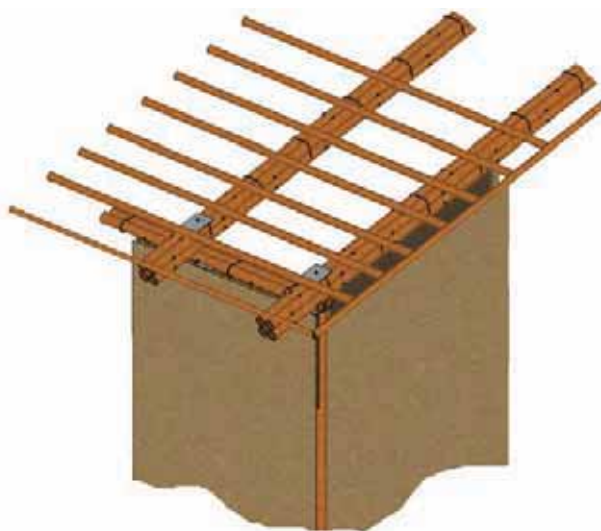


ROOF

No. 3.6

Mono-pitch with bamboo ring beam

- i. Fabricate 4-bamboo joists by tying with binding wire or strings.
- ii. Ensure the levels of the top of the walls; one long wall to be 3' (0.900m) lower than the other.
- iii. Use the required plates and bolts to anchor and fix the joists to the ring beam.
- iv. Fix bamboo purlins to joists with binding wire.
- v. Place layers of kana matting, polythene sheet with a final layer of lime-mud-brick dust and provide curing.

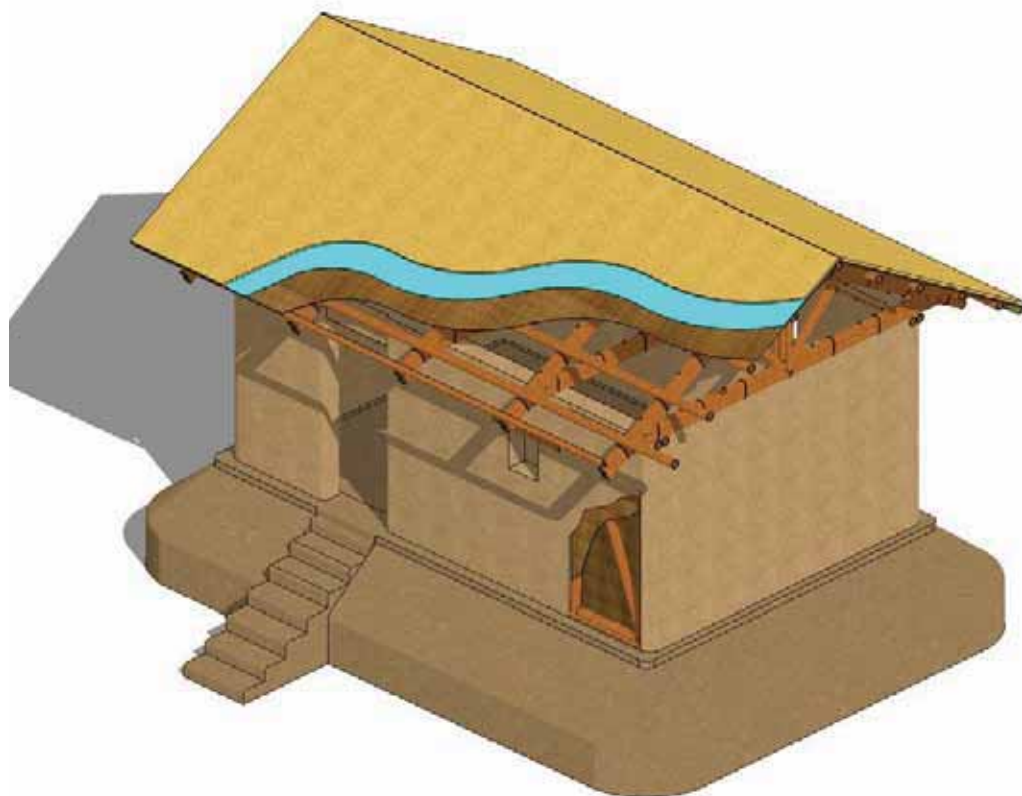
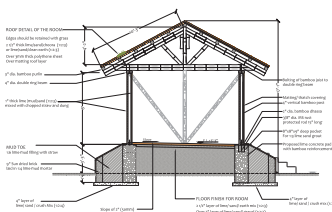
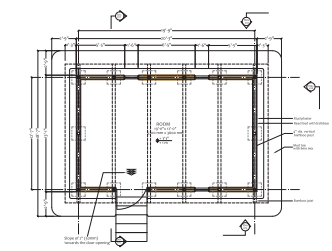


TYPE B3

Base: 1m adobe/mud brick and lime conc. pad platform.

Wall: Loh Khat wall incorporating bamboo skeleton.

Roof: Double-pitch with bamboo ring beam.



The Type B3 shelter is designed as an improved vernacular Loh Khat construction with bamboo joists in the mono-pitched sloping roof. The introduction of a bamboo skeleton makes the walls strong, while retaining the special Khat or reed filling. Since the roof is inaccessible, a raised platform is necessary. Since the roof is inaccessible, it needs to be built on a high platform.

Characteristics: 3'3" (1m) adobe/mud brick platform with toe, and pads base, 4" (100mm) bamboo skeleton with 75mm reed infill on both sides finished with 1' (25mm) thick mud/lime plaster, bamboo lintols, and double pitched roof.

Base: The adobe/mud platform 3'3" (1m) high is laid in mud mortar and is 4'6" (1350mm) wide, incorporating lime concrete pads, both being carried down 1'-6" (450mm).

Wall: The wall above the platform consists of a 4" (100mm) bamboo frame skeleton with diagonal framing with bamboo posts grouted and anchored in lime concrete pads. Bamboo dassa acts as plinth beam. Khat or reed assembly tied with woven rope is used as infill on both sides of the bamboo skeleton.

Roof: The double-pitched roof employs bamboo trusses and is required to be anchored securely to 2-bamboo joists. Purlins should be laid at specified

centres and the eaves should project 1'3" (375mm) to provide protection to the top of walls. Layers of matting, polythene sheet, and mud-lime can be finished with thatch to provide protection from rain.

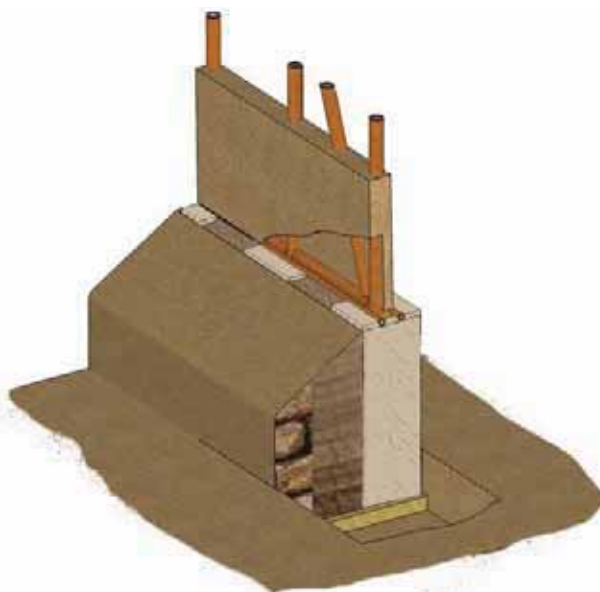
Render: Provide lime-mud render for weather resistance to Khat wall. For further protection, the base of the wall and up to about 1m should be treated with a bamboo lattice before the application of the render/plaster. Provide curing of plaster for a week after application.

BASE

No. 1.5

1m mud and pad platform

- i. Excavate trench 4'6" (1350mm) wide, 1'6" (450mm) below ground level.
- ii. Tamp the base of trench.
- iii. Lay 4" thick 1:4:8 lime concrete.
- iv. Make lime concrete pads size 1'6"x1'6" (450x450mm) that should rise up to the top of the plinth.
- v. Make adobe/mud brick toe in mud mortar up to 1'6" (450mm) height.
- vi. Apply lime-mud render after completion and cure it for a week.



WALLS

No. 2.2

Loh Khat wall with bamboo skeleton

- i. Anchor 4" (100mm) bamboo posts into lime concrete pads.
- ii. Secure bamboo dassa along plinth.
- iii. Fix bamboo diagonal bracing between vertical posts for strength.
- iv. Tie entire structure with 2 bamboo ring beams.
- v. Secure matting along both edges with woven rope.
- vi. Provide 4-bamboo 4" (100mm) dia. lintol tied together with binding wire.
- vii. Apply mud-lime render after completion and allow curing.



ROOF

No. 3.7

Double-pitch with bamboo ring beam

- i. Prefabricate 2 bamboo trusses by using preferably plates. In case of difficulty use binding wire or strings using designated sizes of truss members.
- ii. Ensure the levels of the top of the walls are equal.
- iii. Use the required plates and bolts to anchor and fix the joists to the ring beam. Fix bamboo purlins to joists with binding wire.
- v. Place layers of kana matting, polythene sheet with a final layer of lime-mud-brick dust and provide curing.

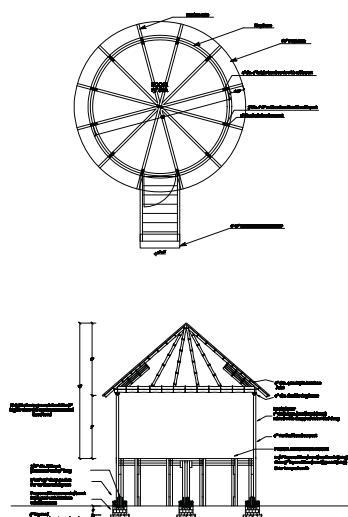


TYPE B4

Base: 1m adobe/mud brick and lime conc. pad anchored stilts.

Wall: Loh Khat wall incorporating bamboo skeleton.

Roof: Conical Chaura



The Type B4 shelter is designed as an improved vernacular Loh Khat construction on stilts. The introduction of a bamboo skeleton makes the walls strong, while retaining the special Khat or reed filling. With a conical inaccessible roof it was decided that the structure should be raised on stilts. The stilts make the structure light weight and ensure that flood waters pass below the finished floor level.

Characteristics: 8" adobe/mud brick pads which have been anchored with bamboo stilts. The stilts rise to 3'3" (1m) or 6" above the highest recorded flood level. 4" (100mm) bamboo skeleton with 75mm reed infill on both sides finished with 1' (25mm)

thick mud/lime plaster, bamboo lintols, and conical roof.

Base: The 1'6" x 1'6" (450mm x 450mm) burnt brick/lime concrete block foundations lie 1'6" (450 mm) below ground and rise 8" (200mm) above ground. 4" (100mm) th bamboo posts are grouted in the pads and raised to 3'3" (1m) in height. Bamboo dhasa acts as an additional tying member, giving the structure further strenght.

Wall: The wall above the platform consists of a 4" (100mm) bamboo frame skeleton with diagonal framing with bamboo posts grouted and anchored in lime concrete pads. Khat or reed assembly tied with woven rope is used as infill on both

sides of the bamboo skeleton.

Roof: TThe conical roof of the KaravanChaura not only increases the height of the internal space, but with the use of 1'3" (375mm) projections along the circumference allows for proper rainwater drainage. Configured with four nos. joists composed of 6 bamboo base and tied together with horizontal reed woven rope at regular intervals ensures fabrication of a technically sound roof.

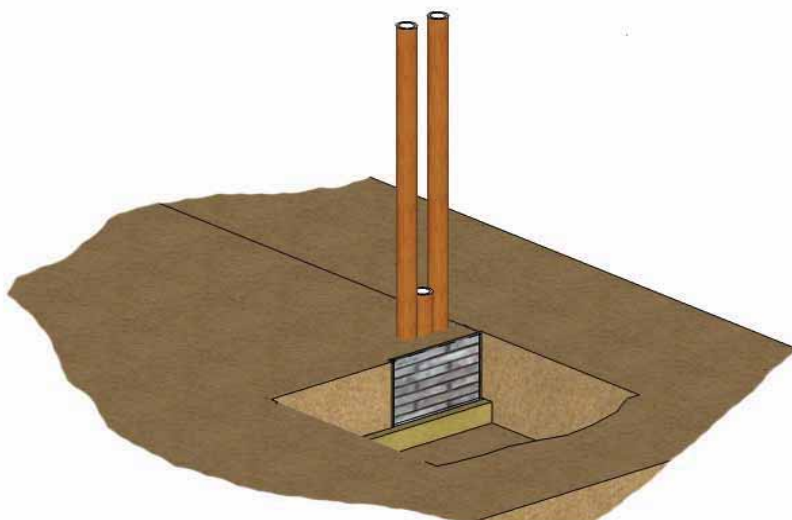
Render: Provide lime-mud render for weather resistance to Khat wall. Provide curing of plaster for a week after application.

BASE

No. 1.5

1m mud and pad platform

- i. Excavate trench 4'6" (1350mm) wide, 1'6" (450mm) below ground level.
- ii. Tamp the base of trench.
- iii. Lay 4" thick 1:4:8 lime concrete.
- iv. Make lime concrete pads size 1'6"x1'6" (450x450mm) that should rise up to the top of the plinth.
- v. Make adobe/mud brick toe in mud mortar up to 1'6" (450mm) height.
- vi. Apply lime-mud render after completion and cure it for a week.

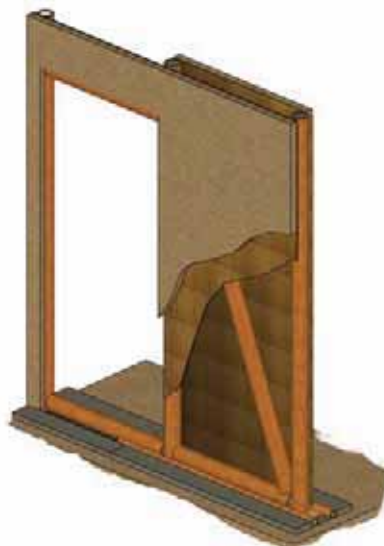


WALLS

No. 2.2

Loh Khat wall with bamboo skeleton

- i. Secure bamboo dassa along plinth.
- ii. Fix bamboo diagonal bracing between vertical posts for strength.
- iii. Tie entire structure with 2 bamboo ring beams.
- iv. Secure matting along both edges with woven rope.
- v. Provide 4-bamboo 4" (100mm) dia. lintol tied together with binding wire.
- vi. Apply mud-lime render after completion and allow curing.

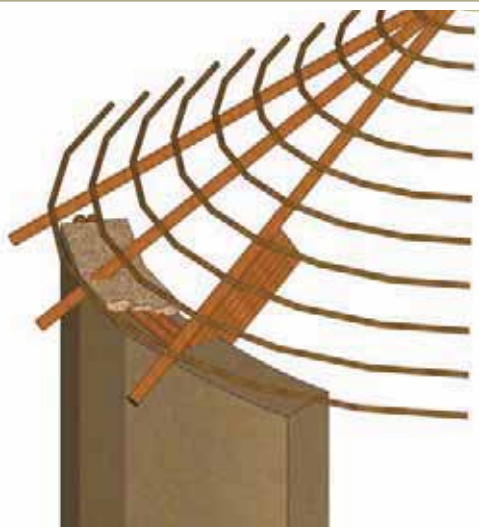


ROOF

No. 3.4

Karavan Chaura

- i. Align 4 nos. prefabricated bamboo joists and ring beam together to form a conical roof.
- ii. Ensure the levels of the top of the walls; all top levels to be uniform all around.
- iii. Place 4" (100mm) thick lime concrete bamboo reinforced ring beam on all walls.
- iv. Tie horizontal reed woven rope at regular intervals
- iii. Raise wall to embed six bamboo joists
- iv. Place layers of polythene sheets and a double layer of thatch



5.1 For Implementing Partners (IPs)

5.1.1 Site & Shelter Typology Selection

Is the site on higher ground?

Is the orientation of shelter north south?

Are preparation for 3'3" (1m) platform* made in case of non-accessible roofs?

Has the Layout been marked with the Layout Template Kit that includes:

- String mould according to house size
- Guniya Template – 3:4:5
- Lime Powder

Has a lime pit been made, soaked with water for one day and slaking process started?

5.1.2 Shelter Construction Using Adobe/Mud Walls

Before Starting Construction Determine Typology of Shelter

- Karavan Roofs require 12"-18" (300mm-450mm) Plinth
- Non-accessible Roofs require: min. 3'3" (1m) Platform

i. Base Preparation

Check if the top soil 6" (150mm) has been removed.

Check if the base trenches have been dug to a depth of 1'6" (450mm).

Check if the bottom of the trench has been compacted by tamping effectively.

Check if lime concrete base lime: sand: aggregate (1:2:4) been laid.

Check if the base has been checked with water level before starting masonry.

ii. Wall Construction

I. Construction of Base and Toe

Mortar of soil and water should be mixed for 4 days to 1 week prior to application.

Check if 9" (275mm) mud brick masonry at edge of base has been started.

Check if wall has been begun from the corners.

Check if bond in masonry has been maintained.

Check if the filling in the base is of layered lime-mud (1:6) mixed with chopped straw.

Check if a slope of 30 degrees has been maintained in the toe up to plinth level.

Check that in the case of Karavan Roof plinth level is min. 1'-6" (450mm); in case of non-accessible roofs the platform is min. 3'3" (1m).

Check that the toe level is the same as the floor level.

[* Floor level of platform must be 6" above the highest recorded flood level]

2. Raise Wall to Lintel Level

Check that thickness of 18" (450mm) mud brick or layered mud wall is maintained.

Check that the lintel level is maintained at 7' (2100mm)

Check that multiple bamboo lintel extends 1' (300mm) on both sides of door or window opening

Check that the door has a width of min. 3' (900mm) and window of min. 1'6" (450mm)

3. Check Wall Heights with Water Level

KaravanRoof – Front wall at 8' (2400mm); Rear wall at 8'6" (2550)

Mono-pitched roof – Front wall at 8' (2400mm); Rear wall at 11' (3300mm).

Double-pitched roof – 8' (2400mm) height all around.

Karavan Chaura – 8' (2400mm) height all around.

iii. Roof Construction

1. Preparation for Roof

Check that the centre lines for joist locations have been marked on top of wall.

Check that 6"x6" (150mmx150mm) pockets have been made on centre line location.

Check the grouting in the pockets checked for consistency and levels.

2. Prefabricated Ring Beams

Check placement of prefabricated bamboo ring beams at the centre of walls.

Check fixing of 4" (100mm) bolts (kabla) at joists centre lines.

Check lime concrete grouting in each pocket.

Check placement of steel plate below ring beam.

3. Prefabricated Green Karavan multiple bamboo Joists

Check binding wire at 2' (500mm) centres.

Check projection of Joists from walls along both sides 15" (375mm).

Check that steel plates above joists are placed and secured with bolts (kabla).

4. Tying of Joists, Ring beam and steel plates

Check that all components have been tied together securely.

5. Bamboo Purlins

Check that purlin ends are leached with lime cream.

Check that purlins are attached at every 1' (300mm).

Check that roof projection is maintained at 15" (375mm) on all sides.

Check bamboo ends are filled with anti-termite biodegradable filling.



PLC RATIO
1 : 2 : 4

LIME 7%



SAND 31%



AGGREGATE 62%

Ratio to mix PCC course for foundations



LIME RENDER
1 : 2 : 3

LIME 17%



SAND 33%



SOIL 50%

Ratio to mix mortar for accessible Karavan Roof and flooring

iv. Roof Finish

1. Application of roof finishes

Check that reed matting on bamboo purlins covers entire surface including projections.

Check that polythene sheet min. 3mm thickness covers the entire matting surface.

Check that 2" (50mm) thick lime: sand: brickdust (1:2:4) layer is applied on accessible KaravanRoofs.

Check that 2" (50mm) thick lime: sand: soil (1:2:3) layer is applied on in-accessible roofs except conical roofs.

Check that grass is used to stabilize roof edges.

2. Curing of Lime Roof Finish

Protect top finishing layer from direct heat and sunlight by use of jute or plastic sheet.

Check that curing is carried out for a minimum 7 days.

v. Flooring

1. Earth filling

Check earth is laid in 6" (150mm) layers and fully compacted.

Check level of base of floor with water level to ensure 2" (50mm) slope towards the door opening.

2. Mud-Lime Layer

Check base layer of 3" (75mm) thickness of lime: sand: gravel (1:2:3).

Check finishing layer of 2-1/2" (63mm) thickness of lime: sand: earth (1:2:3),

Check finishing layer with water level to ensure with 2"(50mm) slope towards the door opening.

3. Protection for Curing

Check if flooring is protected from direct heat and sunlight.

Check if curing has been carried out for one week.

5.1.3 Shelter Construction Using Reed/Loh Khat Walls

Check that the pad (lime concrete (1:2:3) or burnt brick) is 18"x18" (450mmx450mm).

Check that the pad is taken 18" (450mm) below ground.

Check that the bamboo posts are anchored in the pad with 15" (400mm) steel bar.

Check that the steel bar and bamboo posts have been grouted properly.

Check that the bamboo plinth beam (dhassa) been placed in the centre of the wall.

Check that the reed/khat has been attached securely to the bamboo skeleton with a rope.



Stacking of mud bricks

Check that the horizontal khat rope has been tied with rope at 2' (600mm) centres.

Check that the joists, kabla, ring beam and steel plates have been securely tied together.

Check that roof projection is extended 15" (375mm) on all sides.

Check that the roofs either finished as described earlier or is covered with khat and secured with rope.

5.2 For Site Staff

5.2.1 Lime

1. Lime Product

Check that lime procured is in lumps (Pathar Chuuna) and from approved lime kilns.

i. Lime Pit

Check that lime pit is min. 4'x4'x4' (400mmx400mmx400mm) for household use; 5'0"x9'9" (1.5mx3m) and 4' (400mm) deep for communal pits.

Check that lime pit is out of children's reach.

Ensure that it is surrounded by bushes.

ii. Ensure that lime is slaked for minimum 1 week before use.

2. Slaking in Household Pits

Fill pit with water for one day.

Wait for ground to soak water.

Next Day refill pit with water.

Pour two bags of lime.

Lime will take 3-4hrs to lose heat.

Mix thoroughly for one week before use.

5.2.2 Adobe/Mud

1. Mud Brick

Test soil with 'Bottle Test' to check clay content.

Prepare mud by soaking for one week before moulding bricks.

Turn brick on different sides each day for equal drying.

Stack bricks after 4 days of equal drying on each side.

Carry out drying by stacking of bricks so that air passes through them.

Lay mud brick in mud mortar, beginning construction from corners.

2. Layered Mud

Prepare materials (soil, sand, straw) 1 week prior to application.

Increase height slowly, not more than 1' (300mm) each day.

Begin construction from the corners.

Thickness of wall to be minimum 18" (450mm)



Ratio to mix Mortar for non-accessible roof



Cover walls with plastic or cloth during the curing period

5.2.3 Lime-Mud Finishes

1. Wall Plaster

Check that soil is tested with 'Bottle Test'.

Check if sand has been added in case clay content is high.

Check that soil has been soaked 1 week prior to application

Check that long stick straw (bhoosa) has been added (short stick straw should be avoided).

Check that plaster is shaded and kept damp from direct heat and sunlight. Install by gunny bags, old blankets or other shading device hung from the roof.

Check that curing is carried out for min. one week after application.

2. Roof finish for KaravanRoof: lime: sand: brickdust dust (1:2:4)

Check that mortar has been soaked and mixed for 1 week prior to application.

Check that clean brick dust (size 3/8" 10mm) has been used.

Check that roof layer is covered and kept damp for one week.

3. Roof finish for Non-Accessible Roofs

Check that soil is tested with 'Bottle Test'.

Check if sand has been added in case clay content is high.

Check that soil has been soaked 1 week prior to application.

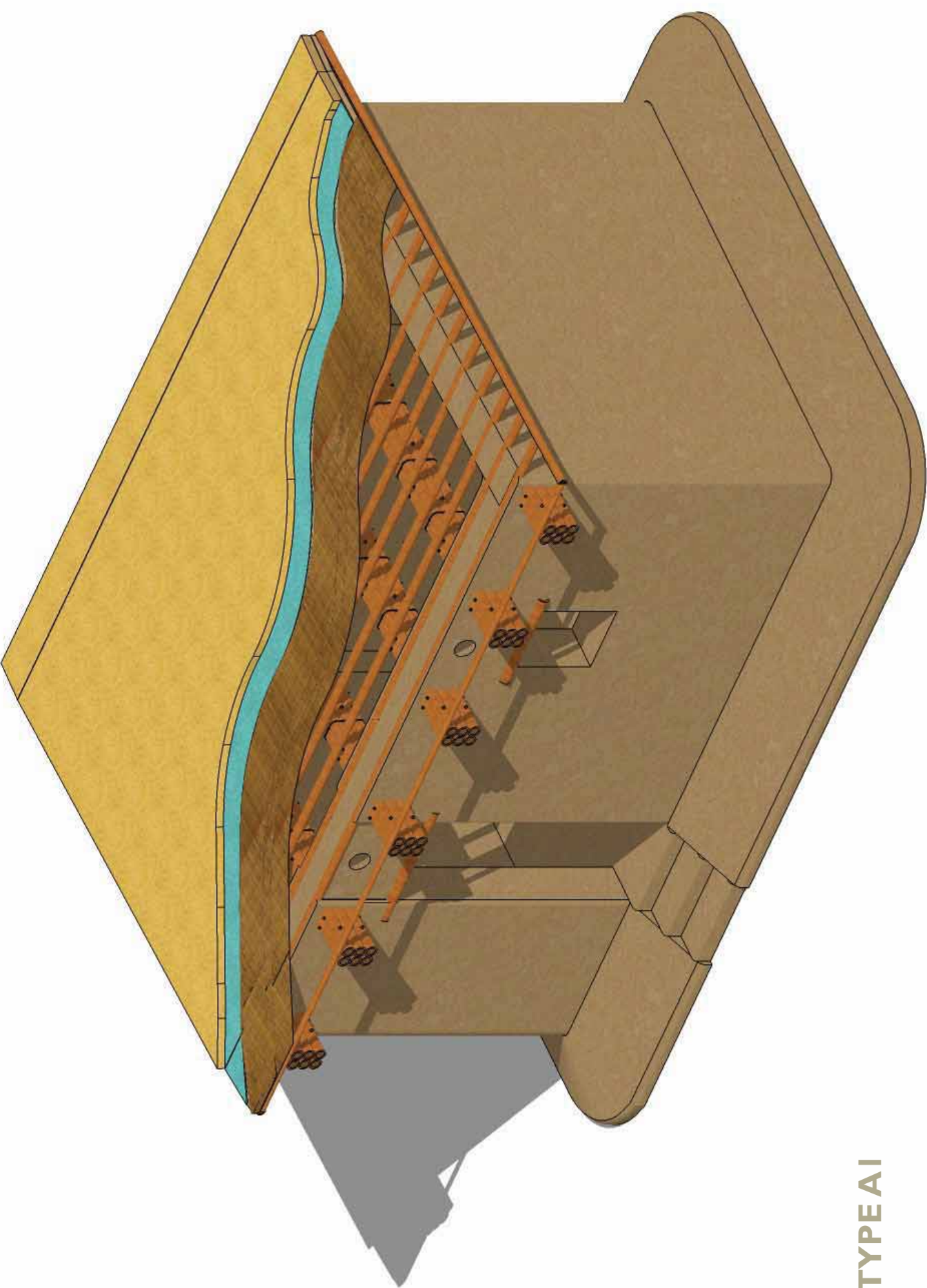
Check that roof layer is covered and kept damp for one week.

5.3 For Households

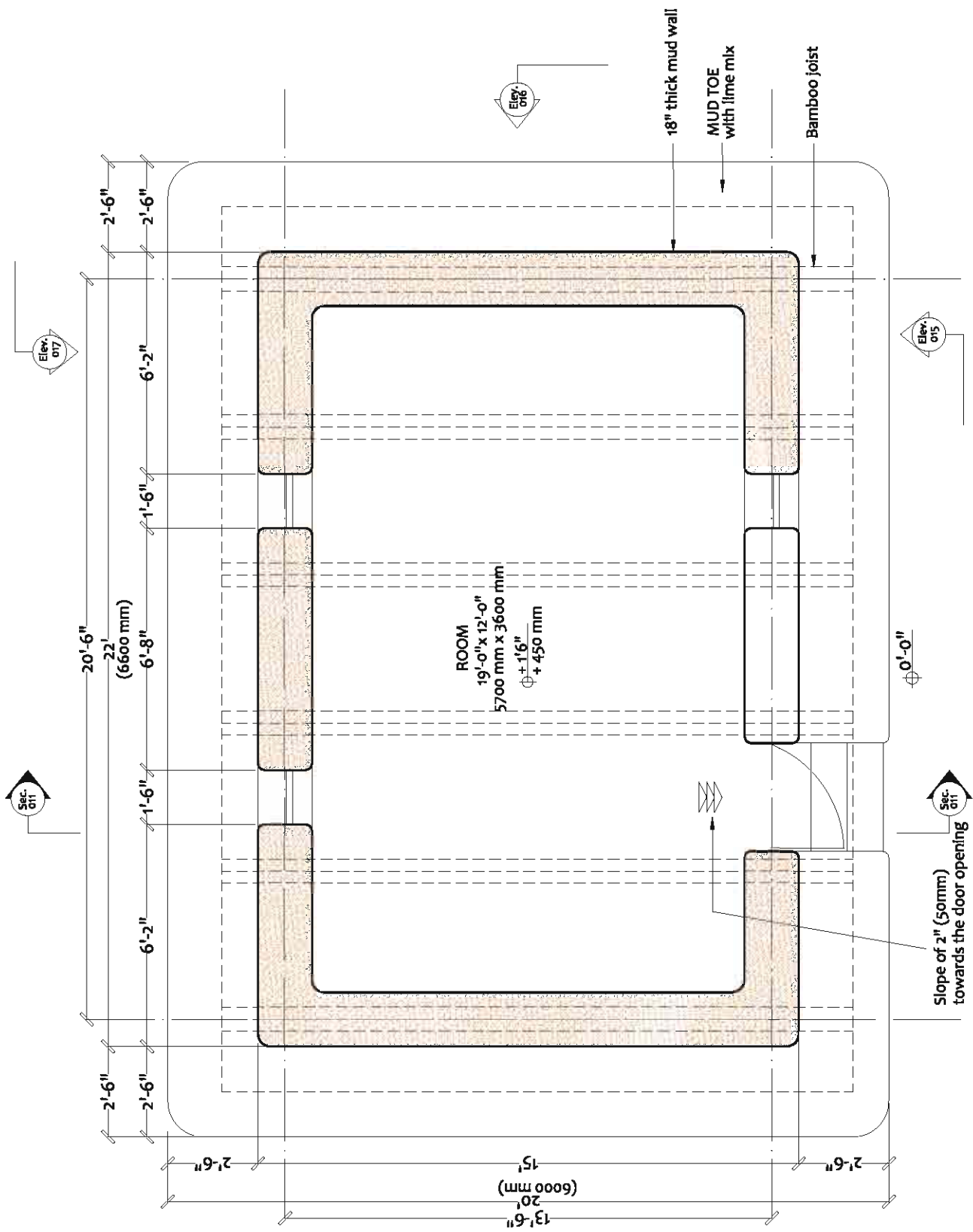
- Has the lime been soaked 7 or more days prior to construction.
- Has the soil been compacted properly.
- Check lime concrete ratio (1:2:4) and levels.
- Has the mortar been prepared using lime.
- Is the lintel equal to wall thickness.
- Is the lintel overlapped on wall at 1' on both sides of the opening.
- Are all bamboo ring beams joined together.
- In case of Karavan Joists are the ends filled with anti-termite biodegradable filling.
- Are the joists projecting at 15" on all sides.
- Are the joists attached with the bolts (kablas).
- Have steel plates been used.
- Are bolts (kablas) tied at 2' (200mm) centres.
- Is the binding wire attached at every 2' (200mm) centres in Karavan Joists.
- Is the plastic sheet 3mm in thickness.
- Does the plastic sheet cover the entire roof.
- Check ratio (1:2:4) of lime, sand, brick dust mortar on roof finish.
- Check roof slope is more than 6" (150mm).
- Cover exterior plaster render with plastic sheet or blanket or any other covering.
- Check if floor has a slope of minimum 2" (50mm).
- Cure for 8 days by sprinkling with water.

Annexure I

AUTOCAD DRAWINGS



TYPE A1



Project:

BUILD BACK SAFER WITH VERNACULAR METHODOLOGIES

Title:

PLAN

Shelter Type:

A1

Scale: 1/4" = 1'0"

April 2012

Dwg no.:

L (2-) 001



Dwg no :
L (2-) 002

Scale: 1/4"=1'0"

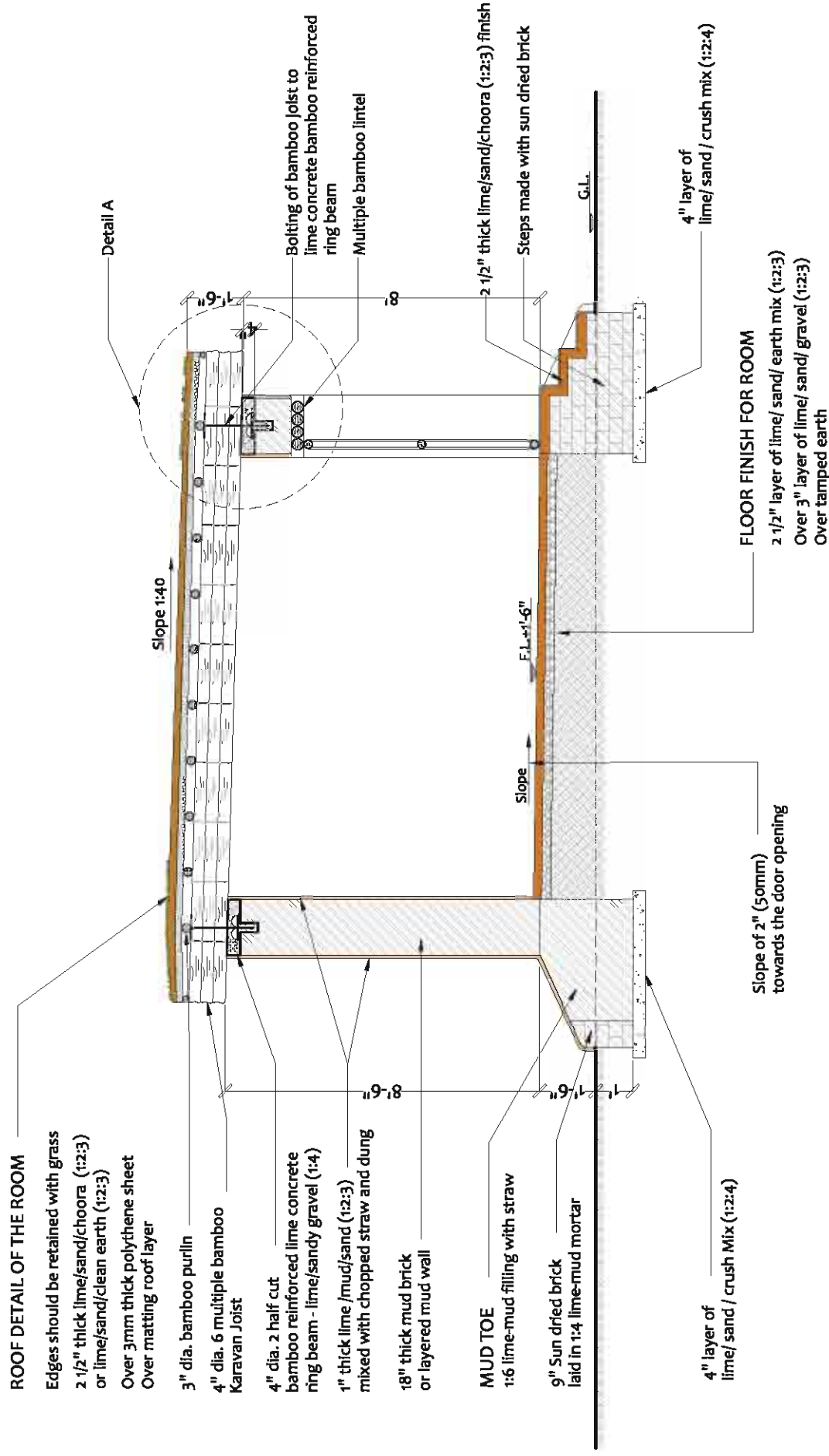
April 2012

Shelter Type: A1

Title: ROOF PLAN

BUILD BACK SAFER WITH VERNACULAR METHODOLOGIES

Project:



Project:

BUILD BACK SAFER WITH VERNACULAR METHODOLOGIES

Title:

SECTION

Shelter Type:

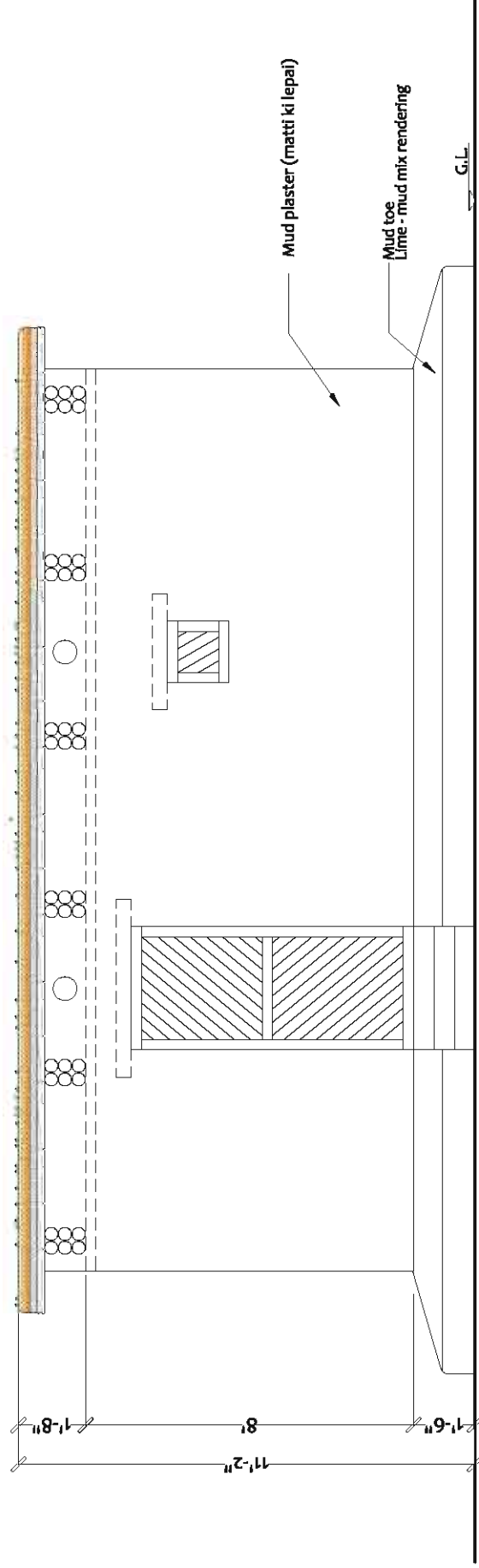
A 1

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April 2012

Dwg no.:

L (2-) 011



Project:

BUILD BACK SAFER WITH VERNACULAR METHODOLOGIES

Title:

ELEVATION

Shelter Type:

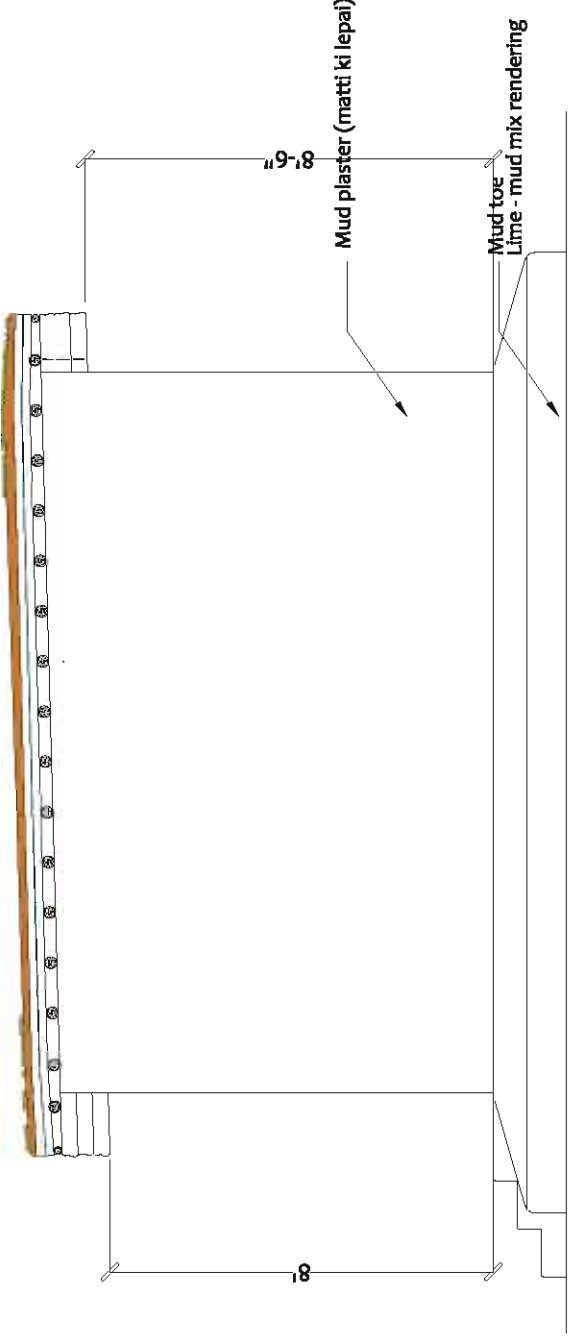
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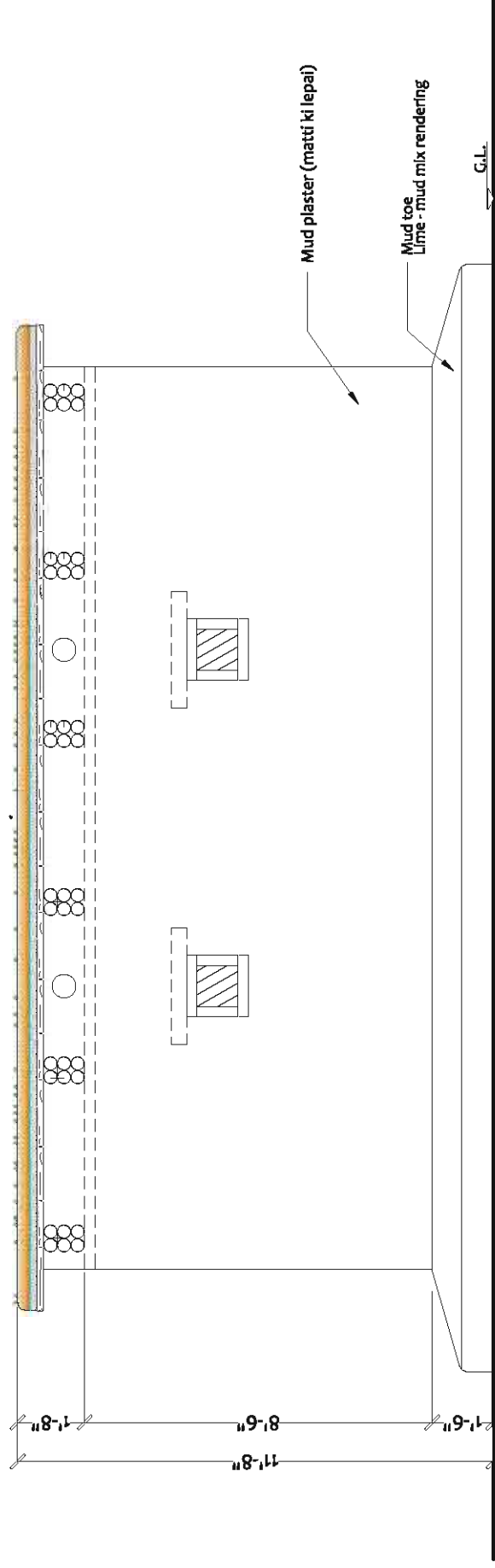
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April 2012

Dwg no :

L (2-) 015

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Elevation

Project:

BUILD BACK SAFER WITH VERNACULAR METHODOLOGIES

Title:

ELEVATION

Shelter Type:

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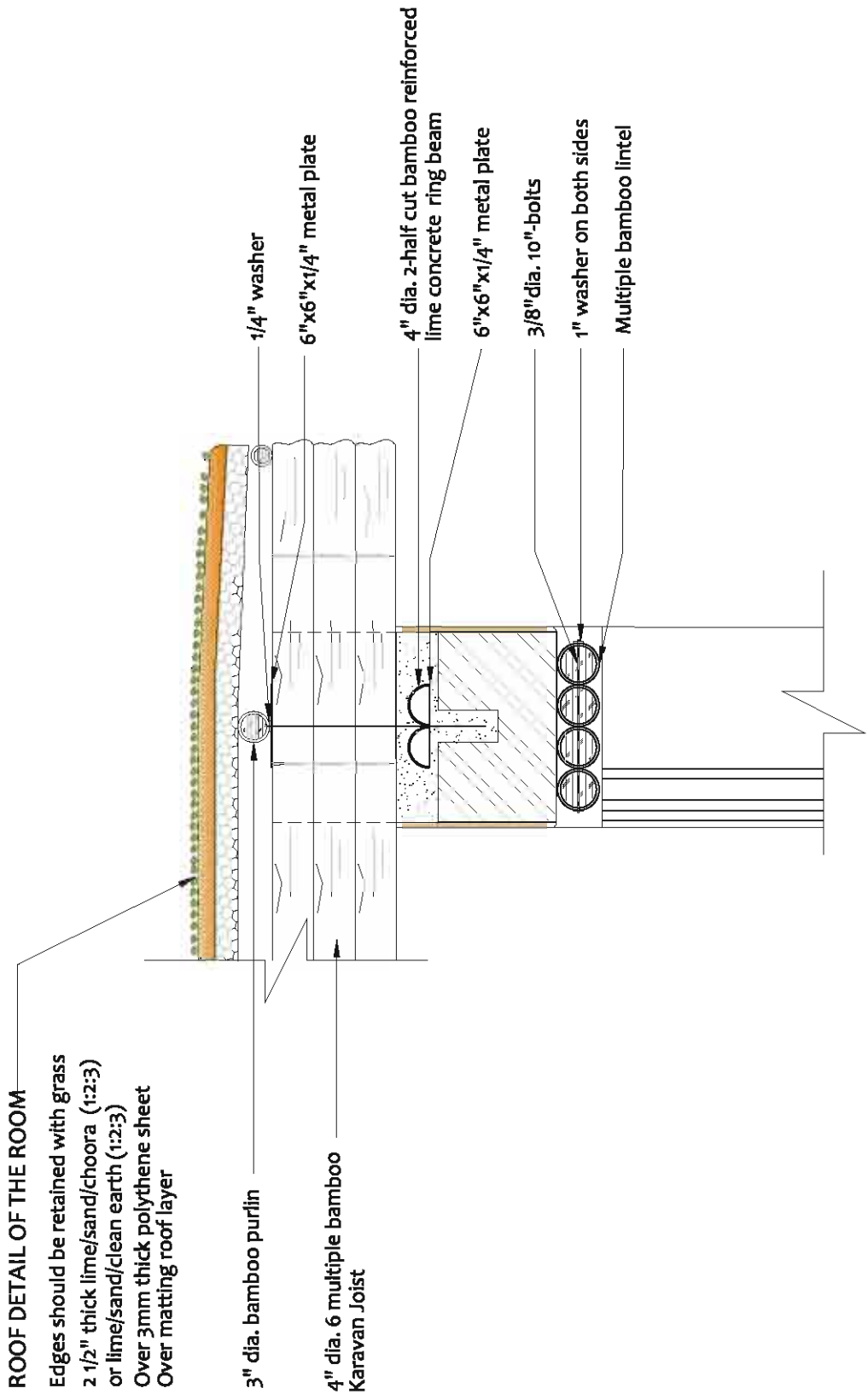
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April 2012

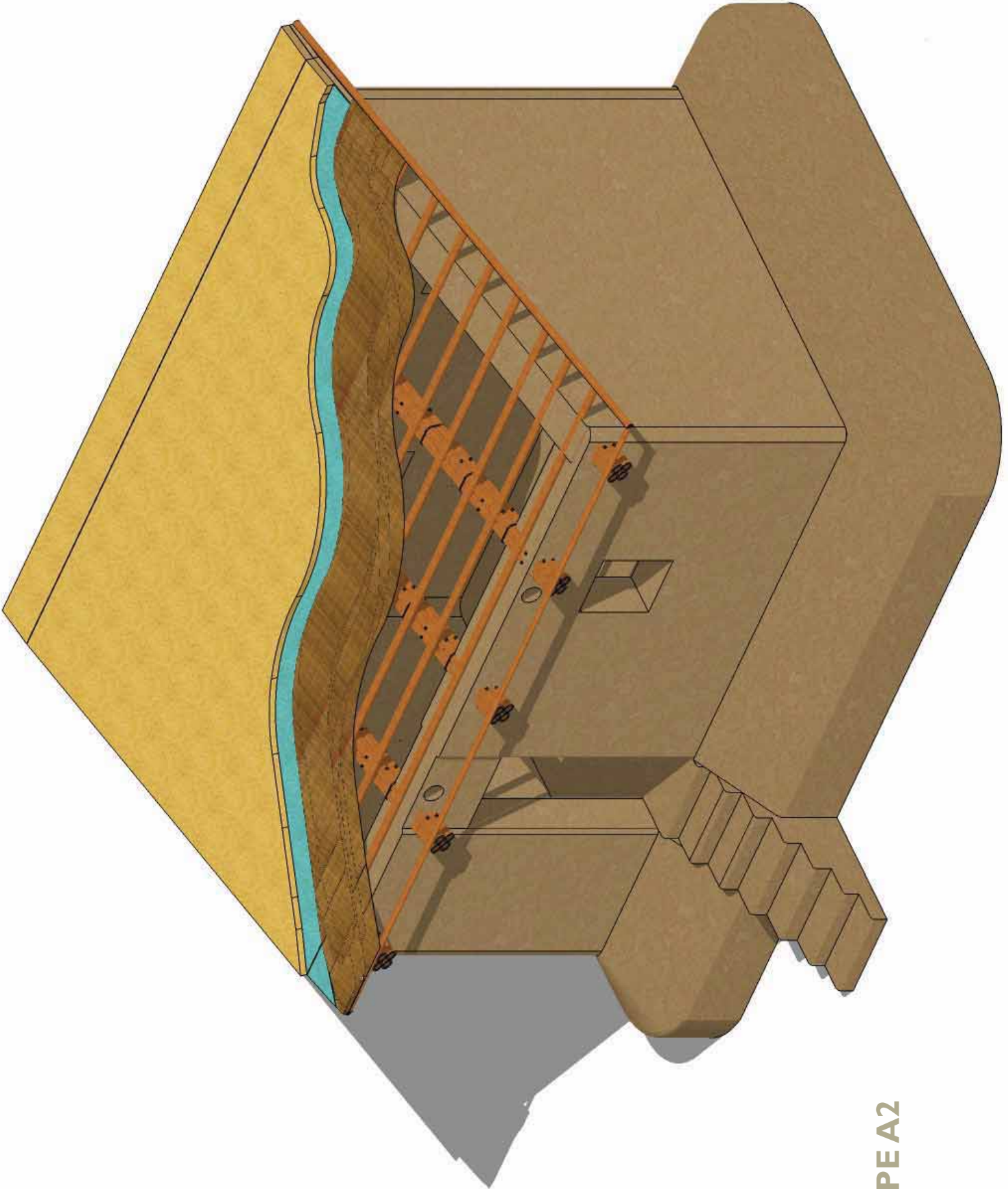
Dwg no :

L (2-) 017

Detail A



Project: BUILD BACK SAFER WITH VERNACULAR METHODOLOGIES	Title: ROOF DETAIL	Shelter Type: A 1	Scale: 3/4"= 1'0"	Dwg no : A (27) 001	 HERITAGE FOUNDATION OF PAKISTAN
			April 2012		



TYPE A2

ROOF DETAIL OF THE ROOM

Edges should be retained with grass
2 1/2" thick lime/sand/choora (1:2:3)
or lime/sand/clean earth (1:2:3)
Over 3mm thick polythene sheet
Over matting roof layer

3" dia. bamboo purlin

4" dia. 4 multiple bamboo
Karavan Joist

4" dia. 2 half cut
bamboo reinforced lime concrete
ring beam - lime/sandy gravel (1:4)

1" thick lime /mud/sand (1:2:3)
mixed with chopped straw and dung

18" thick mud brick
or layered mud wall

MUD TOE
1:6 lime-mud filling with straw

9" Sun dried brick
laid in 1:4 lime-mud mortar

4" layer of
lime/ sand / crush Mix (1:2:4)

Slope of 2" (50mm)
towards the door opening

Bolting of bamboo joist to
lime concrete bamboo reinforced
ring beam
Multiple bamboo lintel

2 1/2" thick lime/sand/choora (1:2:3) finish

Steps made with sun dried brick

FLOOR FINISH FOR ROOM

2 1/2" layer of lime/ sand/ earth mix (1:2:3)
Over 3" layer of lime/ sand/ gravel (1:2:3)
Over tamped earth

Project:

BUILD BACK SAFER WITH VERNACULAR METHODOLOGIES

Title:

SECTION

Shelter Type:

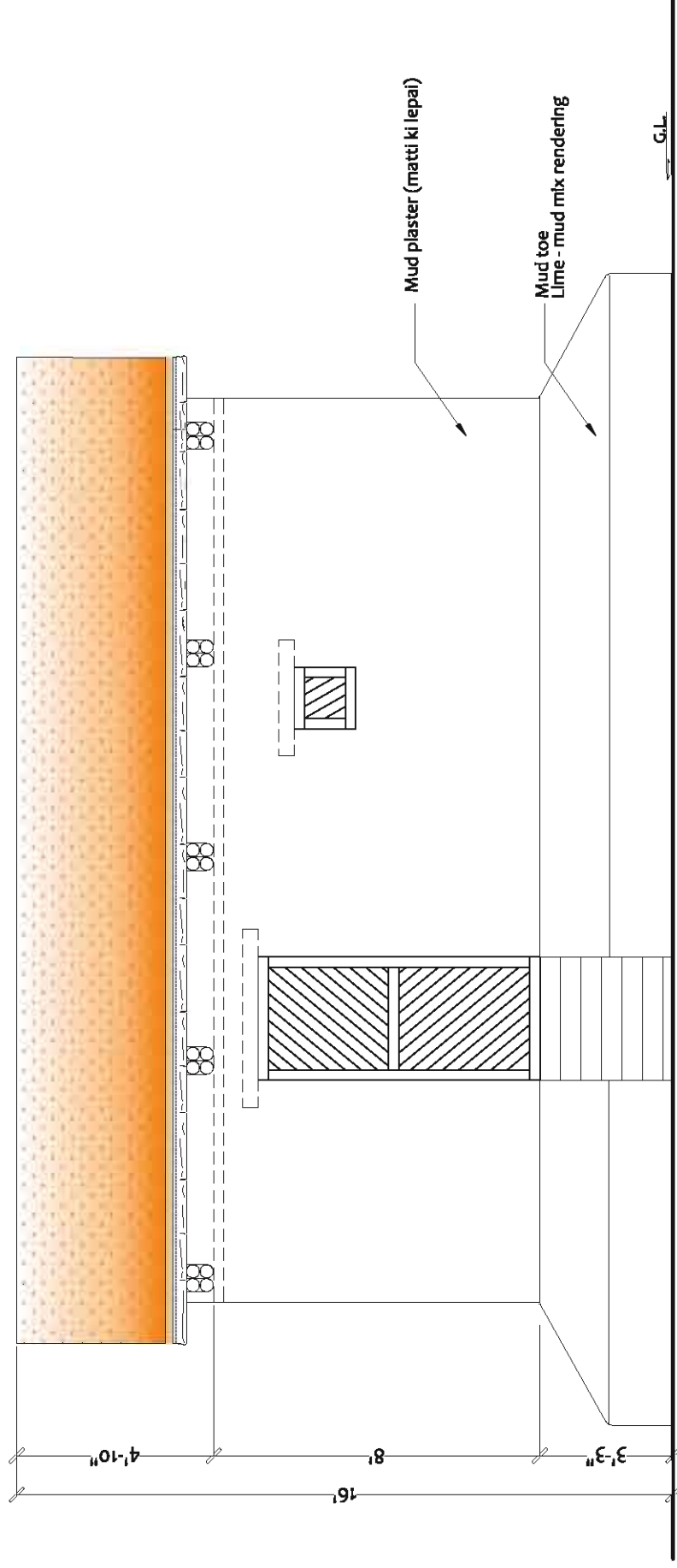
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Scale: 1/4"= 1'0"

April 2012

Dwg no :

L (2-) 011



Project:

BUILD BACK SAFER WITH VERNACULAR METHODOLOGIES

Title:

ELEVATION

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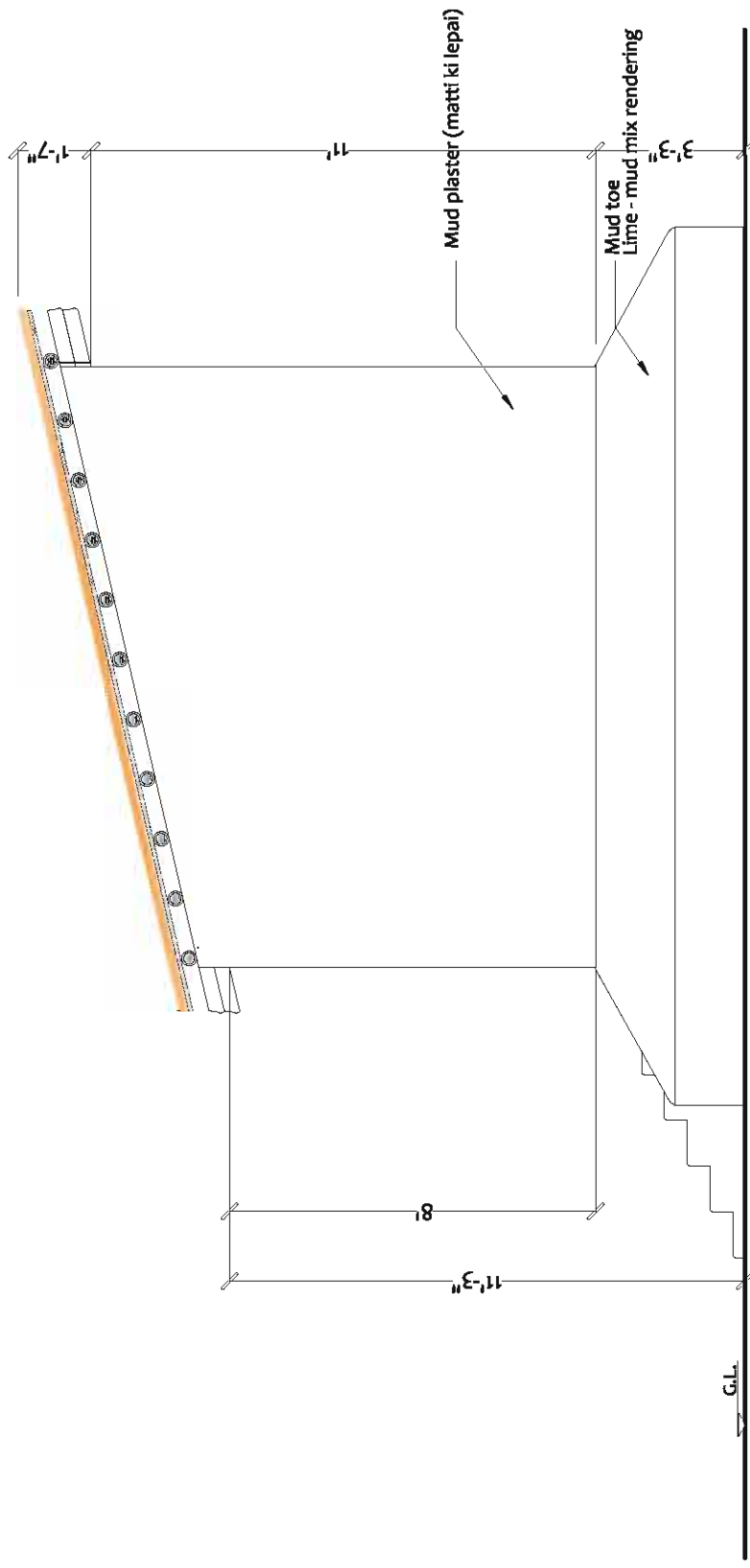
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Dwg no.:

L (2-) 015



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ELEVATION

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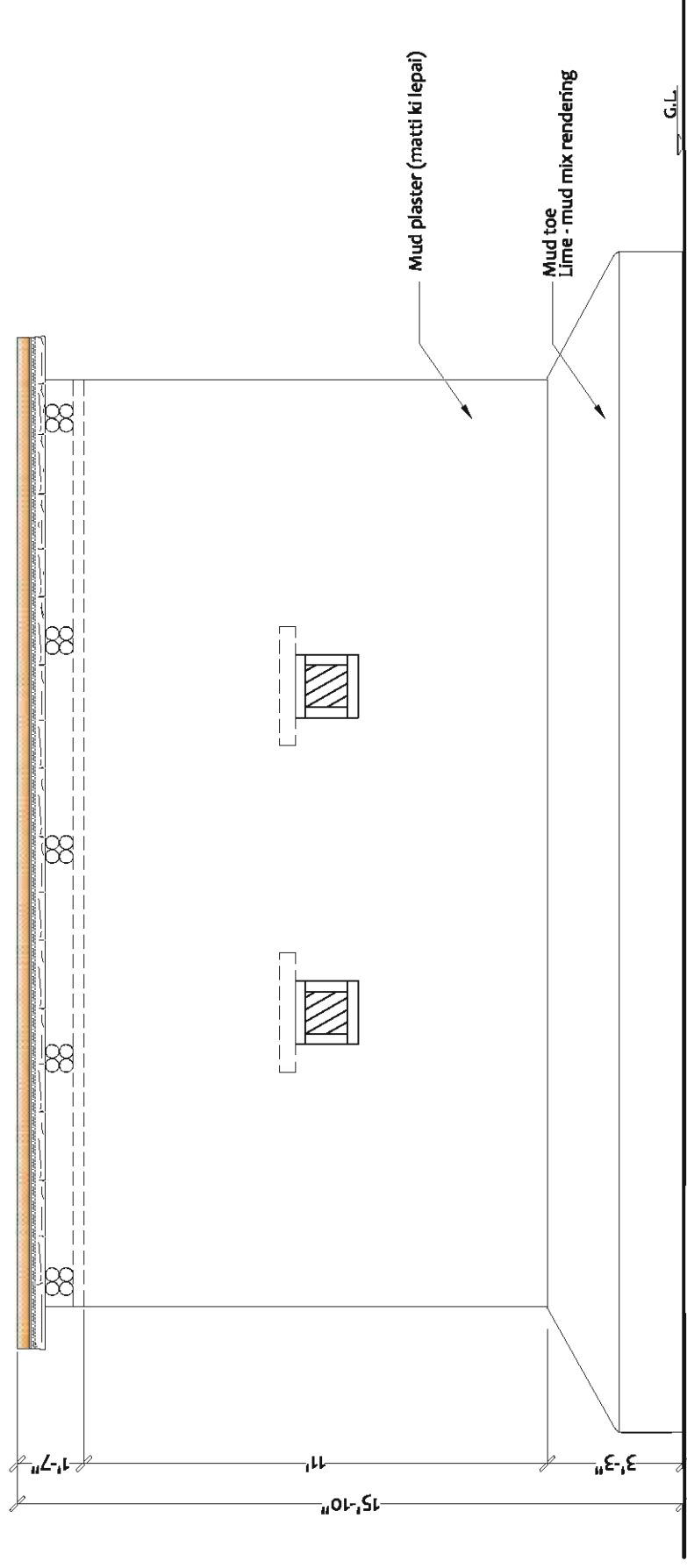
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April 2012

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L (2-) 016



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Title:

ELEVATION

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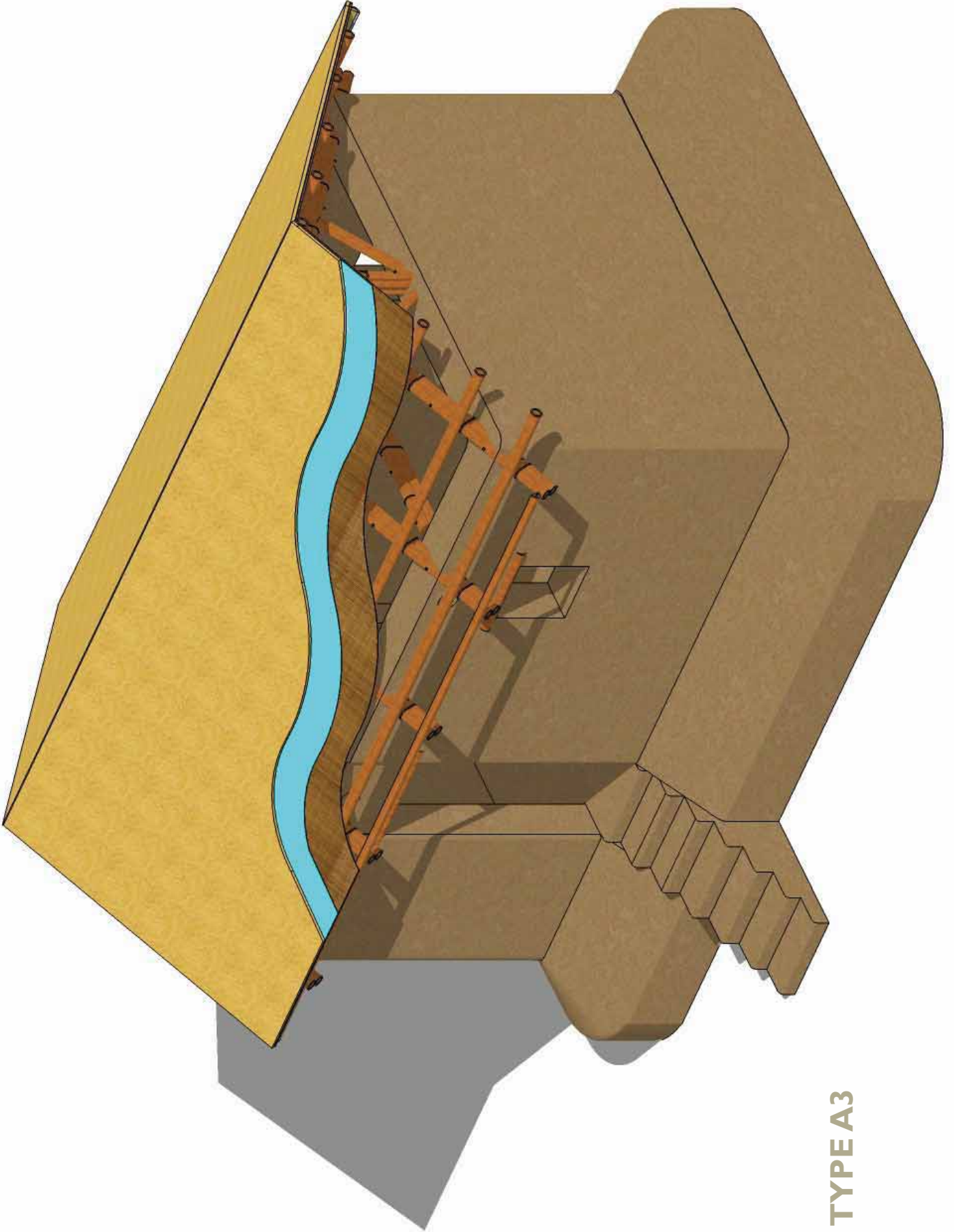
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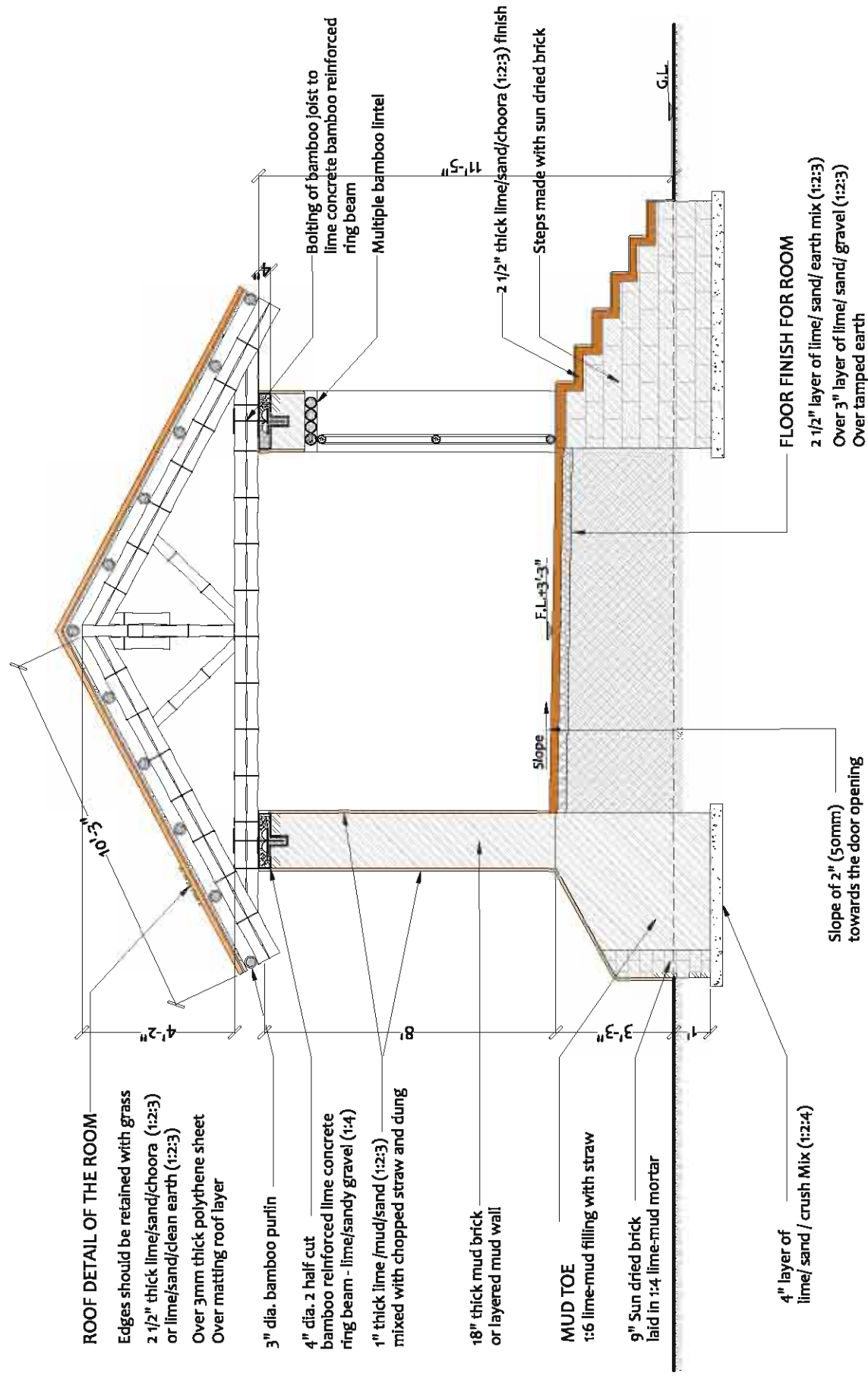
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TYPE A3



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BUILD BACK SAFER WITH VERNACULAR METHODOLOGIES

Title:

SECTION

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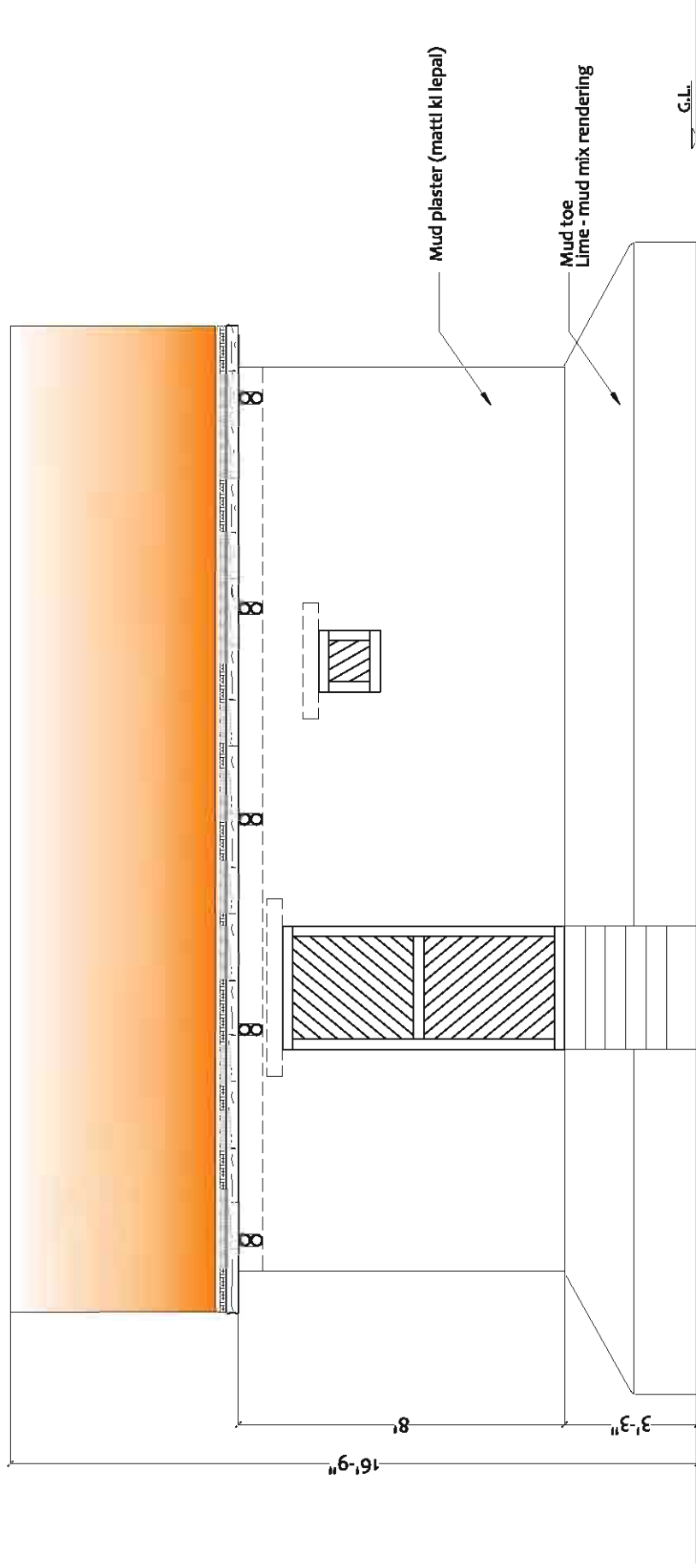
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April 2012

Dwg no :

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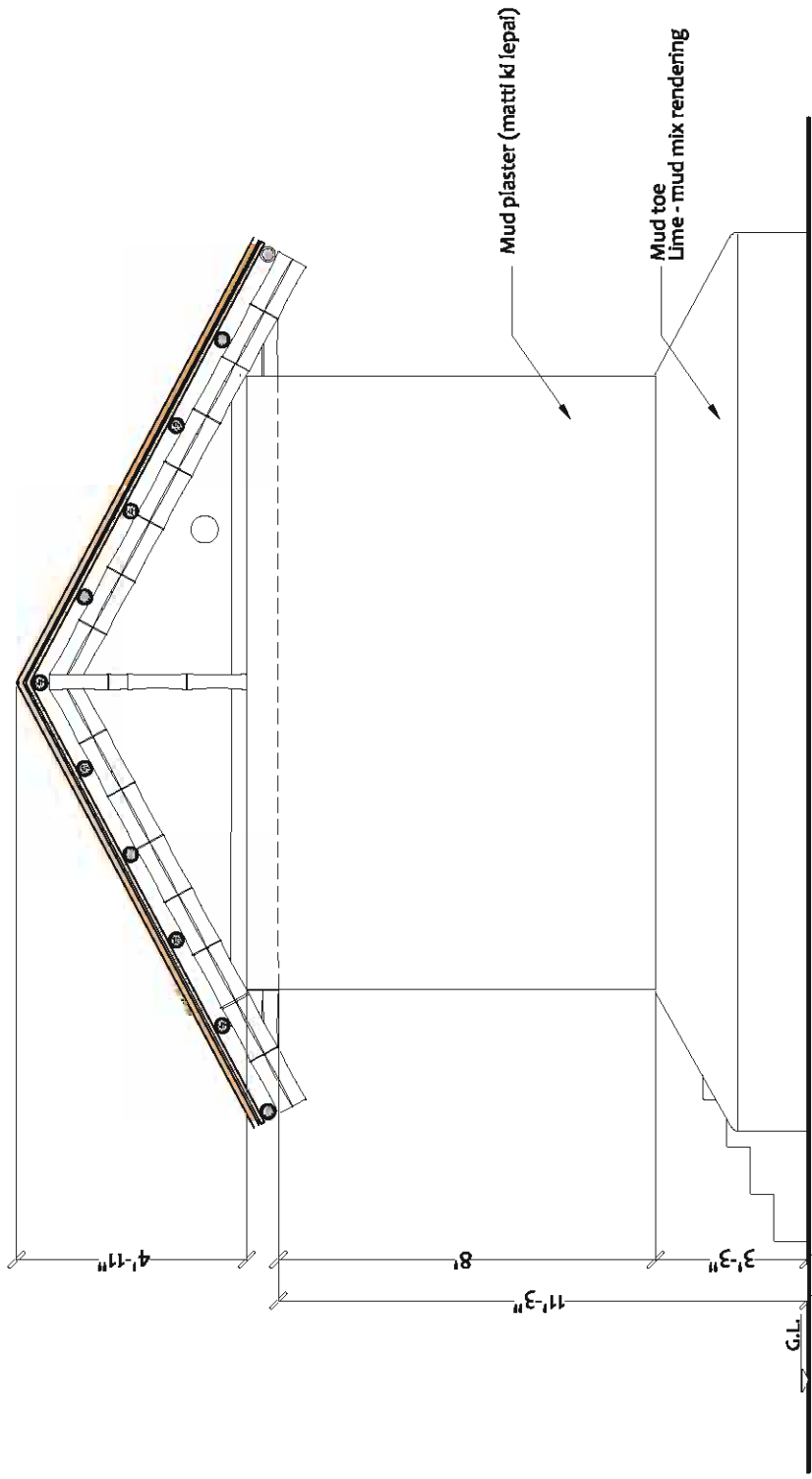
BUILD BACK SAFER WITH VERNACULAR METHODOLOGIES

Title:
ELEVATION

Shelter Type:
A 3

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April 2012

Dwg no :
L (2-) 015



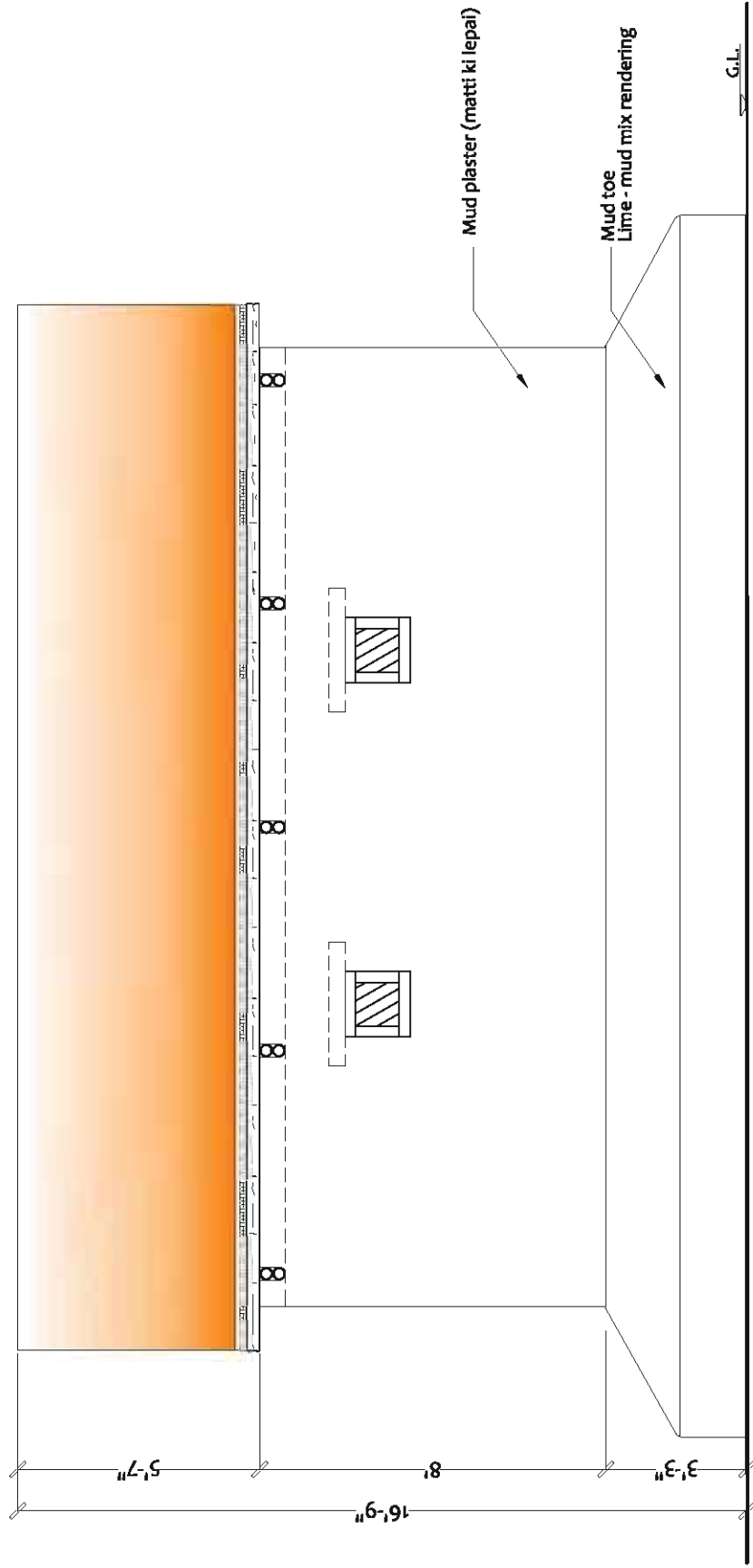
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April 2012

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L (2-) 016



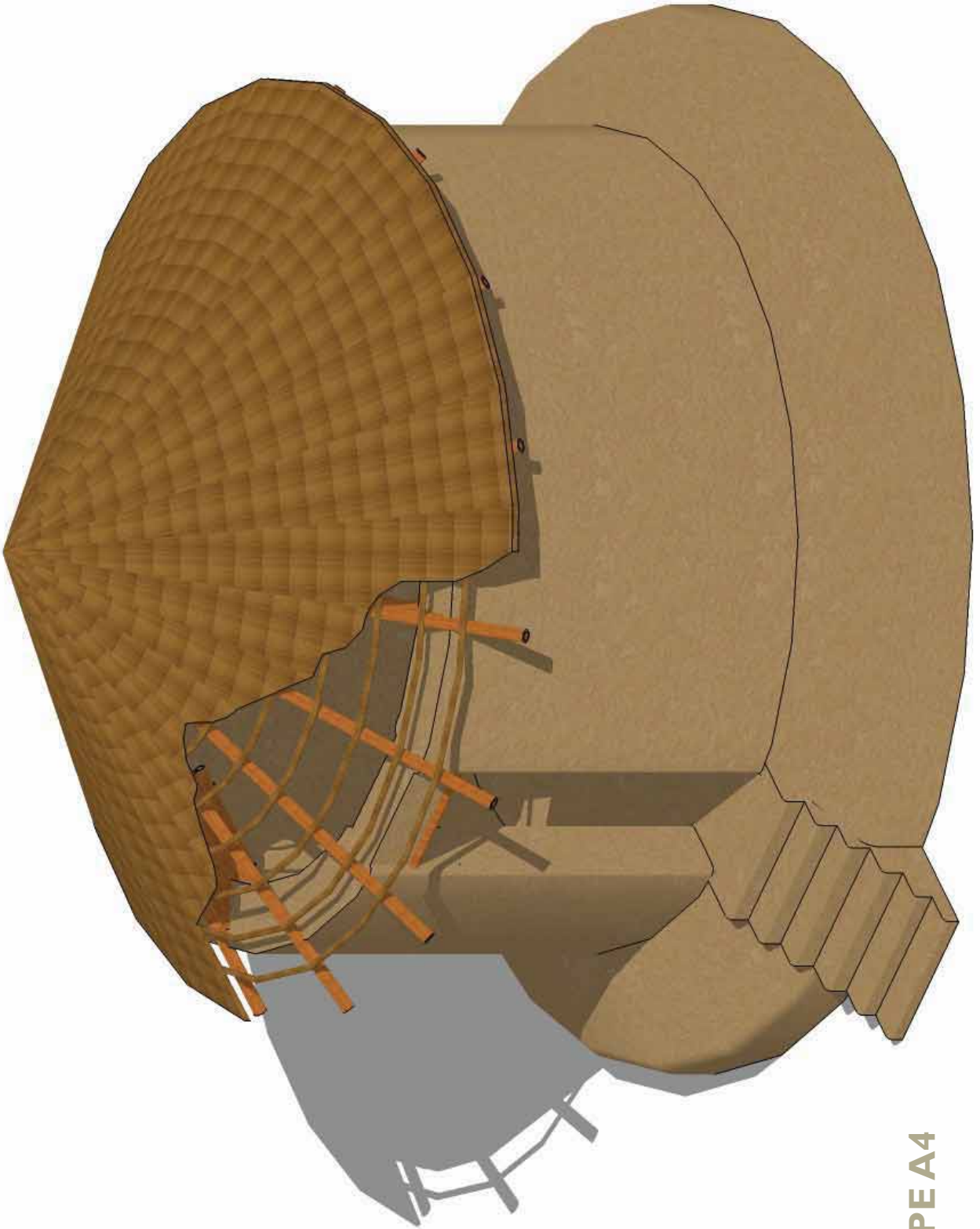
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ELEVATION

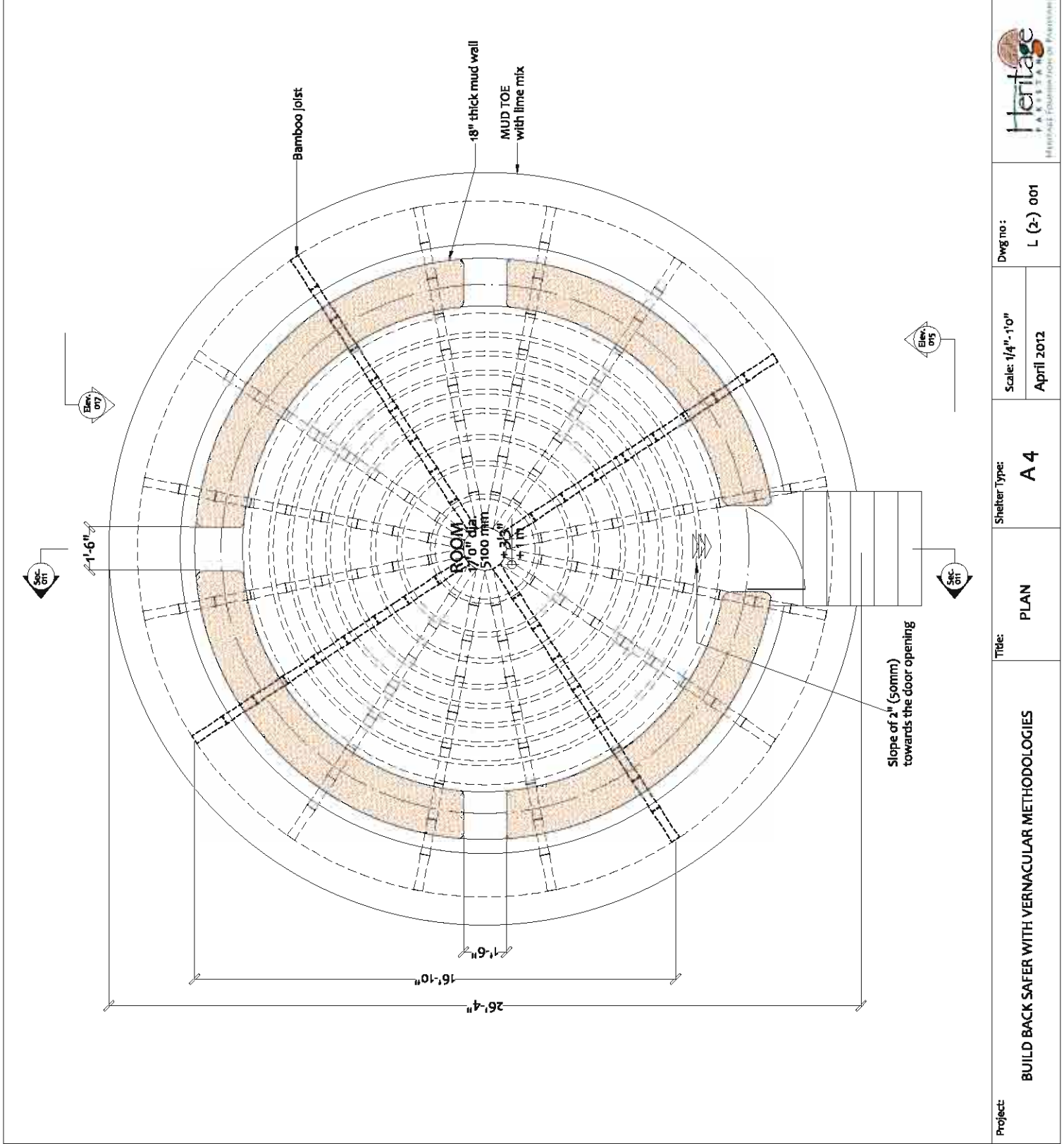
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A 3

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April 2012

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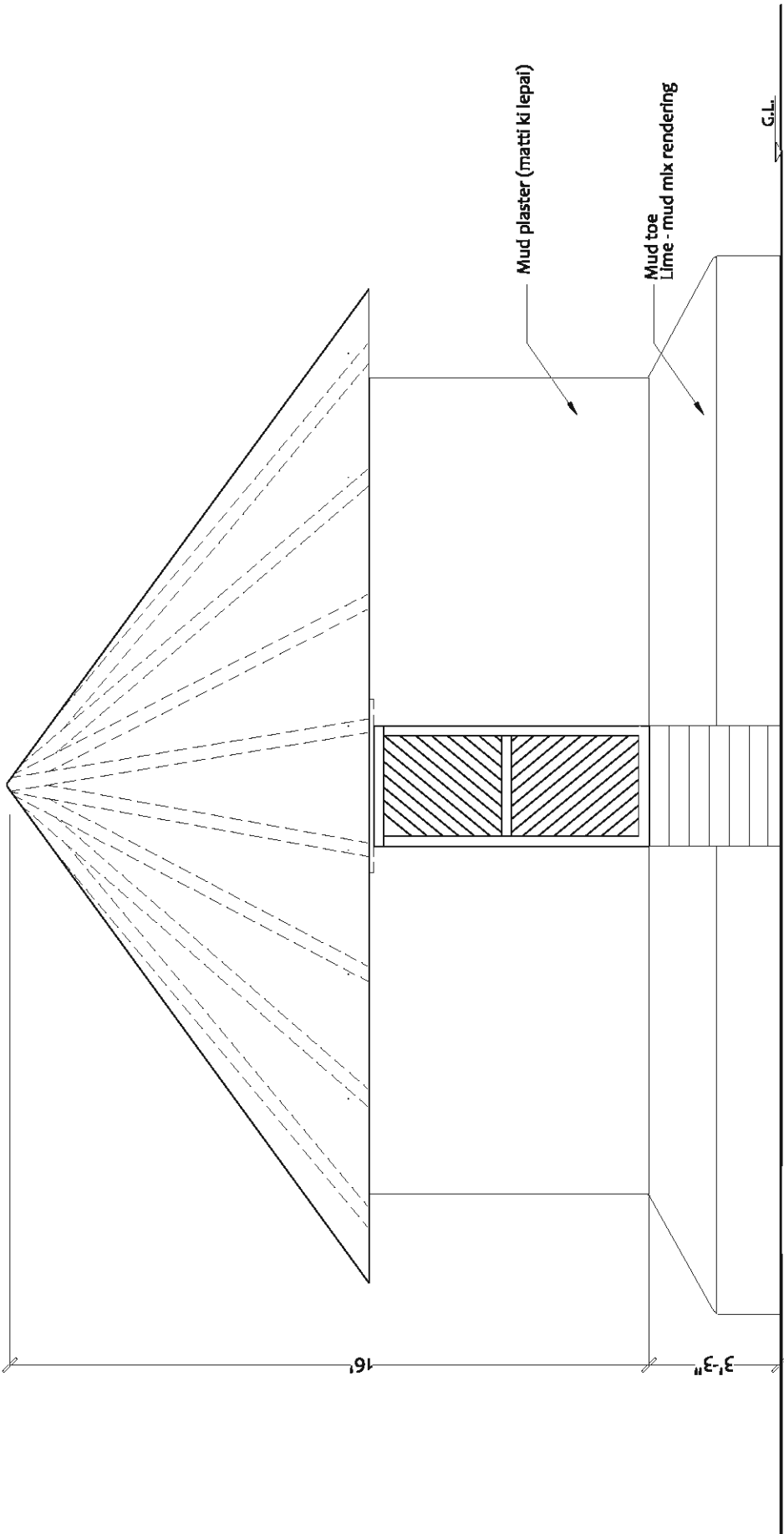


TYPE A4



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	Title:	PLAN	Shelter Type:	A 4	Dwg no :
					L (2-) 001

Scale: 1/4" = 1'0"
April 2012



Project:

BUILD BACK SAFER WITH VERNACULAR METHODOLOGIES

Title:

ELEVATION

Shelter Type:

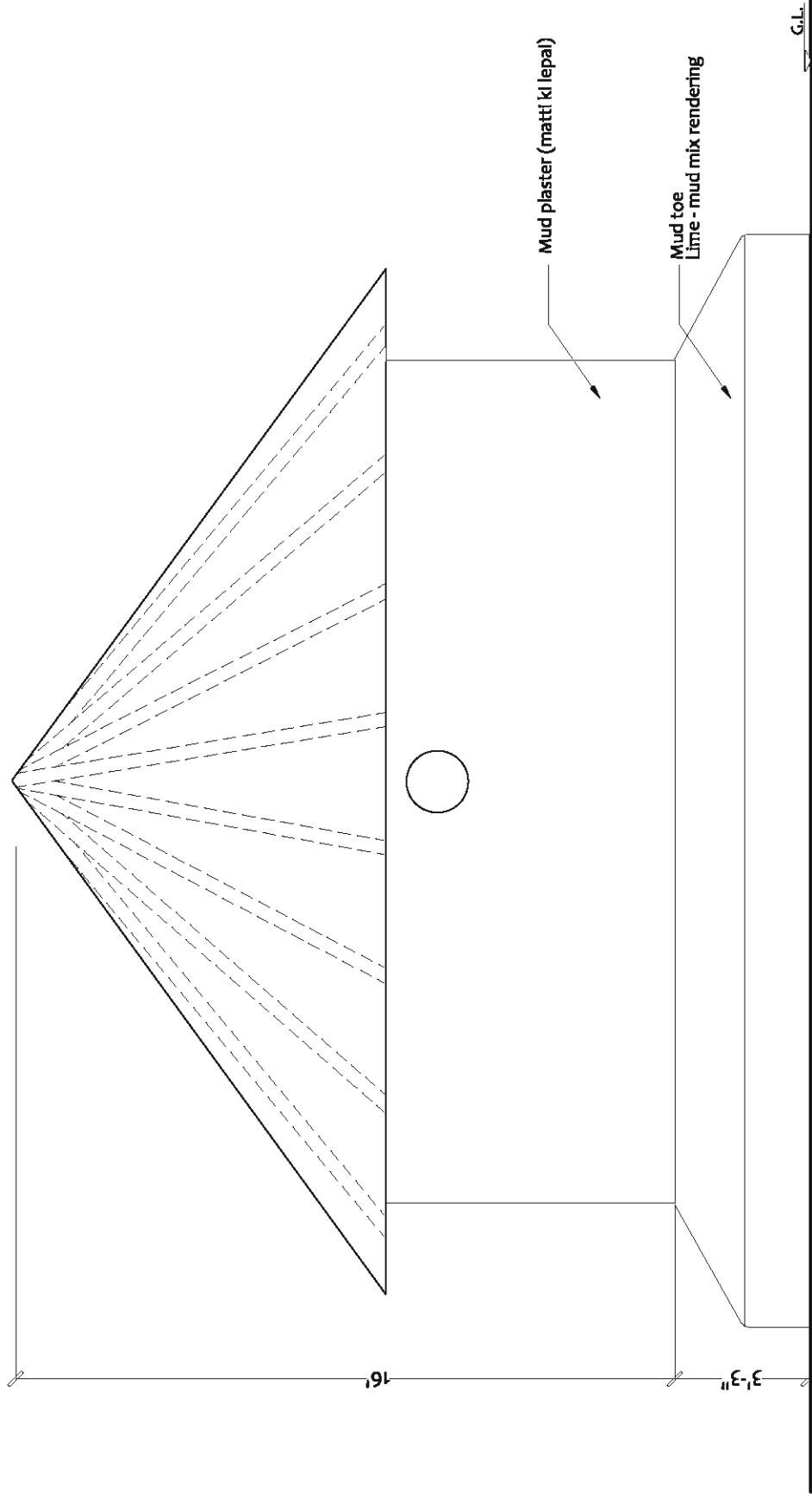
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Dwg no :

L (2-) 015



Project:

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Title:

ELEVATION

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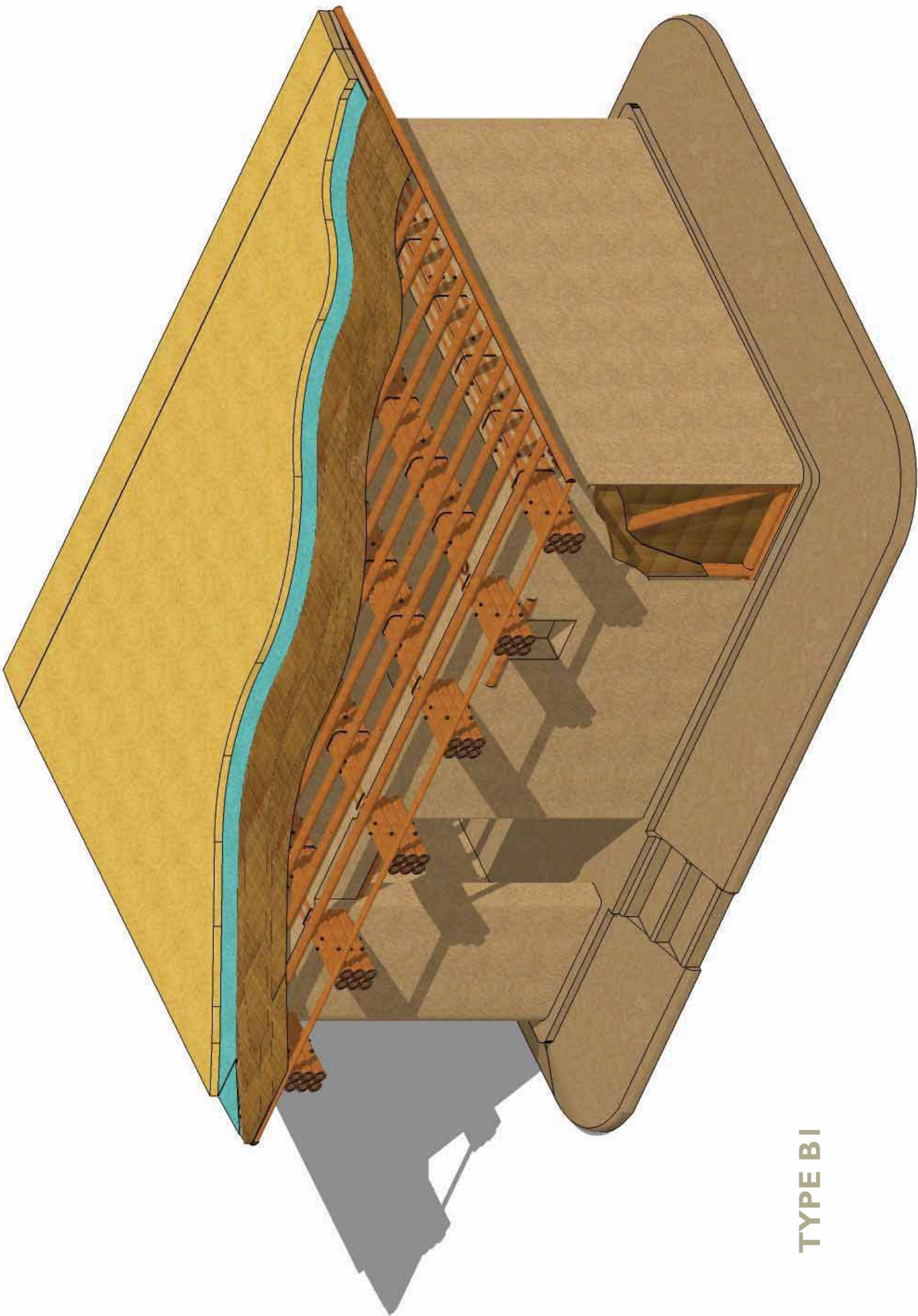
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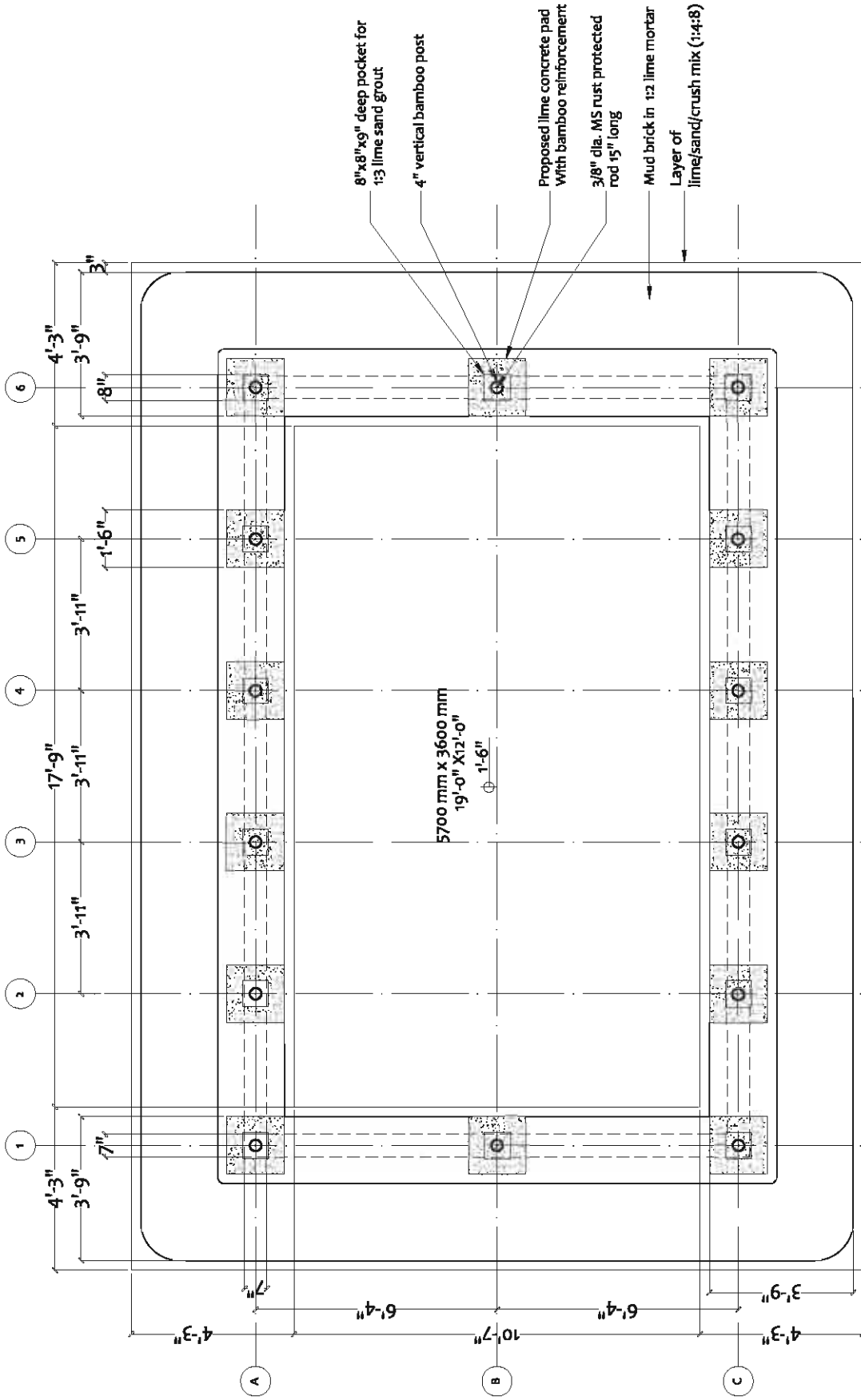
April 2012

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L (2-) 017



TYPE B1



- 8"x8"x9" deep pocket for 1:3 lime sand grout
- 4" vertical bamboo post
- Proposed lime concrete pad with bamboo reinforcement
- 3/8" dia. MS rust protected rod 15" long
- Mud brick in 1:2 lime mortar
- Layer of lime/sand/crush mix (1:4:8)

FOUNDATION PLAN

Project: BUILD BACK SAFER WITH VERNACULAR METHODOLOGIES

Title: FOUNDATION PLAN

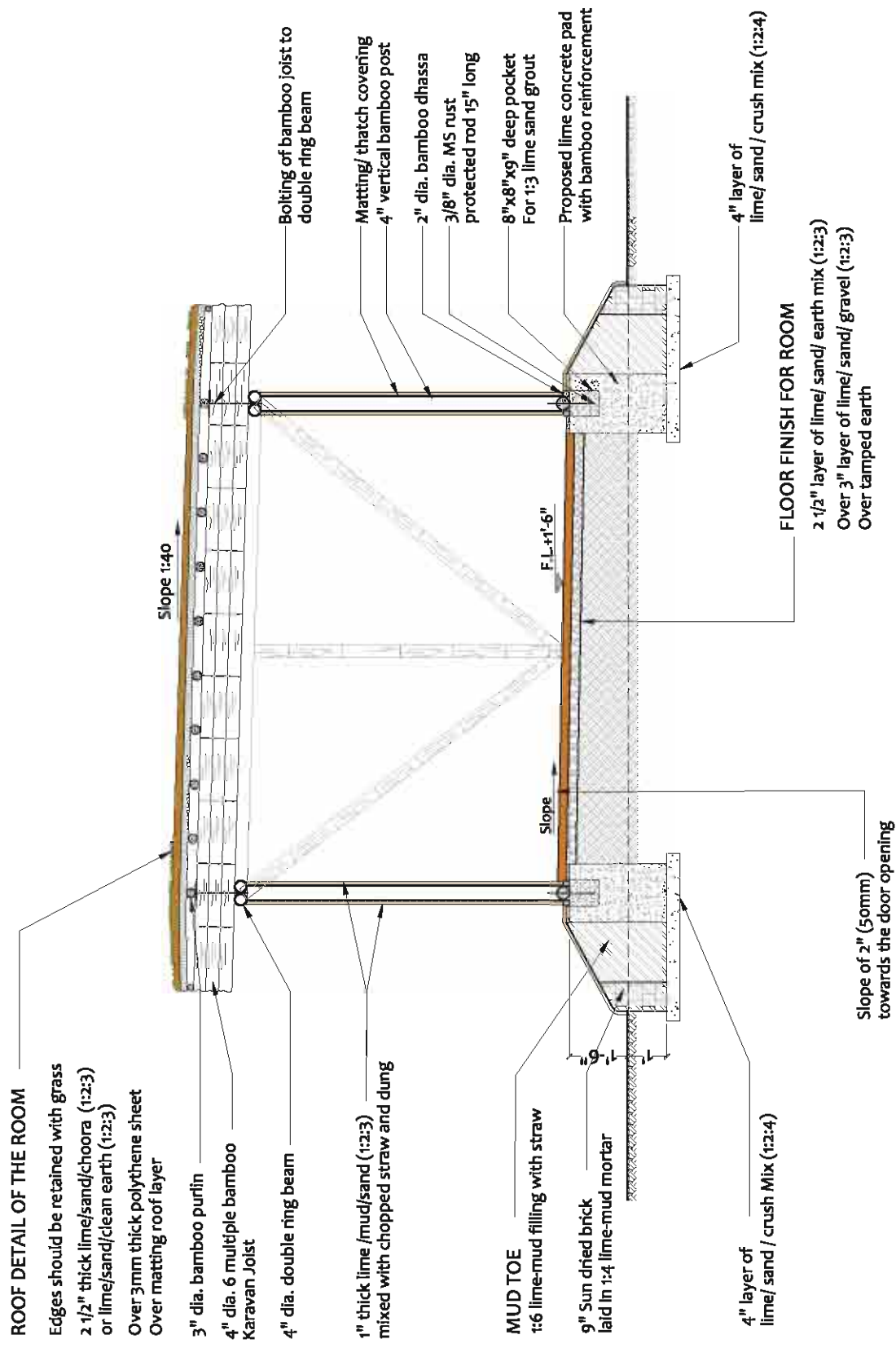
Shelter Type: B 1

Scale: 1/4" = 1'-0"

April 2012

Dwg no : L (2-) -001





Project:

BUILD BACK SAFER WITH VERNACULAR METHODOLOGIES

Title:

SECTION

Shelter Type:

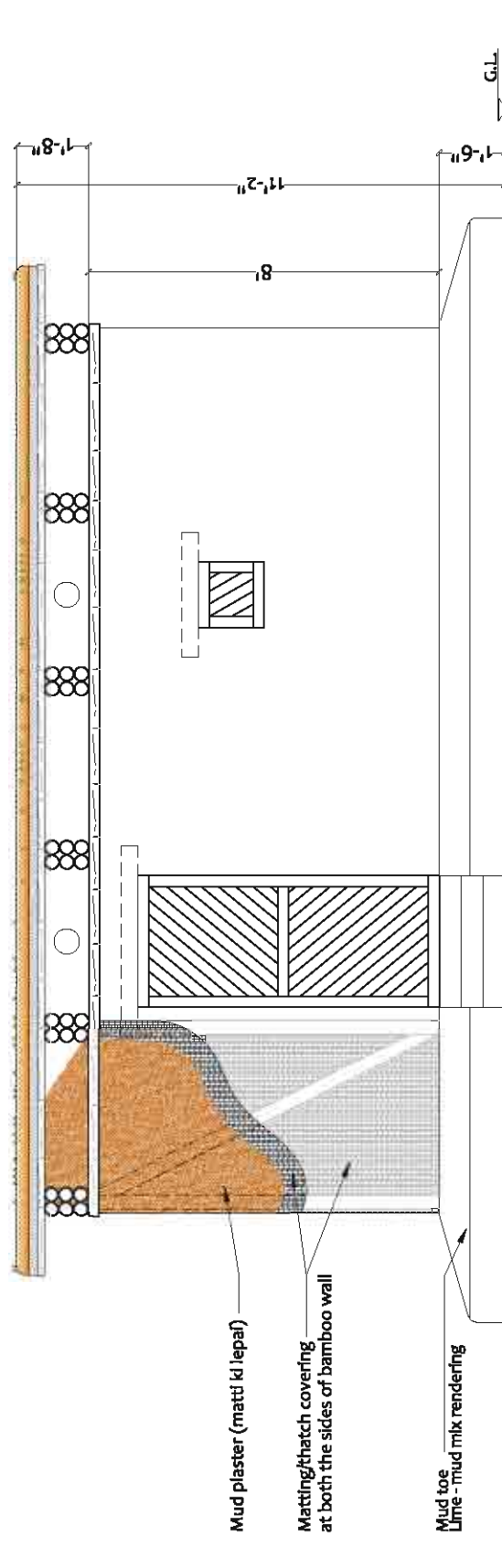
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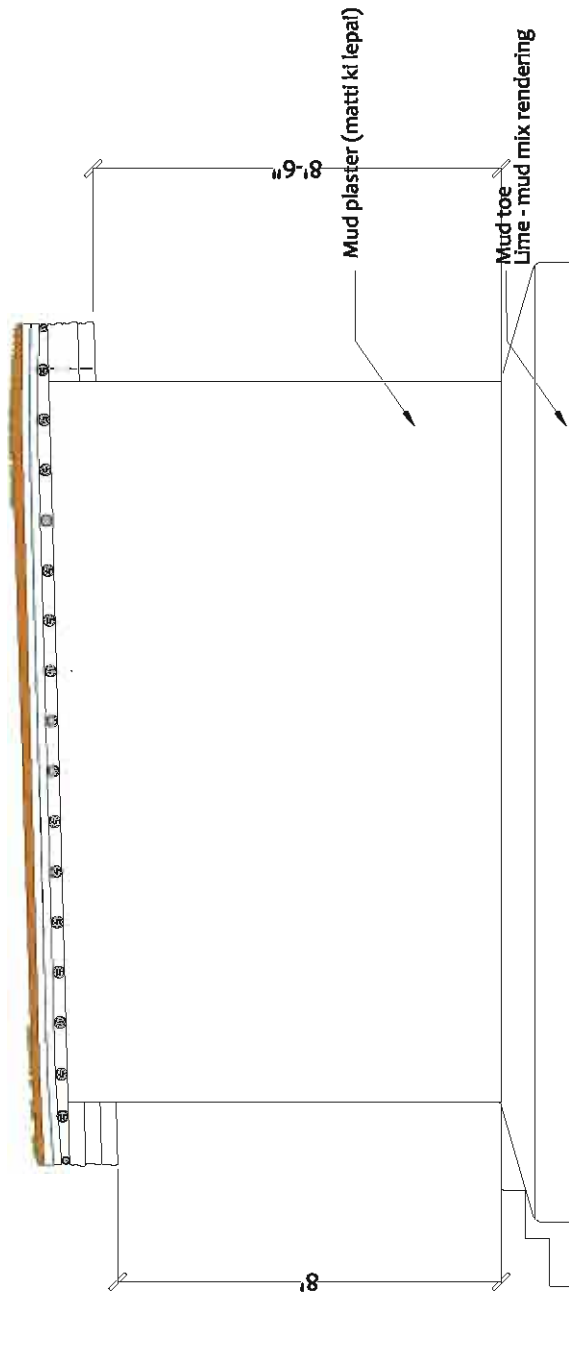
April 2012

Dwg no :

L (2-) 011



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Project:

BUILD BACK SAFER WITH VERNACULAR METHODOLOGIES

Title:

ELEVATION

Shelter Type:

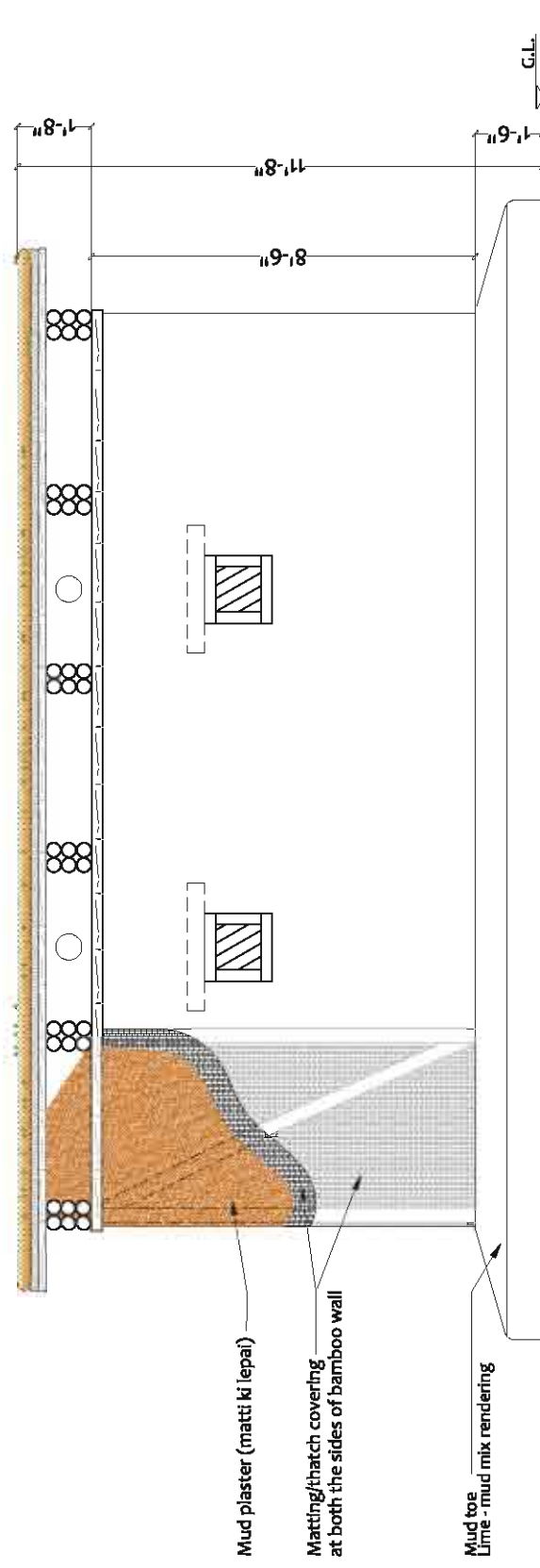
B 1

Scale: 1/4" = 1'0"

April 2012

Dwg no :

L (2-) 016



Project:

BUILD BACK SAFER WITH VERNACULAR METHODOLOGIES

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ELEVATION

Shelter Type:

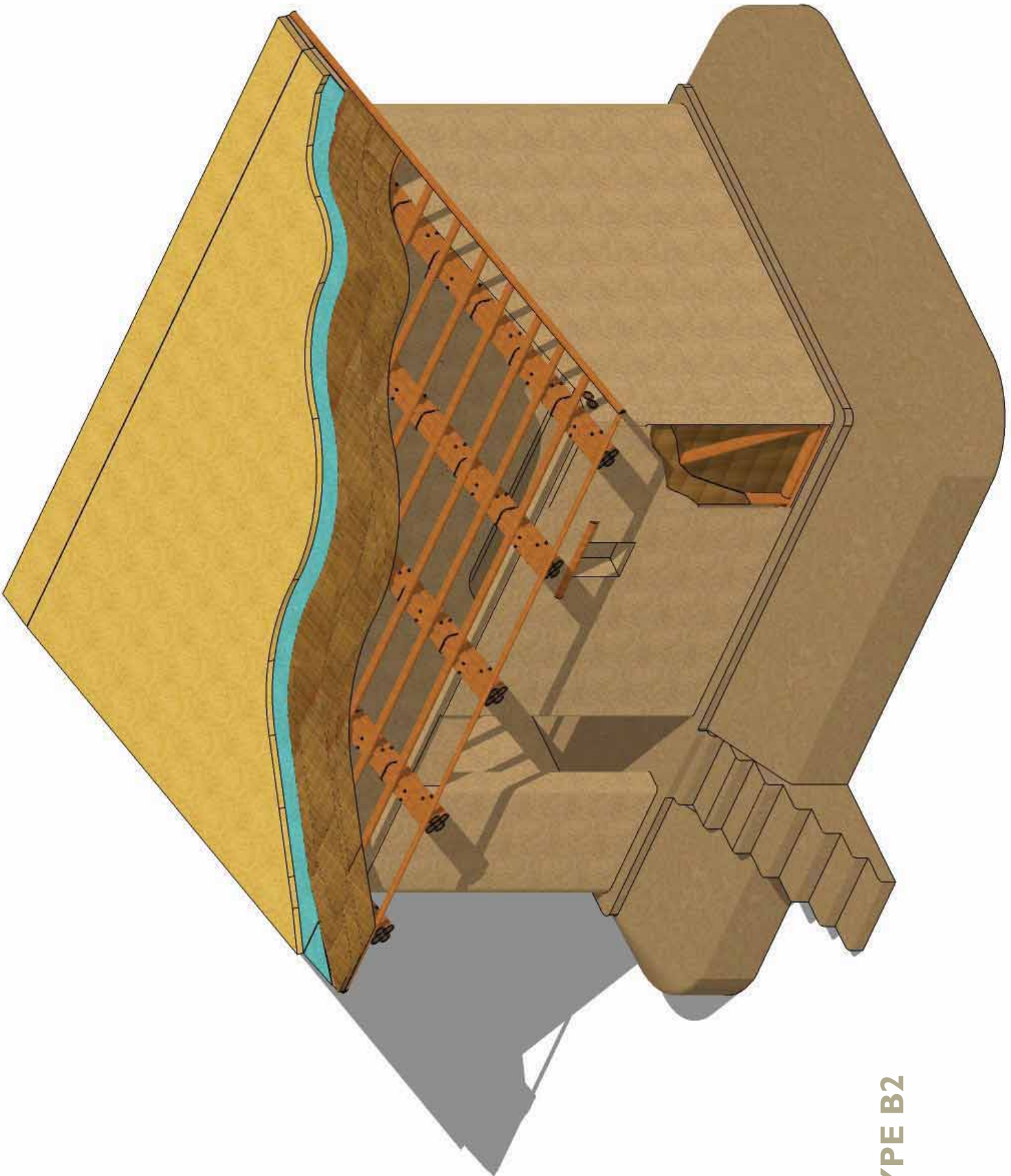
B 1

Scale: 1/4" = 1'0"

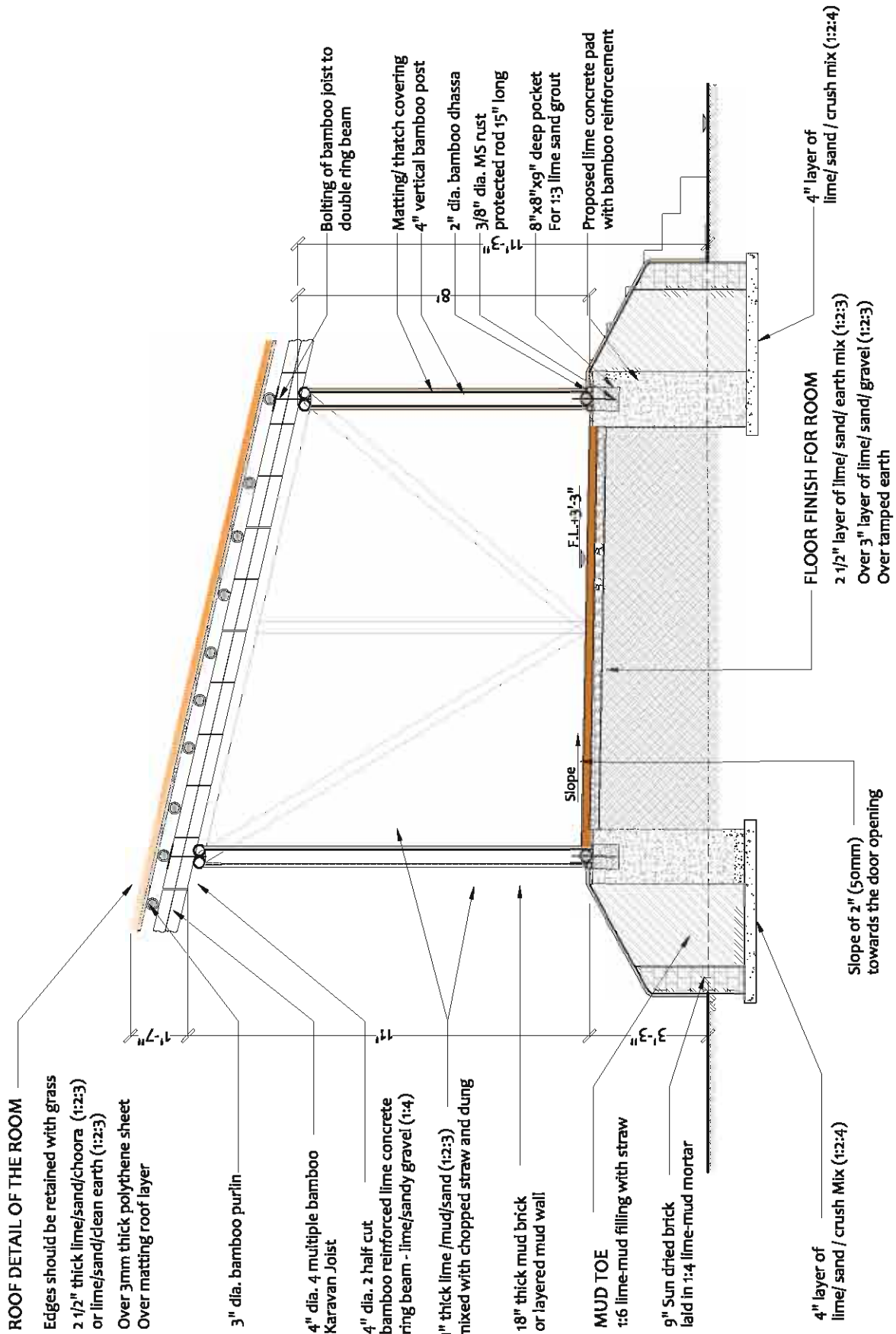
April 2012

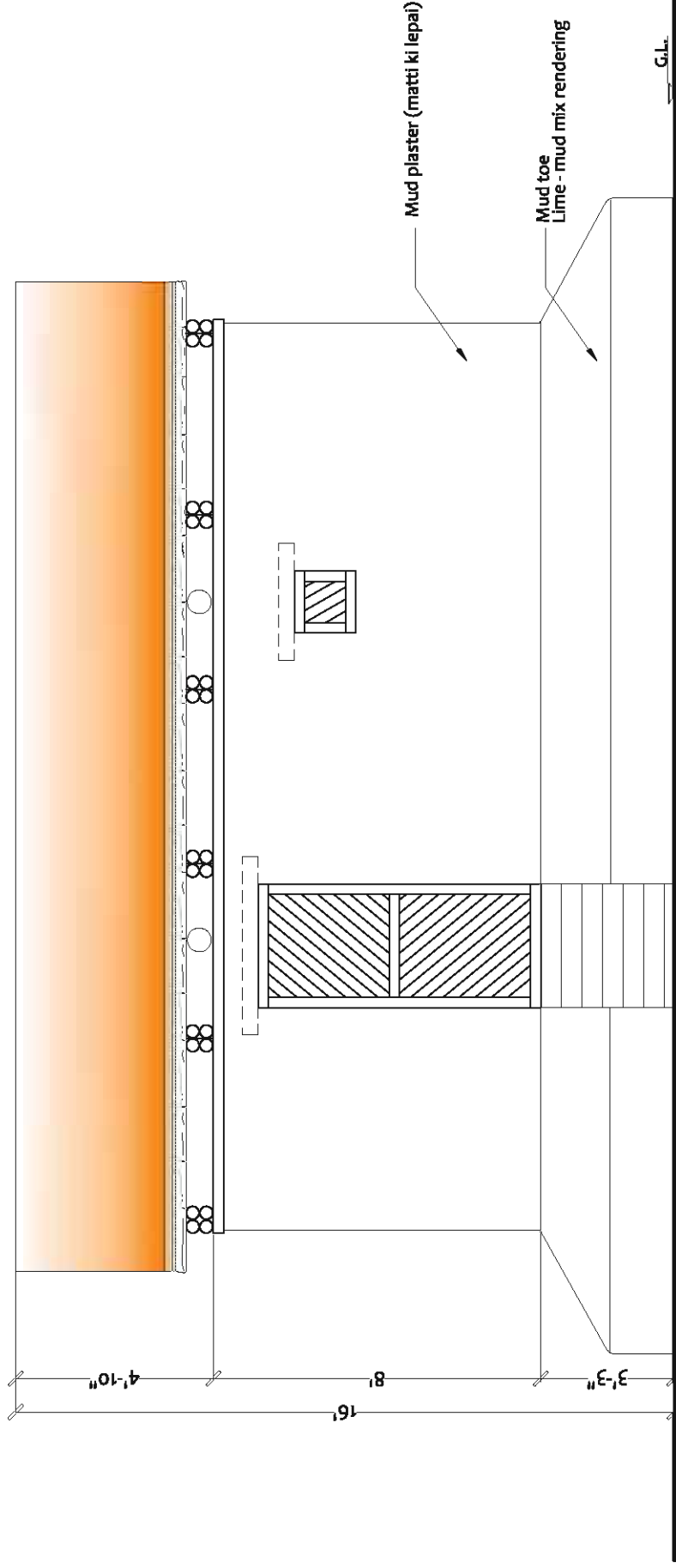
Dwg no :

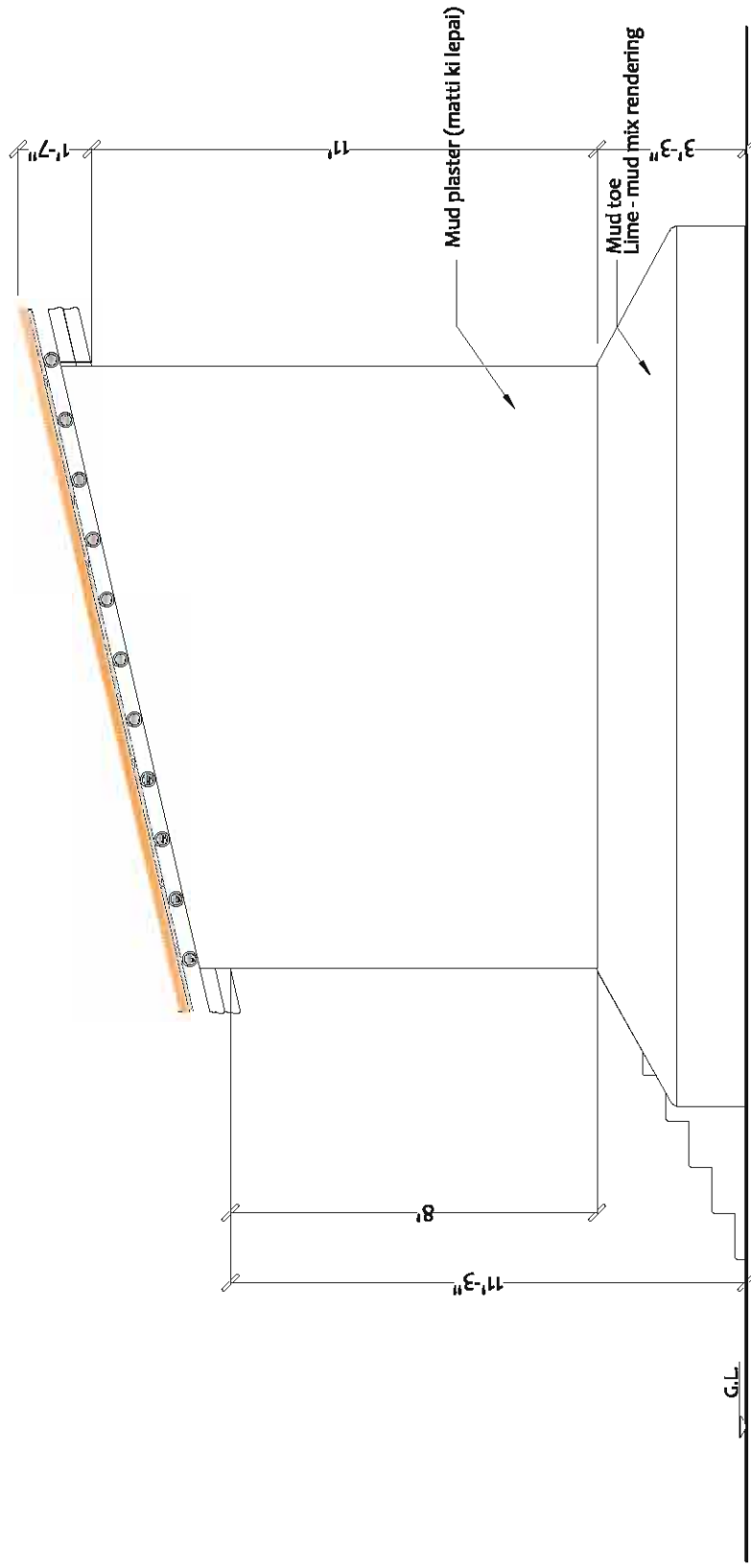
L (2-) 017



TYPE B2







Project:

BUILD BACK SAFER WITH VERNACULAR METHODOLOGIES

Title:

ELEVATION

Shelter Type:

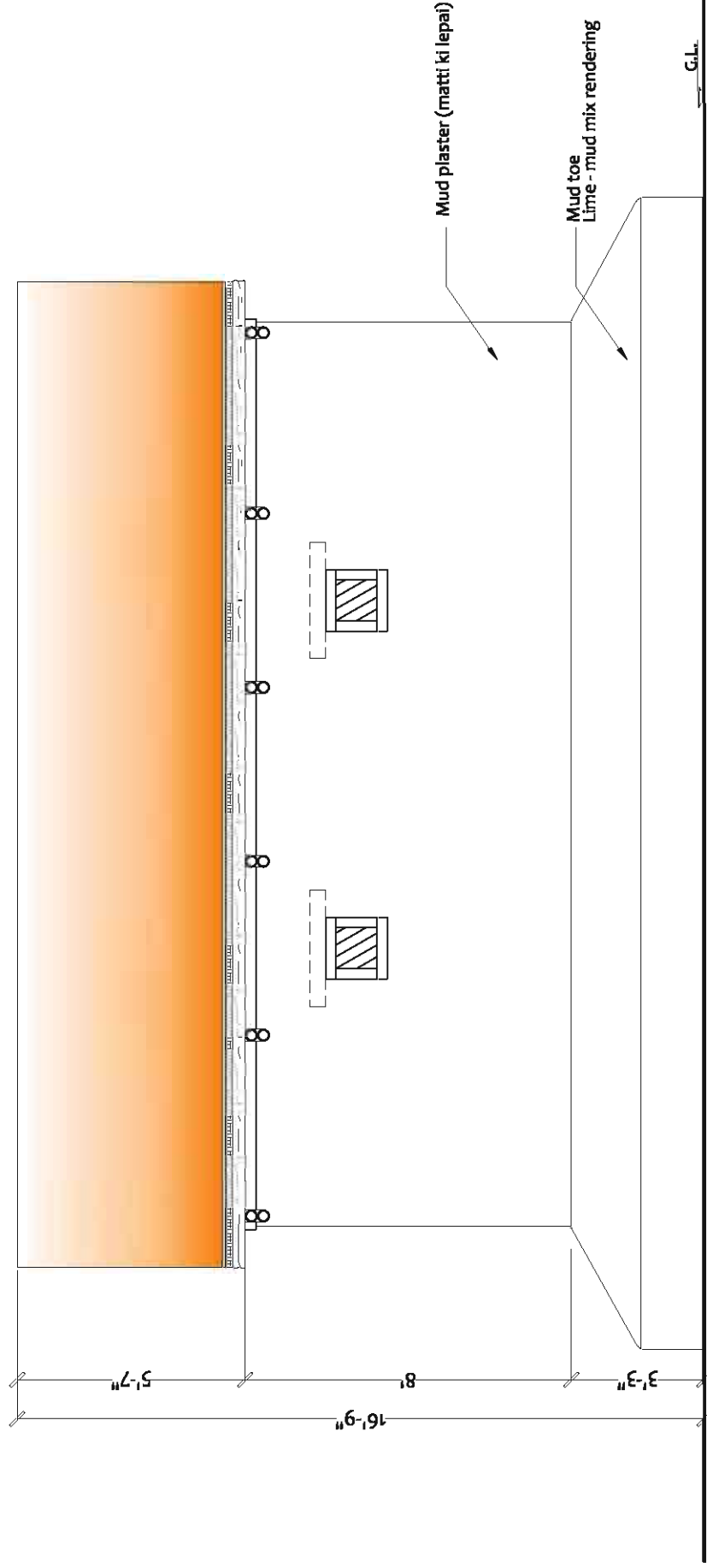
B 2

Scale: 1/4" = 1'0"

April 2012

Dwg no.:

L (2-) 016



Project:

BUILD BACK SAFER WITH VERNACULAR METHODOLOGIES

Title:

ELEVATION

Shelter Type:

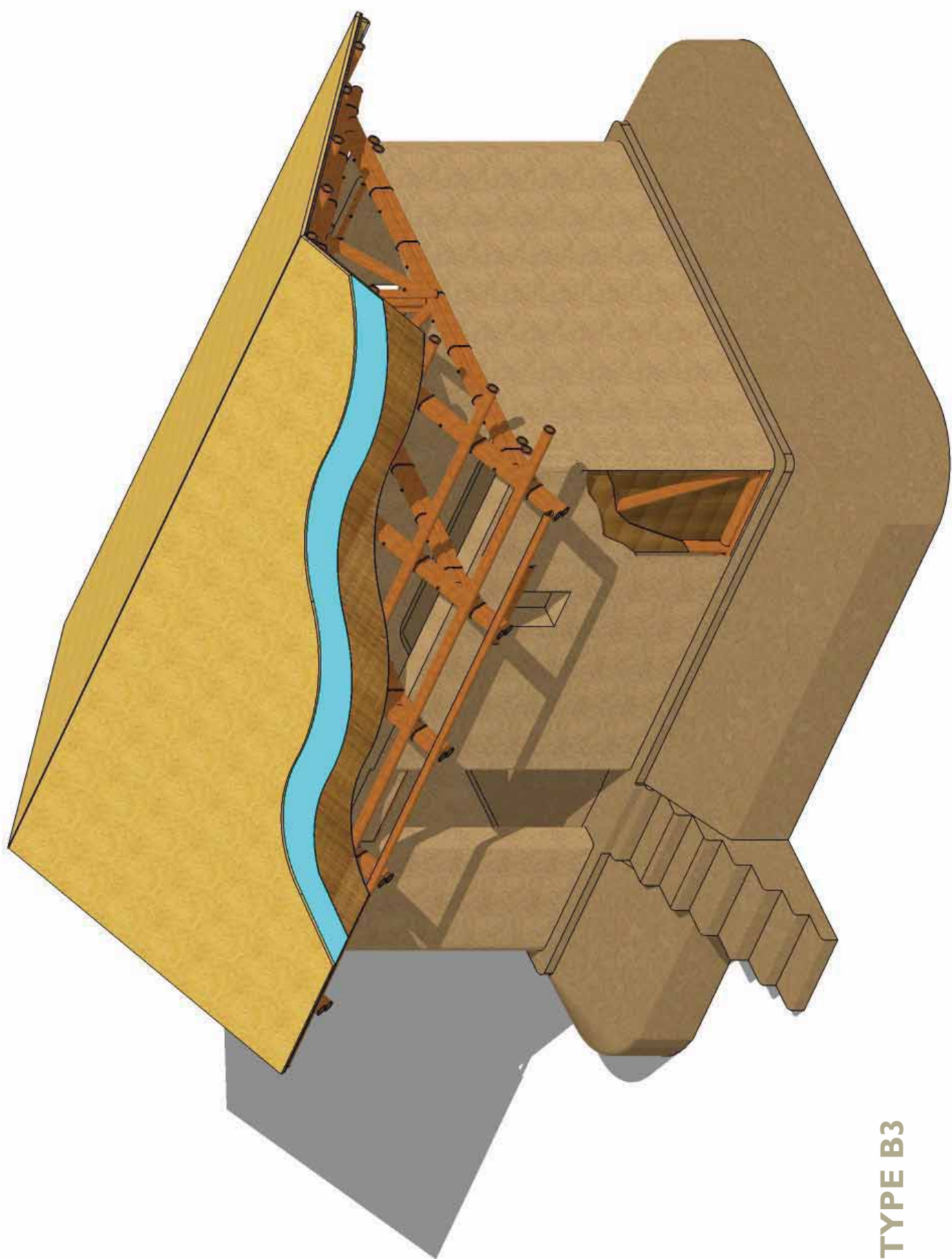
B 3

Scale: 1/4" = 1'0"

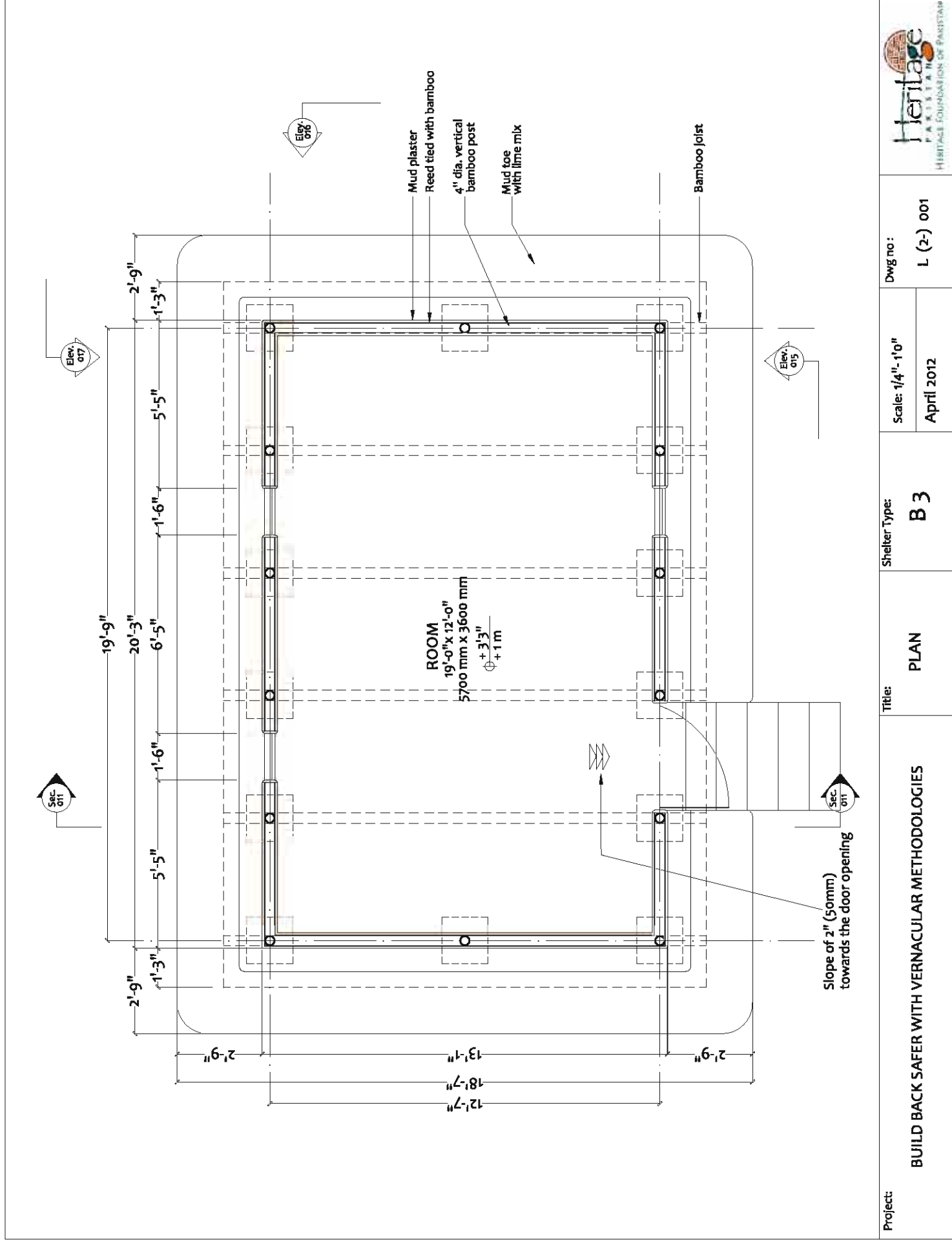
April 2012

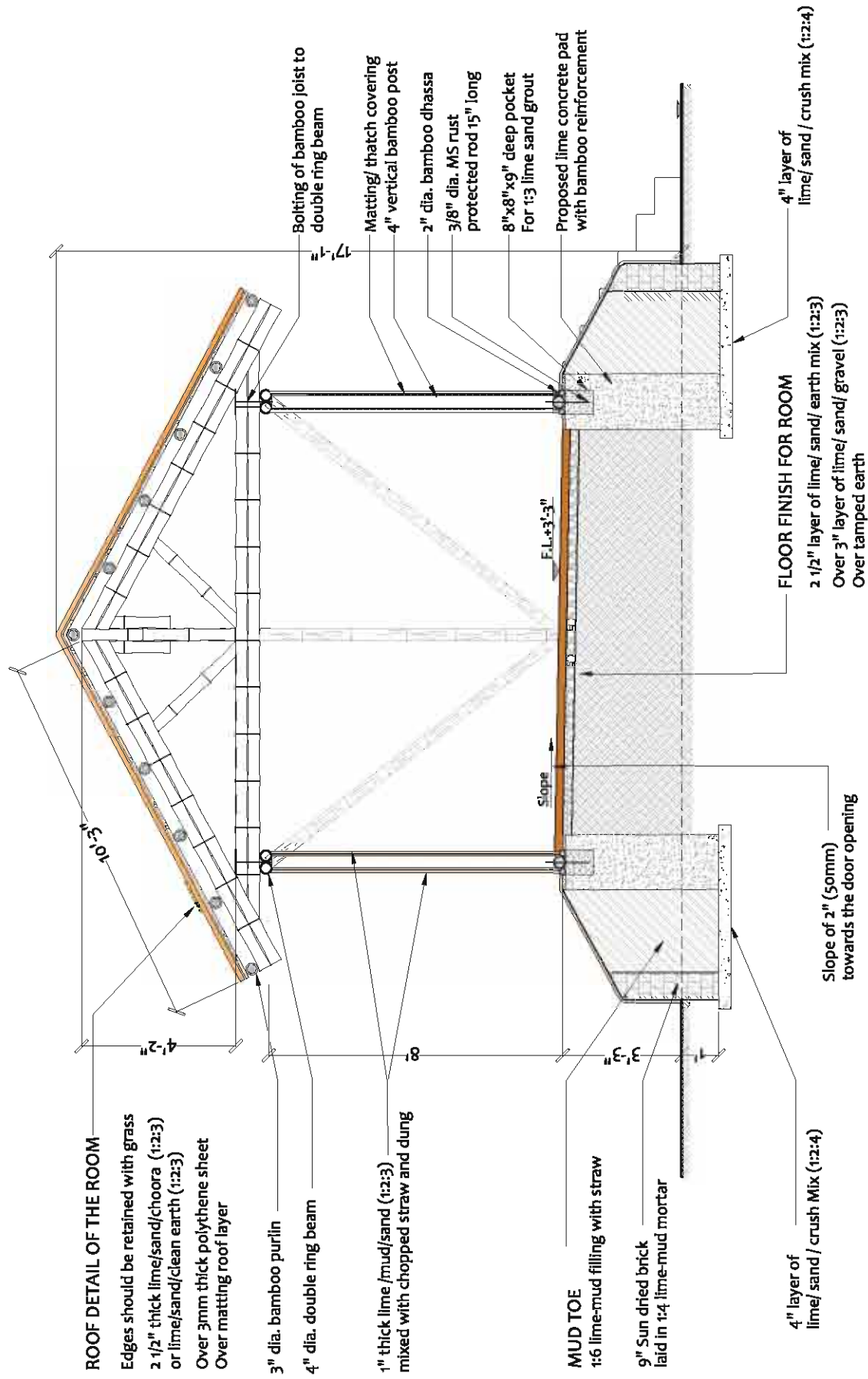
Dwg no :

L (2-) 017



TYPE B3





Project:

Title:

BUILD BACK SAFER WITH VERNACULAR METHODOLOGIES

SECTION

Shelter Type:

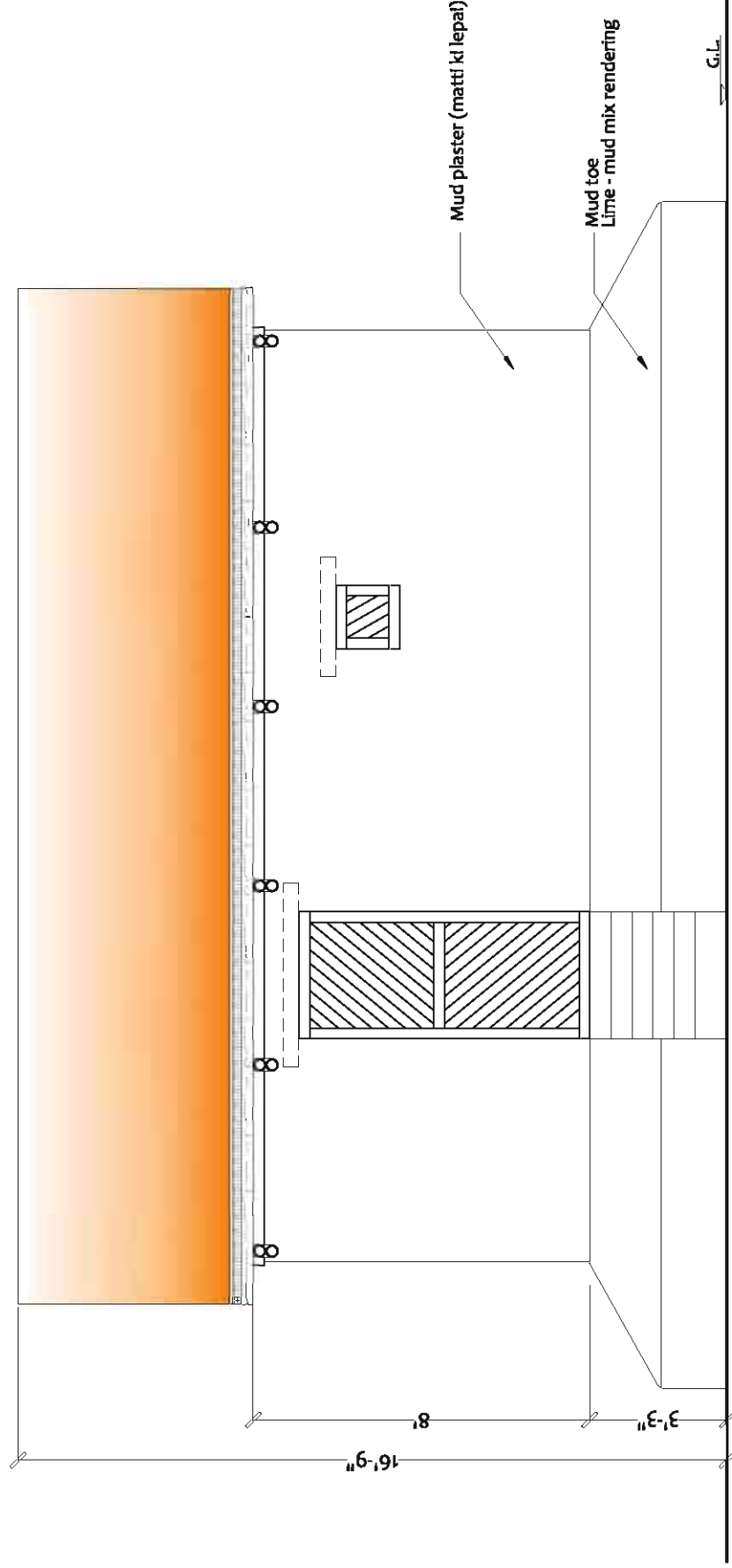
B 3

Scale: 1/4" = 1'0"

April 2012

Dwg no.:

L (2-) 011



Project:

BUILD BACK SAFER WITH VERNACULAR METHODOLOGIES

Title:

ELEVATION

Shelter Type:

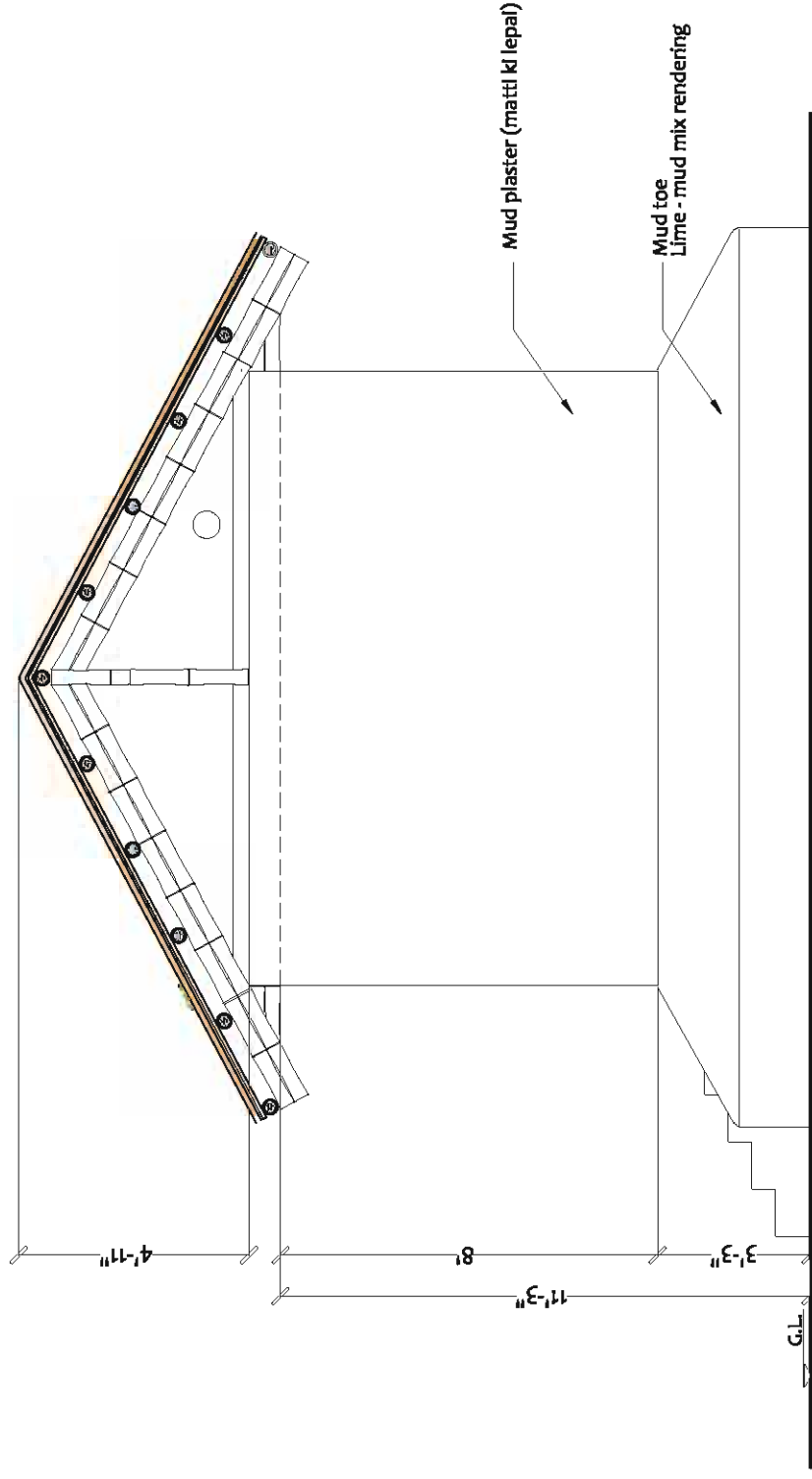
B 3

Scale: 1/4" = 1'0"

April 2012

Dwg no.:

L (2-) 015



Project:

BUILD BACK SAFER WITH VERNACULAR METHODOLOGIES

Title:

ELEVATION

Shelter Type:

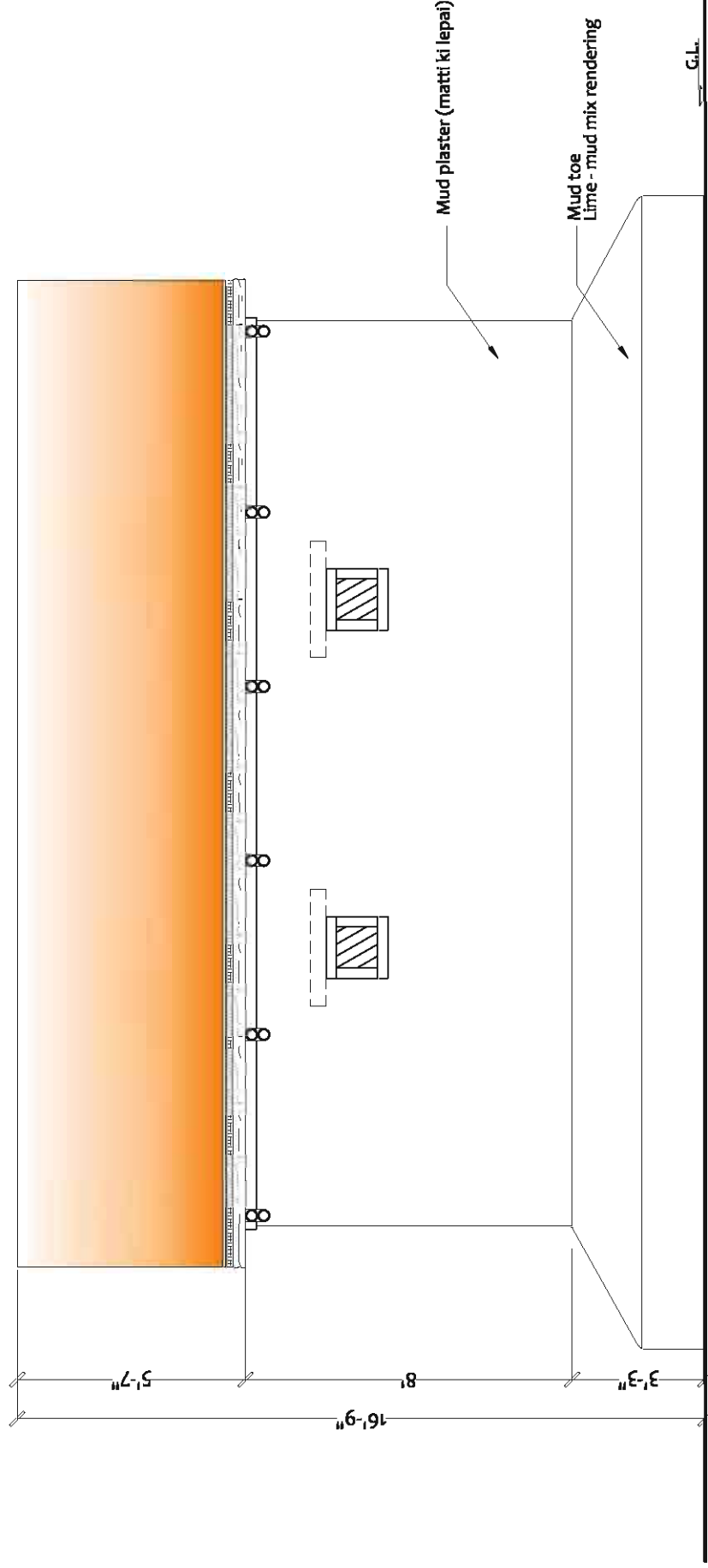
B 3

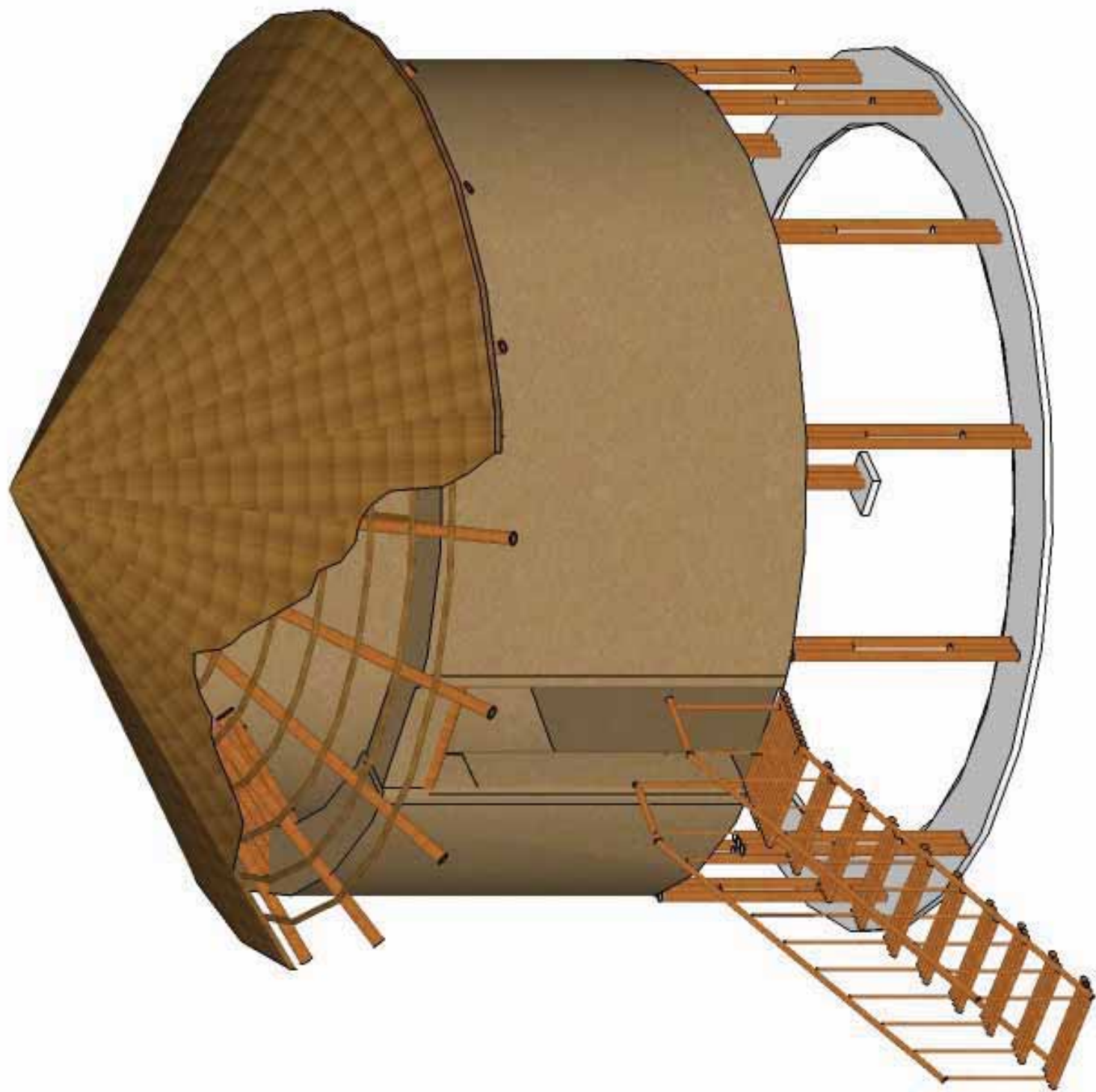
Scale: 1/4" = 1'0"

April 2012

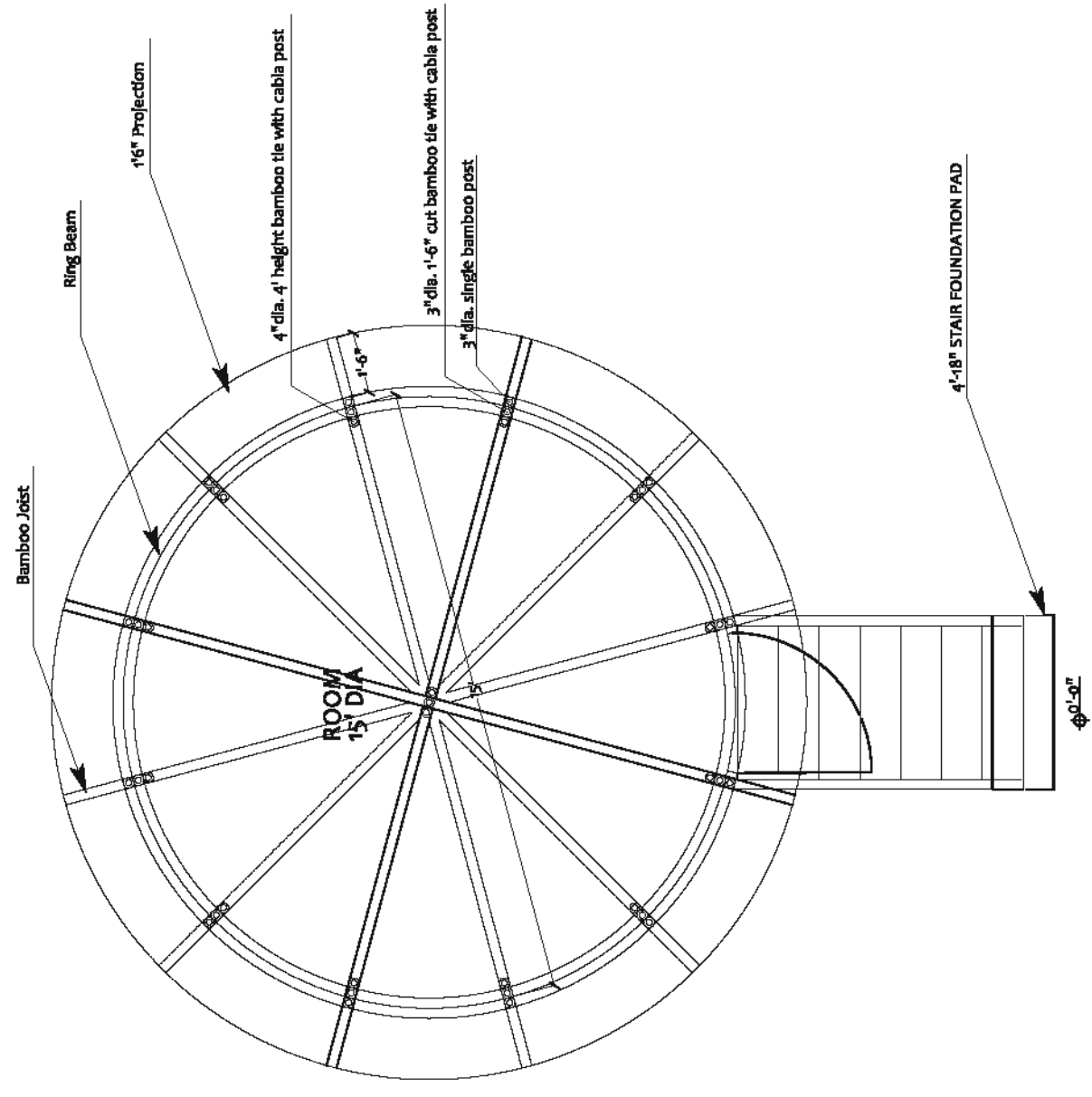
Dwg no :

L (2-) 016





TYPE B4



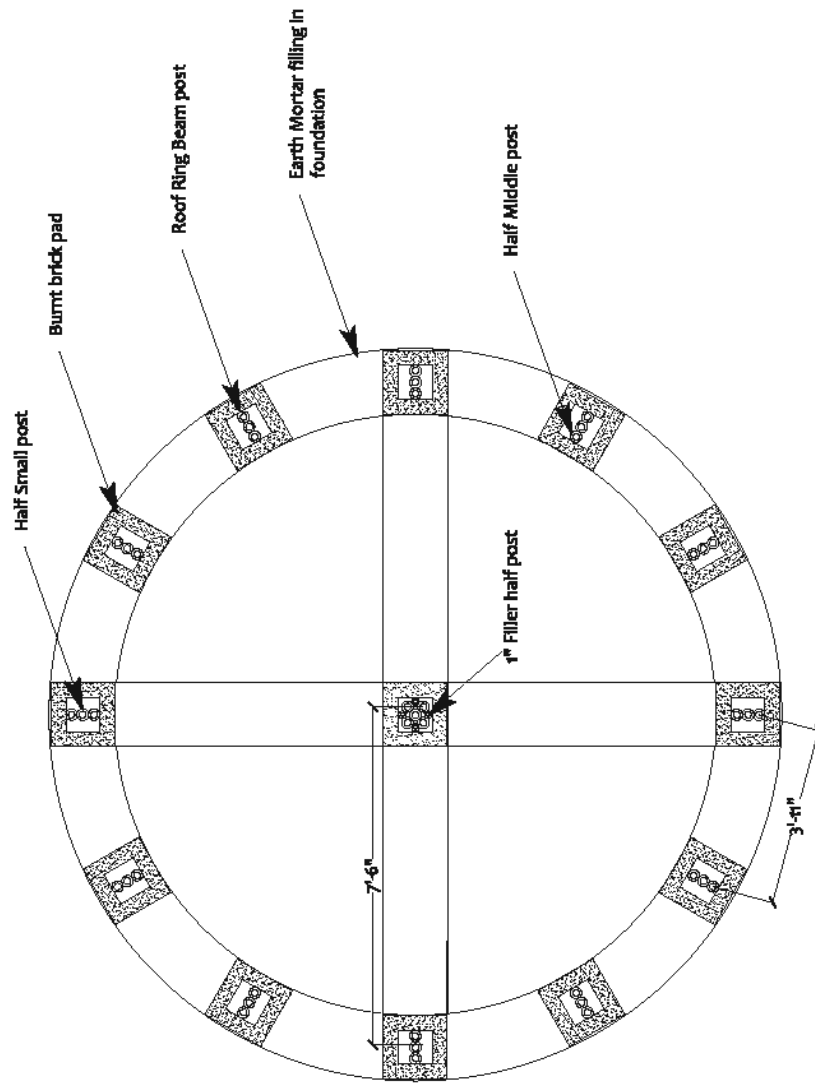
Project: BUILD BACK SAFER WITH VERNACULAR METHODOLOGIES

Title: PLAN

Shelter Type: B 4

Scale: 1/4" = 1'-0"
August 2012

Dwg. No: L (2-001



Project:

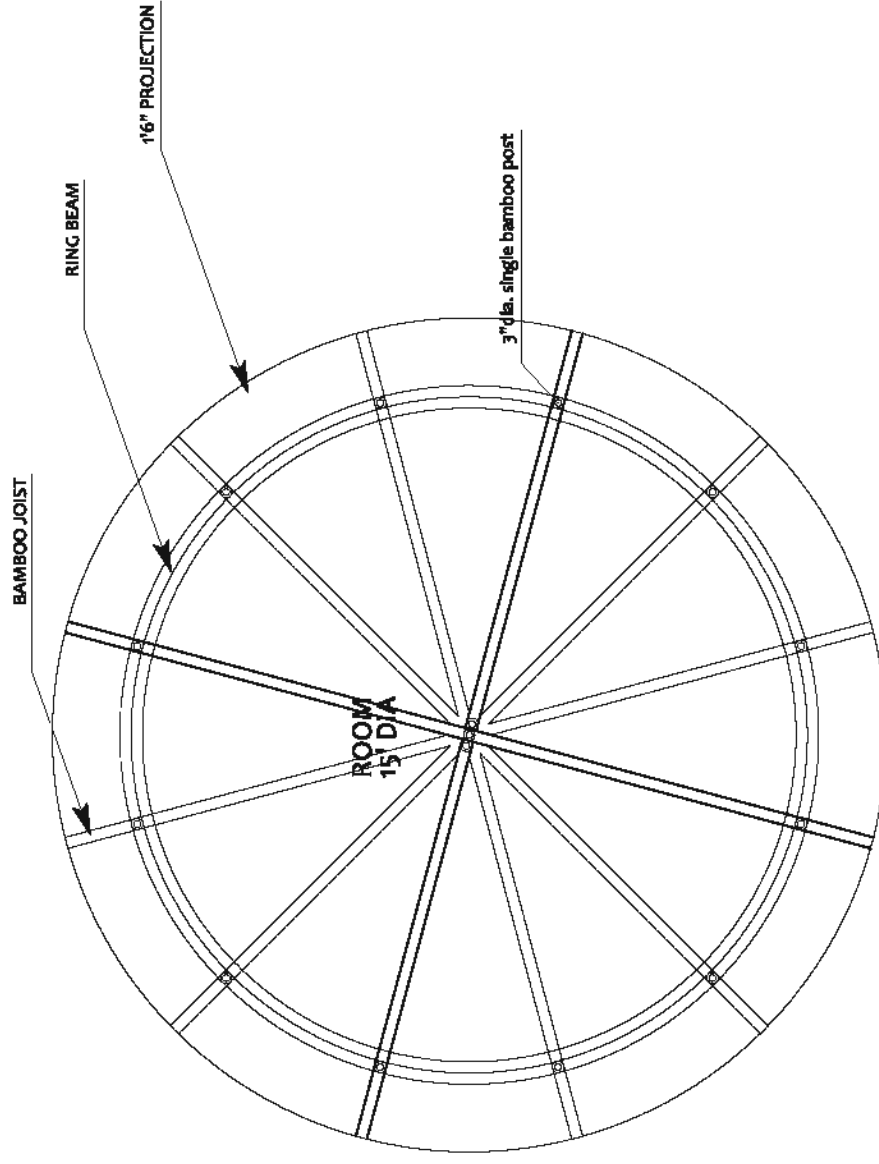
BUILD BACK SAFER WITH VERNACULAR METHODOLOGIES

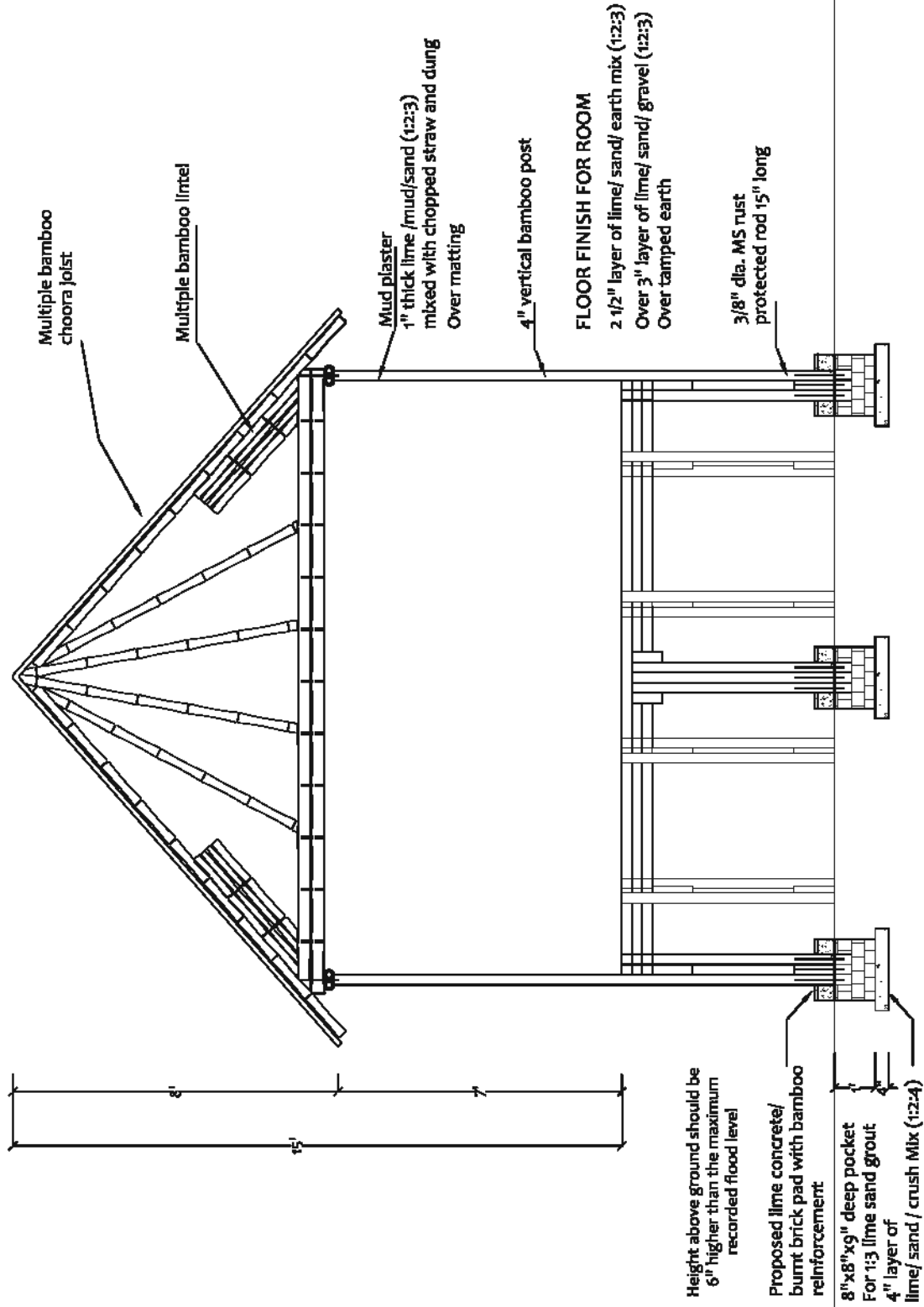
Title:
FOUNDATION

Shelter Type:
B 4

Scale: 1/4" = 1'0"
August 2012

Dwg. No:
L (2-)-001





Project:

BUILD BACK SAFER WITH VERNACULAR METHODOLOGIES

Title:

SECTION

Shelter Type:

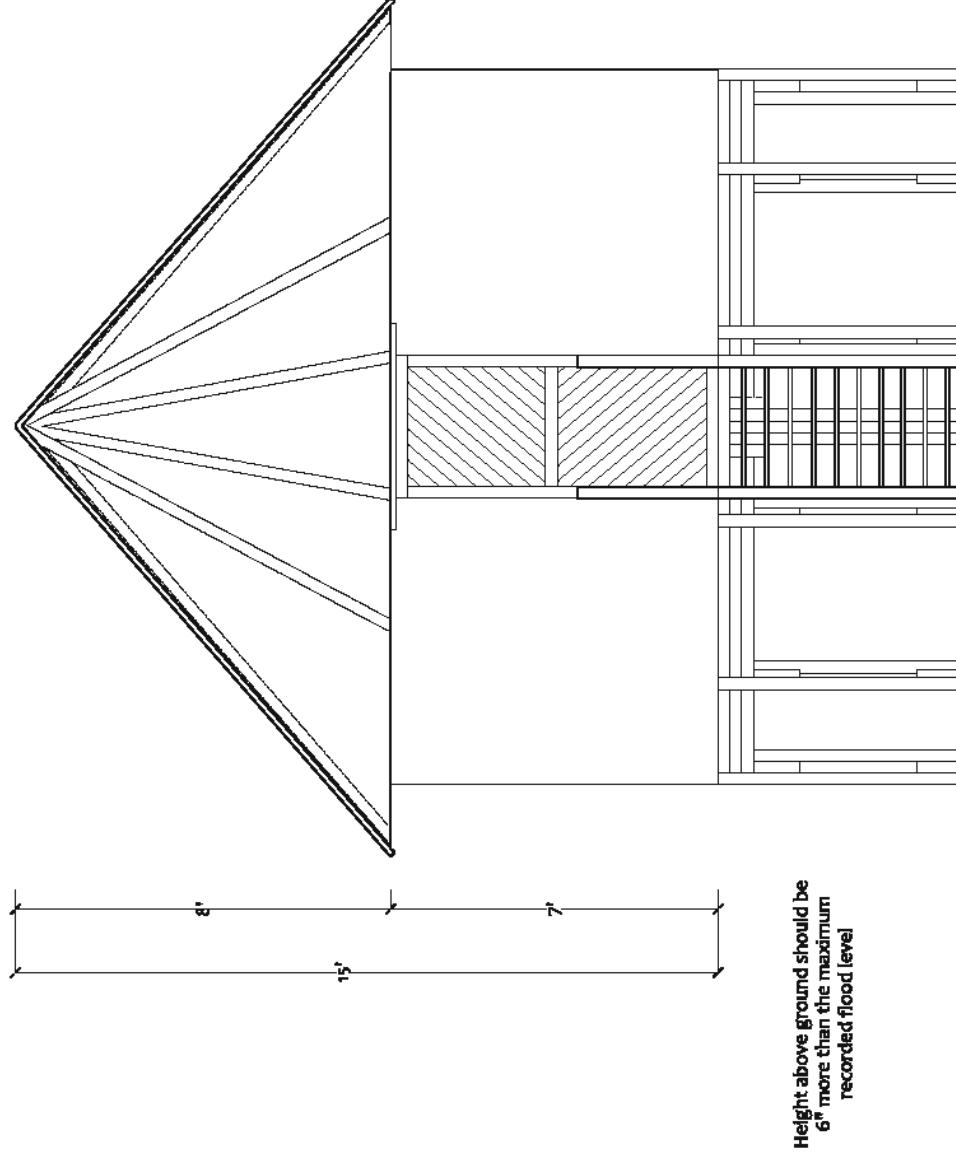
B 4

Scale: 1/4" = 1'0"

August 2012

Dwg no.:

L(2)-011



Project:

BUILD BACK SAFER WITH VERNACULAR METHODOLOGIES

Title:

ELEVATION

Shelter Type:

B 4

Scale: 1/4" = 1'-0"

August 2012

Dwg no.:

L(2)-015



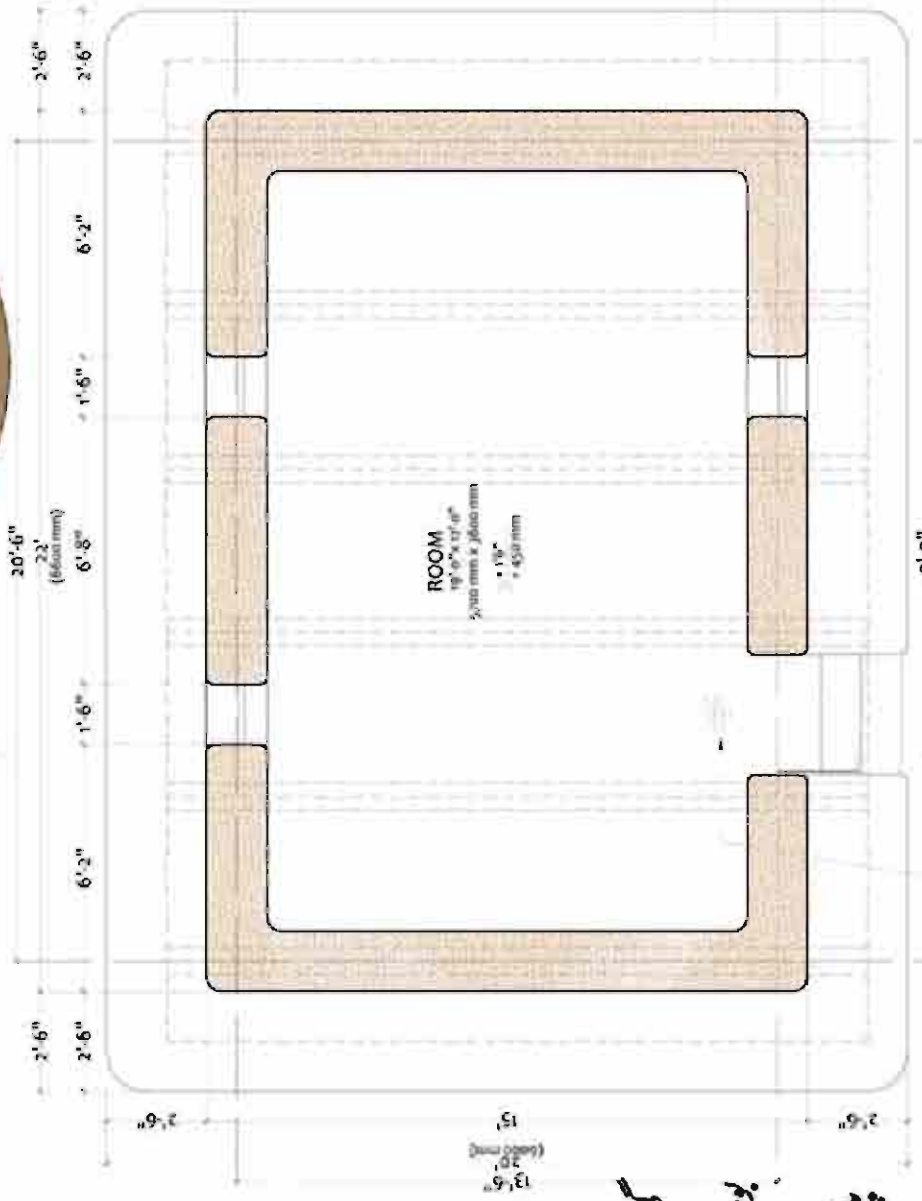
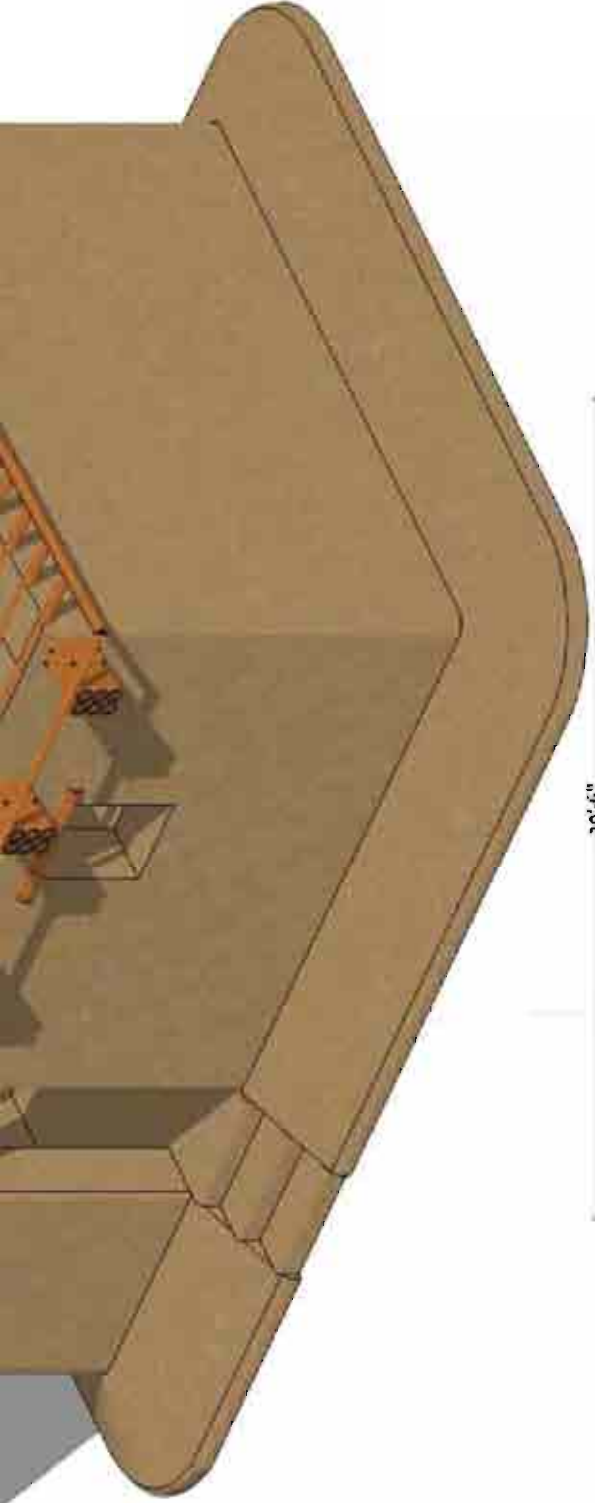
HERITAGE FOUNDATION'S DRR - COMPLIANT SUSTAINABLE CONSTRUCTION

BUILD BACK SAFER WITH VERNACULAR METHODOLOGIES

Annexure C

Build Back Safer with Vernacular Methodologies:
Shelter Typology Charts





18" Thick Mud Wall
سوئی مٹی کی دیوار

Lime-Mud-Straw Layered Filling
چمٹا-مٹی-بھوسے کی تھیرائی

9" Mud Brick
9" مٹی اینٹ

Lime Concrete (1 : 2 : 4)
چمٹا کنکریٹ (1 : 2 : 4)

48" Thick Mud Wall
Mud Tie with Lime role

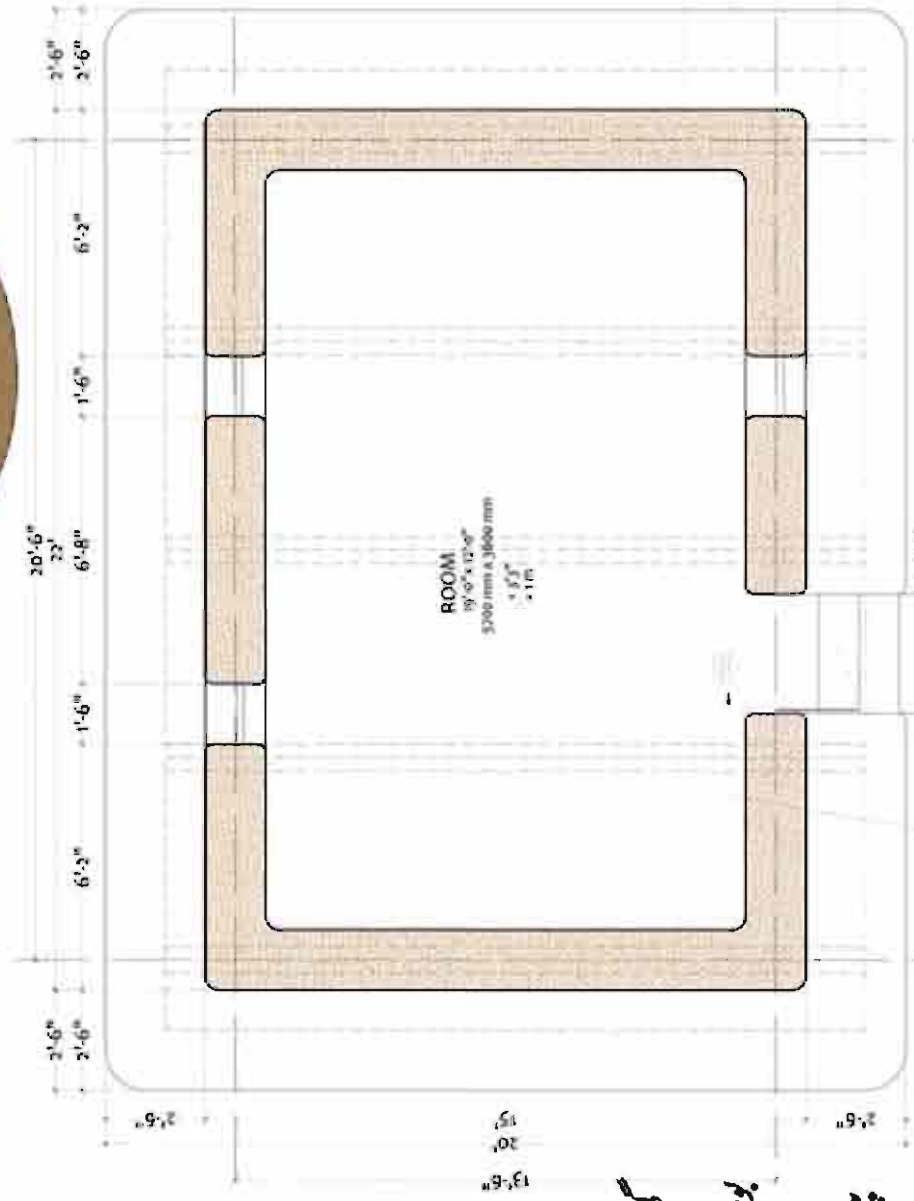
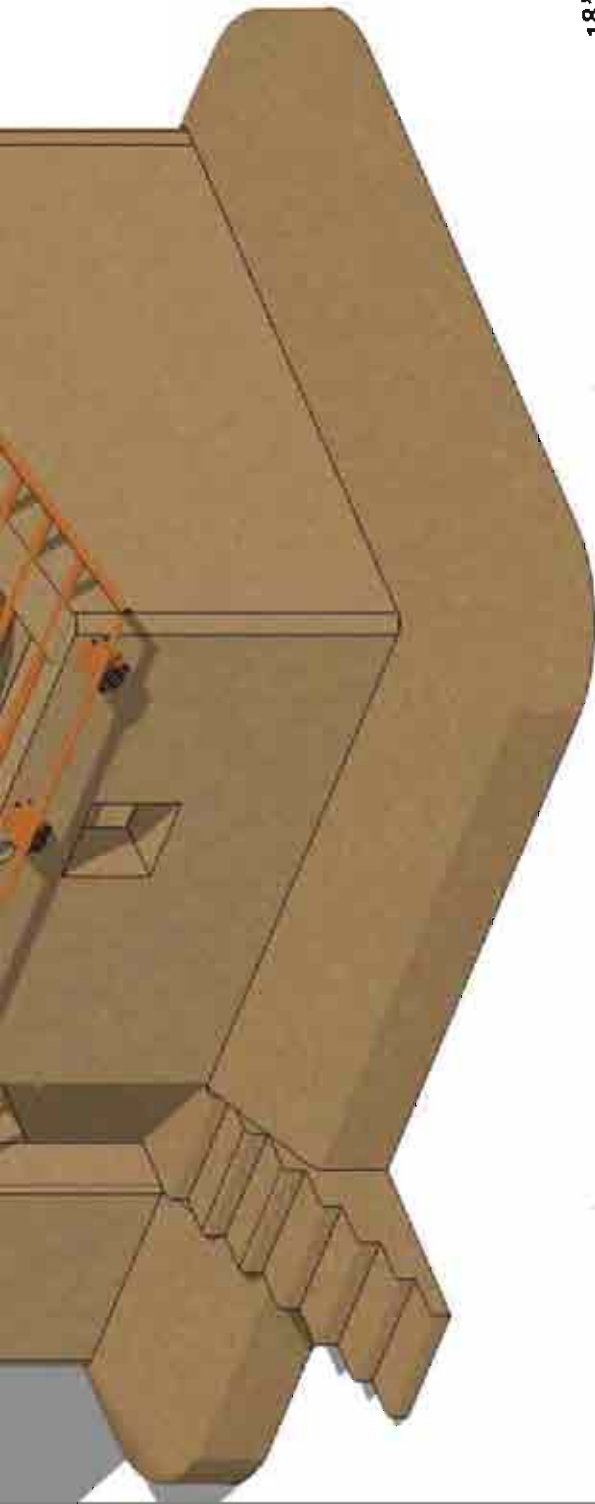
Over 4" dia.
6 tied Bamboo Jult

FLOOR PLAN

پلان

SECTION

تکراس



18" Thick Mud Wall
18" موٹی مٹی کی دیوار

Lime-Mud-Straw Layered Filling
چھتا-مٹی-بھوسے کی تختہ برائی

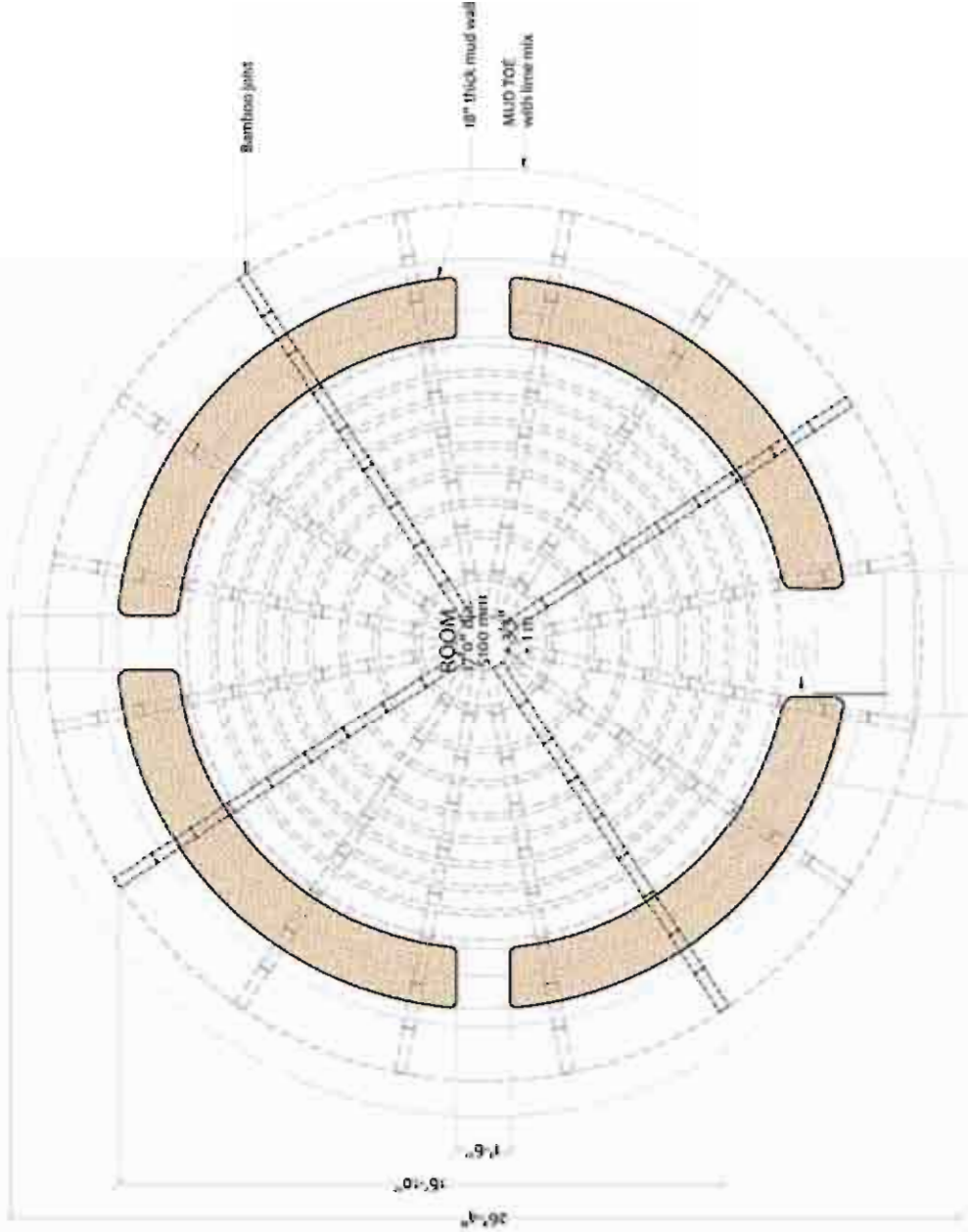
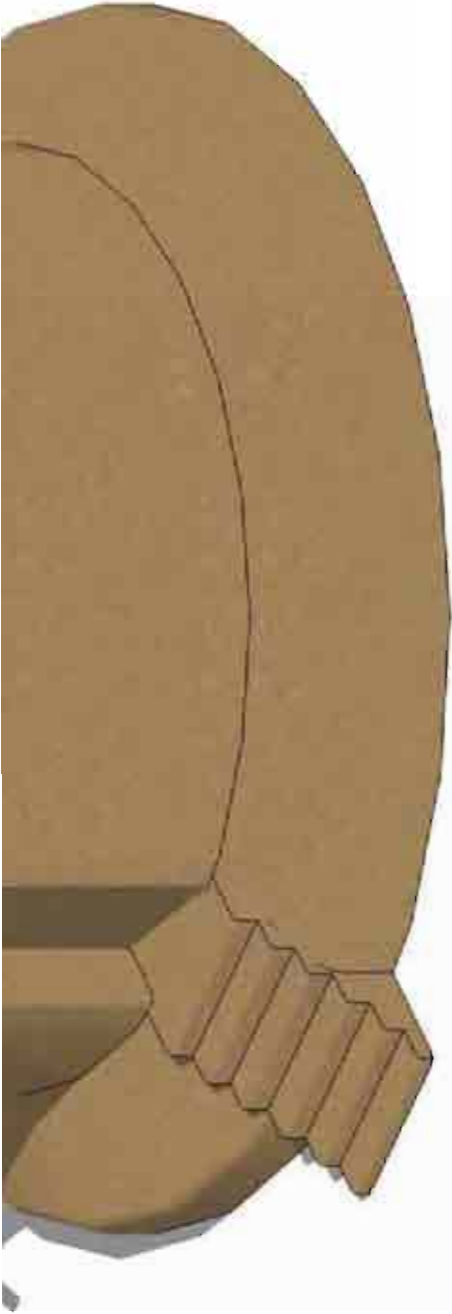
9" Mud Brick
9" مٹی اینٹ

Lime Concrete (1:2:4)
چھتا کنکریٹ (1:2:4)

18" Thick Mud Wall
Mud Tie with Lime robe
Over 4" dia. 4 tied Bamboo Joist

FLOOR PLAN

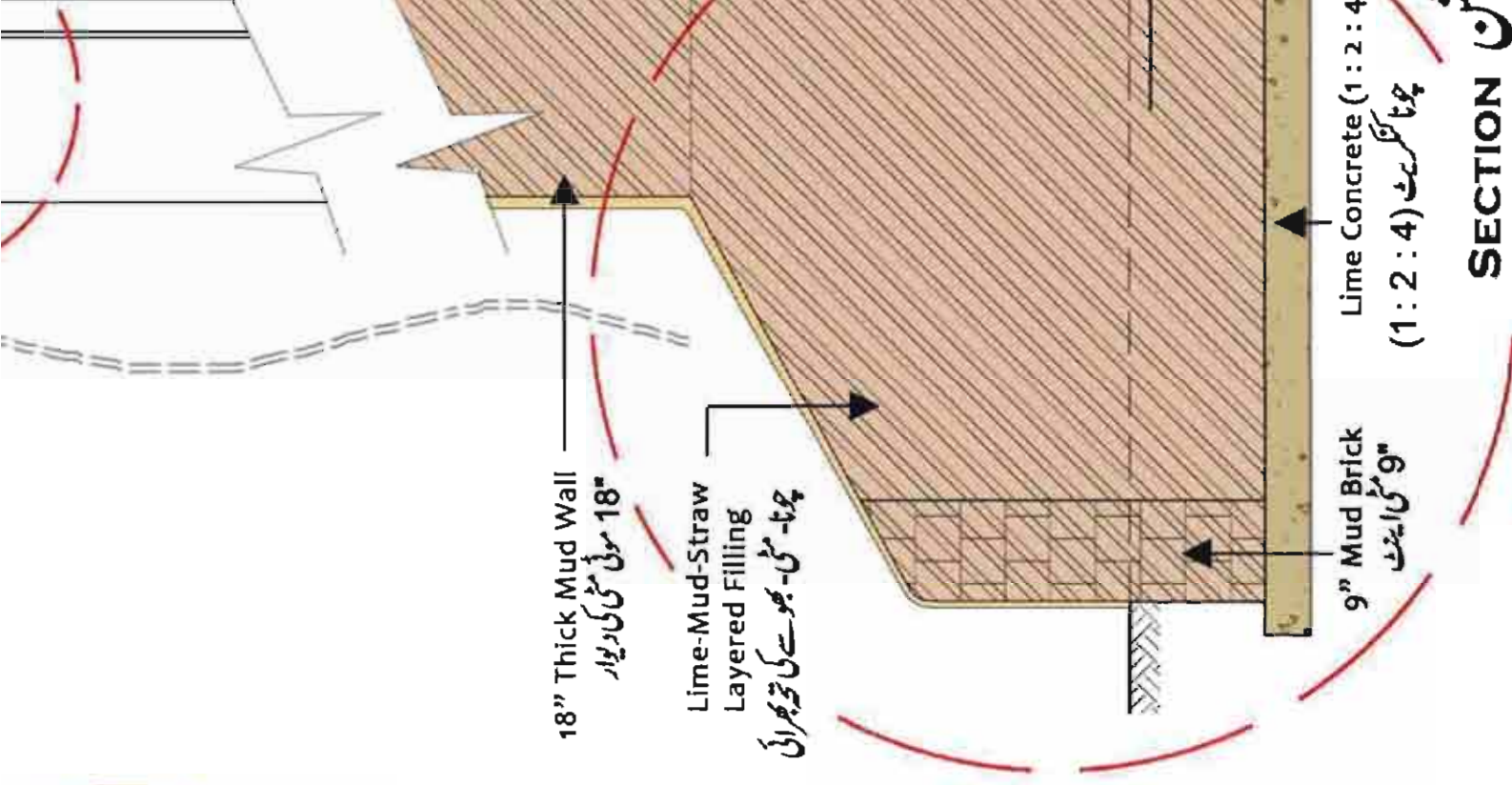
SECTION



Slope of 2° (50mm)
towards the door opening

FLOOR PLAN

پلان



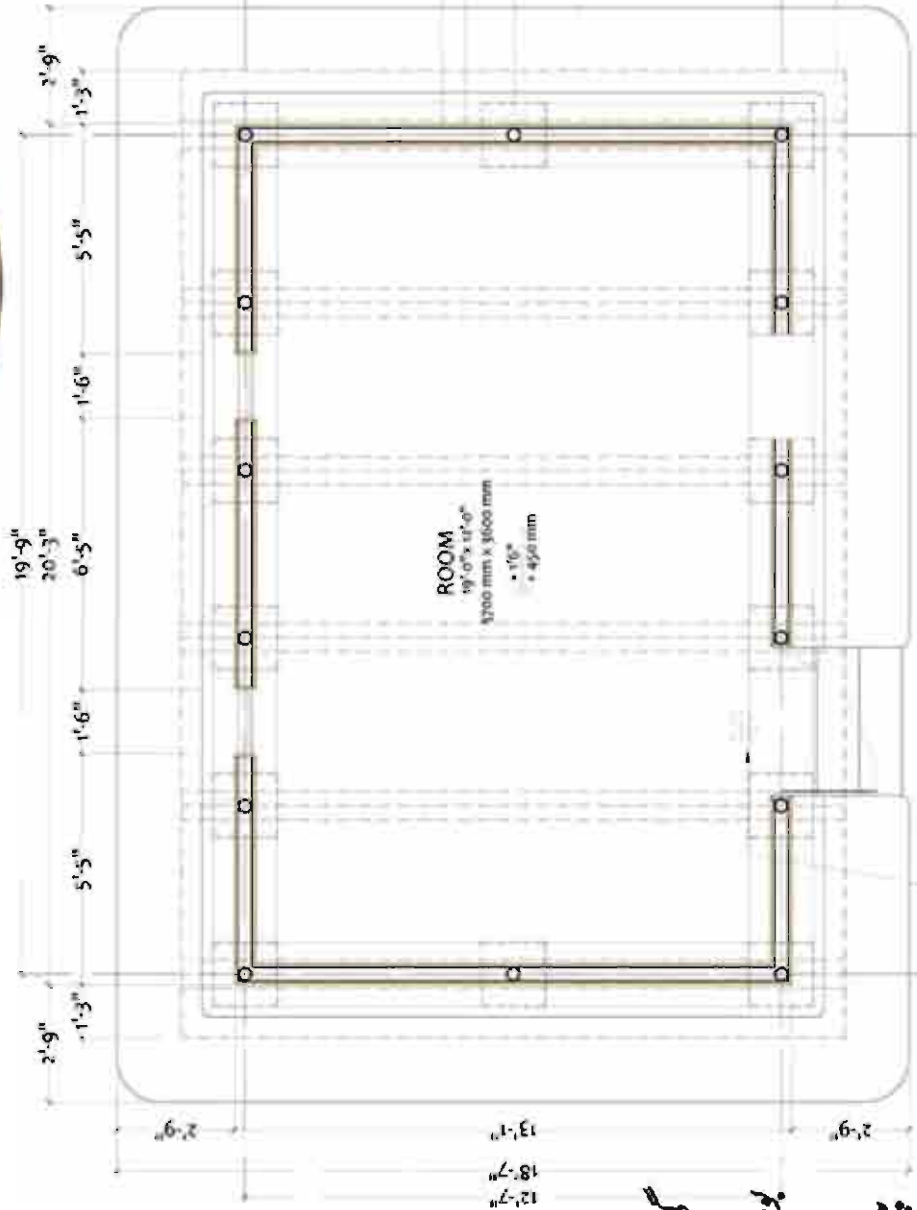
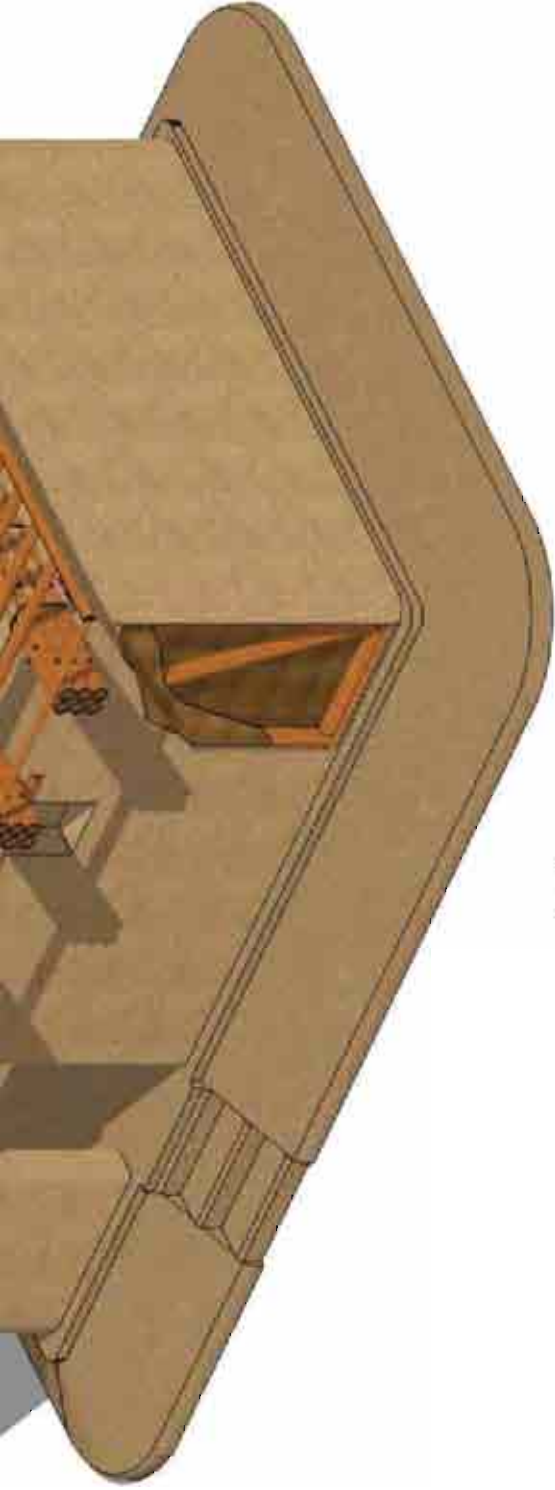
SECTION

چونا گھریٹ (1 : 2 : 4)
Lime Concrete (1 : 2 : 4)

9\"/>

چونا-مٹی-بھوسے کی تختہ برائی
Lime-Mud-Straw
Layered Filling

18\"/>



Slope of 2" (50mm)
towards the door opening

Reed Wall
کھاٹ کی دیوار

Lime-Concrete Base
چھٹا کنکریٹ پایہ

Lime-Mud-Straw
Layered Filling
چھٹا مٹی-بھوسے کی تھیرھرائی

Mud Plaster
Reed tied with Bamboo

4" dia. Vertical
Bamboo Post

Mud Toe
with Lime mix

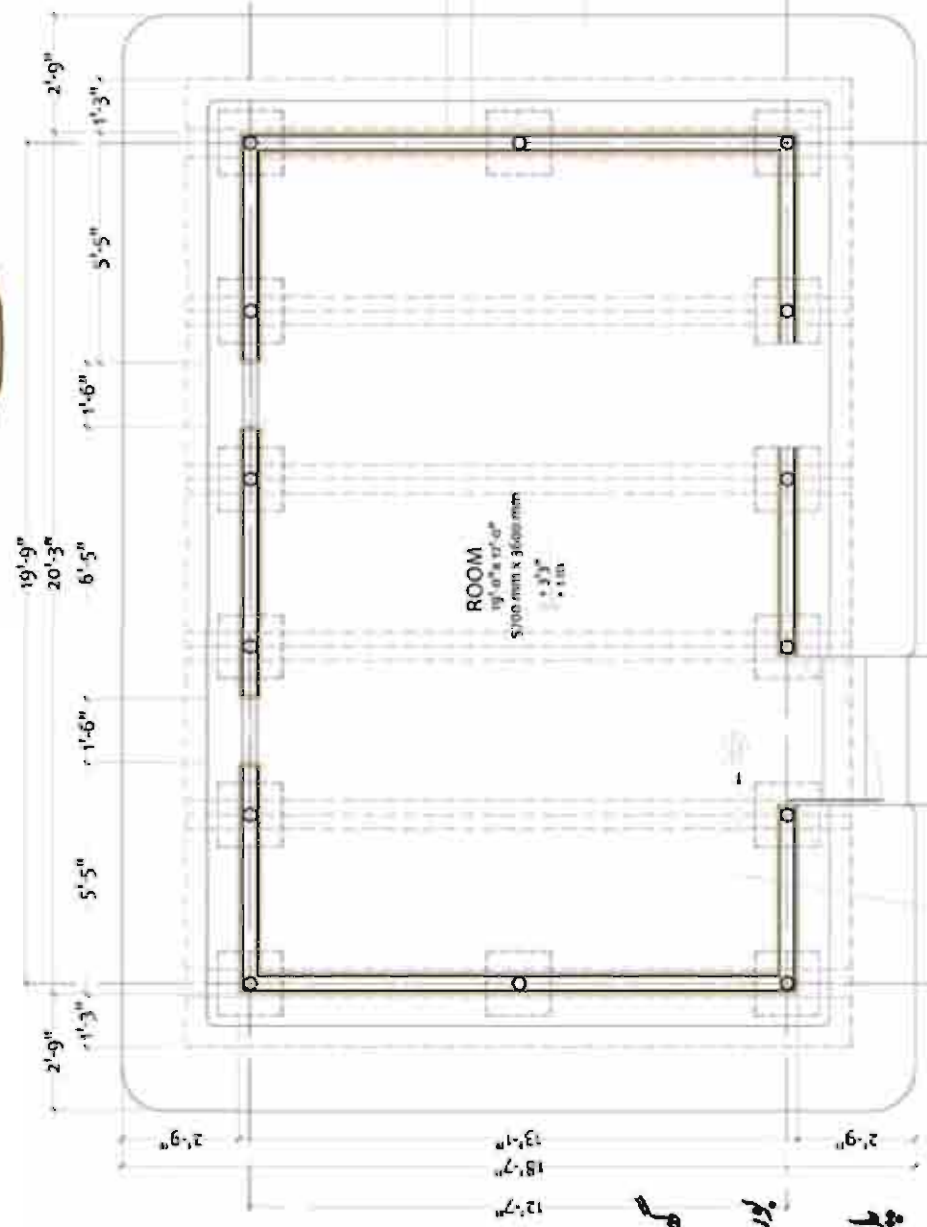
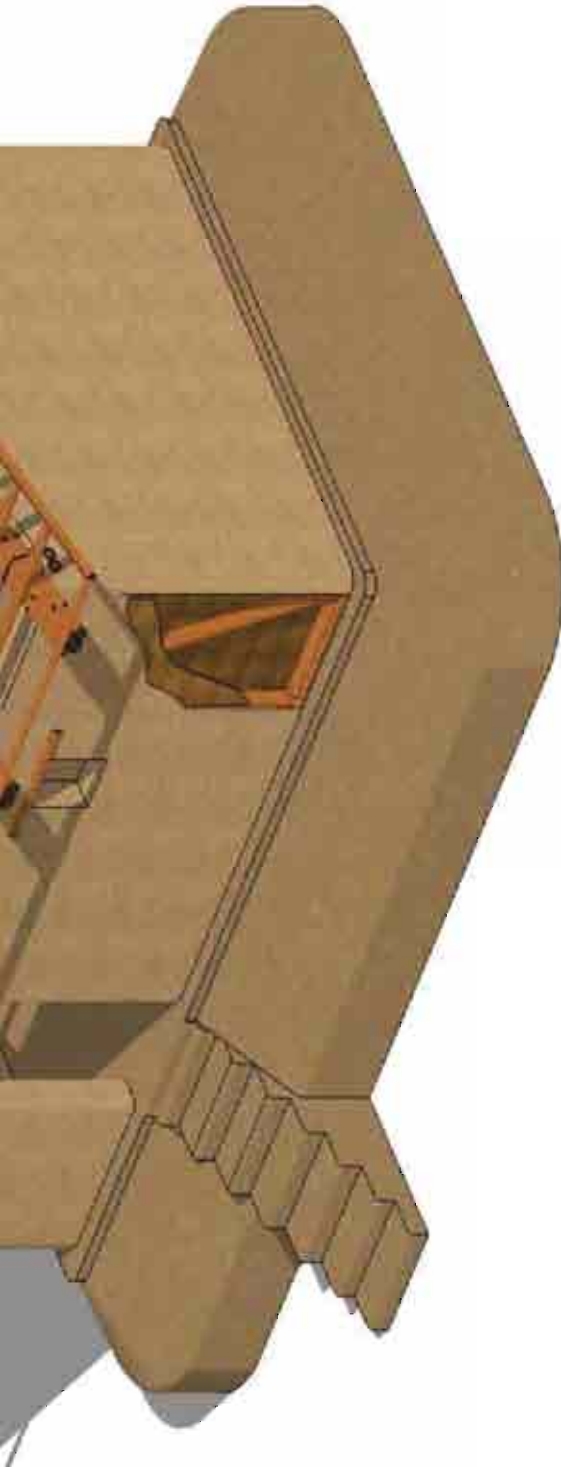
4" dia. tied
& Bamboo joint

9" Mud Brick
9" مٹی اینٹ

Lime Concrete (1 : 2 : 4)
چھٹا کنکریٹ (1 : 2 : 4)

پلان
FLOOR PLAN

SECTION



Reed Wall

کھاٹ کی دیوار

Lime-Concrete Base

چونا کنکریٹ پایہ

Lime-Mud-Straw Layered Filling

چونا-مٹی-بھوسے کی تھیرائی

Mud Plaster
Reed tied with Bamboo

4" dia. Vertical
bamboo Post

Mud Tie
with Linerite

4" dia. tied
4 Bamboo Joint

9" Mud Brick

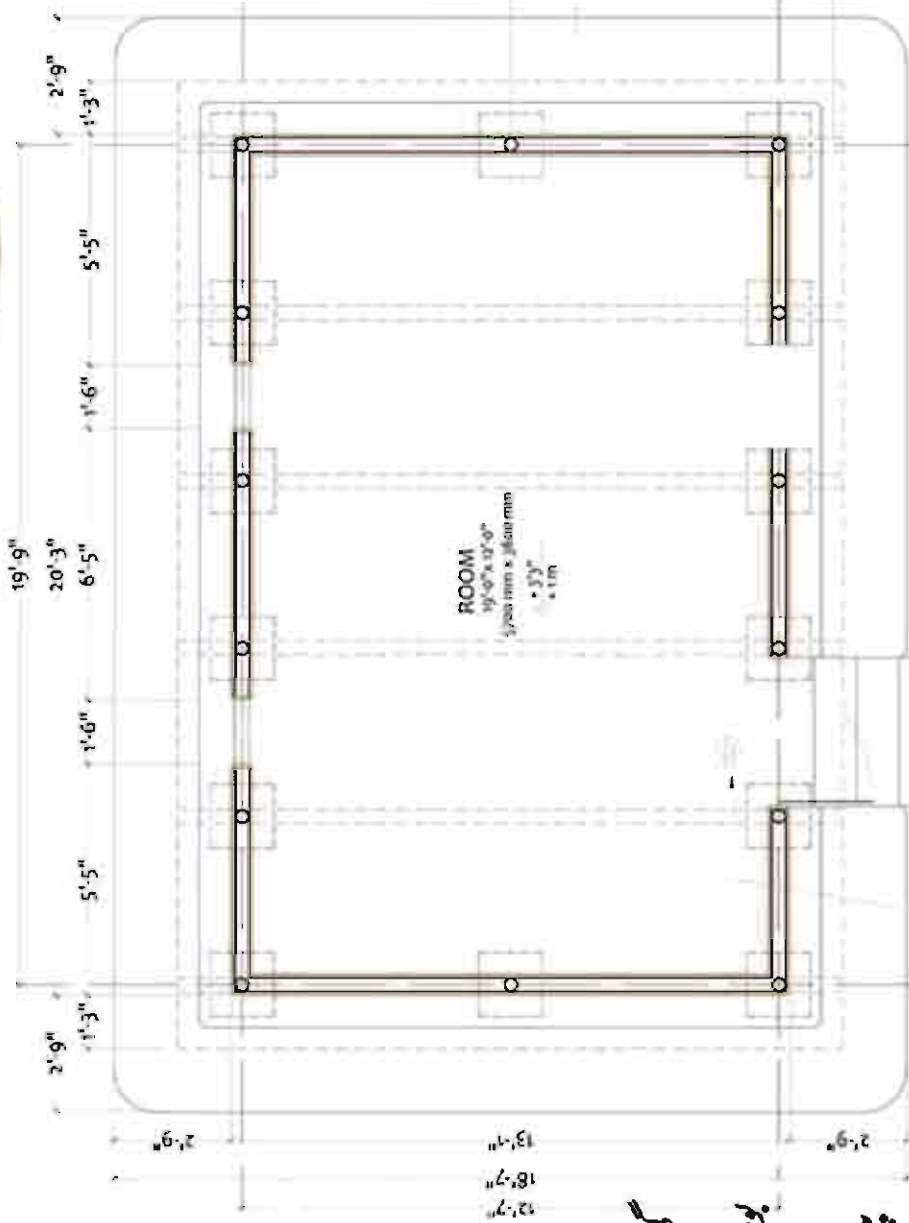
9" مٹی اینٹ

Lime Concrete (1 : 2 : 4)

چونا کنکریٹ (1 : 2 : 4)

پلان
FLOOR PLAN

SECTION



Reed Wall

کھاٹ کی دیوار

Lime-Concrete Base

چونا کنکریٹ پایہ

Lime-Mud-Straw Layered Filling

چونا-مٹی-بھوسے کی تھیرائی

9" Mud Brick

9" مٹی اینٹ

Lime Concrete (1 : 2 : 4)

چونا کنکریٹ (1 : 2 : 4)

Mud Plaster
Reed tied with bamboo

4" dia. Vertical
Bamboo Post

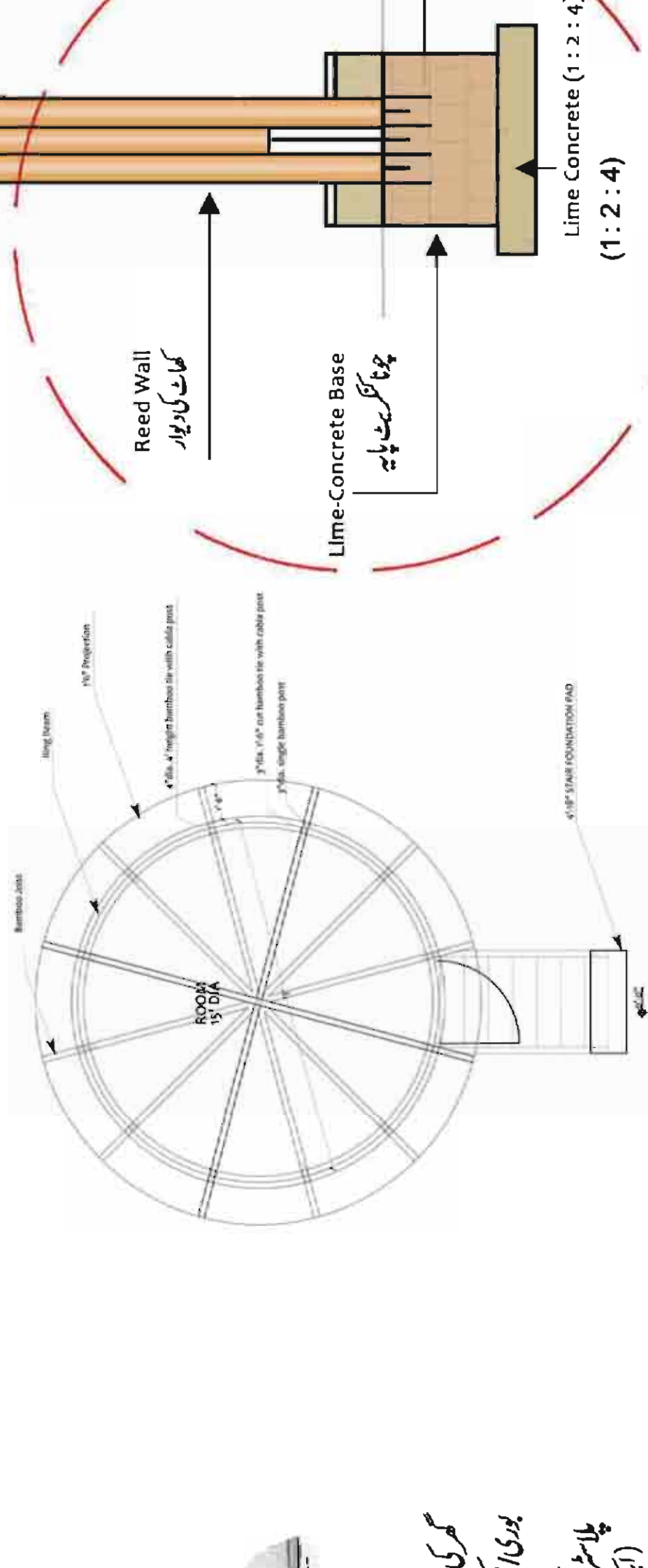
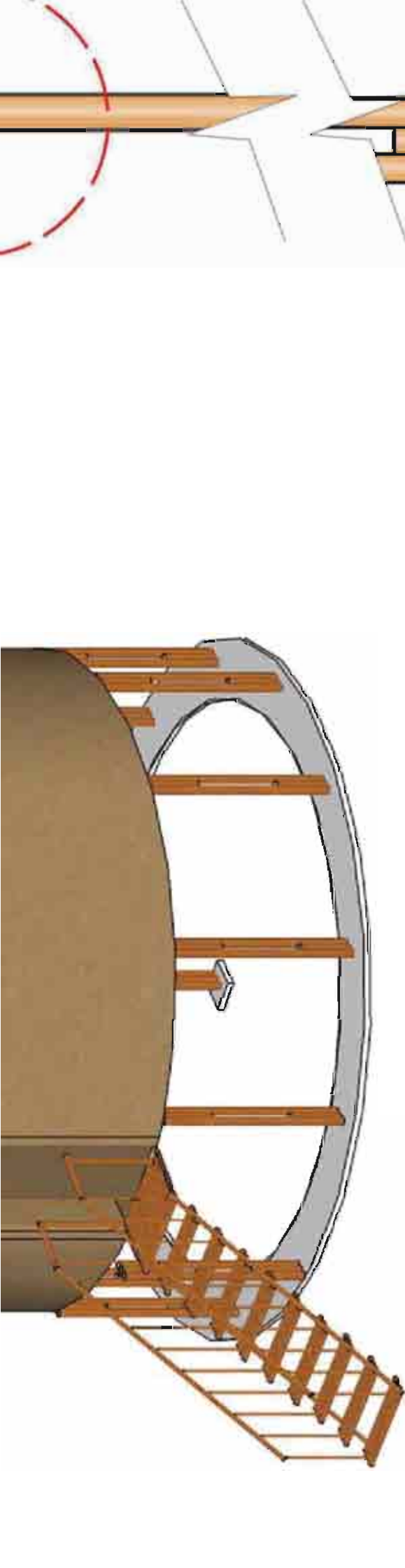
Mud Toe
with Lime mix

4" dia. tied
Bamboo Joist

FLOOR PLAN

SECTION

پلان
FLOOR PLAN



Reed Wall
کھار کی دیوار

چونا کنکریٹ باسہ
Lime-Concrete Base

4" 18" STAIR FOUNDATION PAD

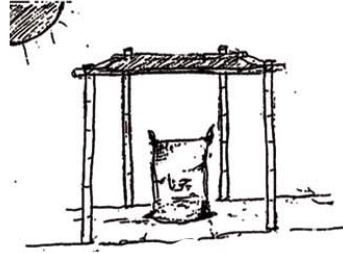
گھڑی
بوری
چلا سٹ
(آر)

1.



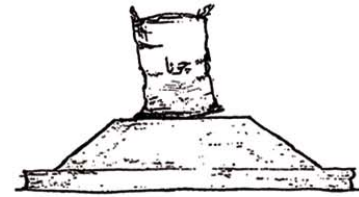
Lime should be procured in the form of lumps (Pathar Choonā) available in 25 kg weather resistant bags, in order to reach the site in a dry state.

چونے کے استعمال کریں جو 25 کلوگرام تک کیے جاتے ہیں۔



All lime bags should be placed in a dry place.

چونے کے تھیلے خشک جگہ پر رکھیں۔



In case of danger of flooding, keep lime bags in an elevated place to avoid dampness or seepage of water.

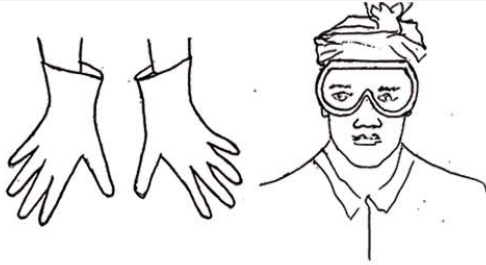
چونے کے تھیلے پانی سے بچانے کے لئے اونچی جگہ پر رکھیں۔



If any Lime bags have become damp or contaminated they must not be used in construction.

اگر چونے کے تھیلے ہو گئے ہوں تو انکو استعمال نہ کریں۔

2.



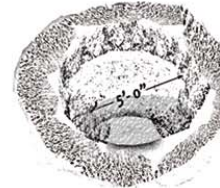
Protect eyes and hands during handling lime.

چونے سے آنکھوں کو بچائیں، چشمہ اور دستاں استعمال کریں۔



Buckets of clean water must be available for first-aid purposes so that the eyes can be washed thoroughly.

صاف پانی کی باقی قریب رکھیں تاکہ آنکھوں کو دھو سکیں۔



Surround the lime pit with bushes and place a danger sign near it.

چونے کے گڑے کے گرد جھاڑیاں اور خطرے کا نشان رکھیں۔



Keep children and animals away from the lime pit. Do not touch the lime while it is hot.

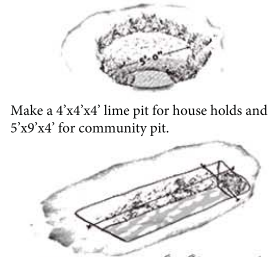
بچوں اور جانوروں کو چونے کے گڑے سے دور رکھیں۔ جب چونے گرم ہوں تو اس کو ہاتھ نہیں رکھیں۔



In case of exposure of lime to skin, use lemon juice or vinegar.

اگر چونے ہاتھوں پر لگ جائے تو فوراً لیموں یا سرکہ لیں۔

3.



Make a 4'x4'x4' lime pit for house holds and 5'x9'x4' for community pit.

چونا تیار کرنے کے لیے گڑھا 4'x4'x4' یا 5'x9'x4' گاؤں کا گڑھا کھودیں۔



Pour water to wet the pit. Line the pit with the plaster of mud mixed with chopped straw.

گڑھے کو پانی سے تر کر دیں تاکہ پانی جذب کر لے، پھر مٹی اور جھو سے کا پلاسٹر کریں۔



Refill the pit with water the next day.

اگلے دن گڑھے کو دوبارہ پانی سے بھر دیں۔



Pour lime in the pit filled with water, wait until it loses its heat.

چونے کو پانی میں ڈال دیں جب تک کہ اس کی گرمی ختم نہ ہو جائے۔



Stir and mix the mixture with a wooden stake. A 4" layer of water should always cover the lime mix.

گڑی کی مدد سے چونے کو ملائیں۔ 4" پانی کی تہہ چونے کے اوپر رہنی چاہیے۔



Slake lime for a minimum of 7 days before using it.

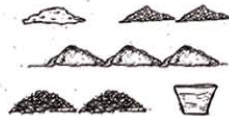
چونے کو 7 دن کے بعد استعمال کریں۔

4.



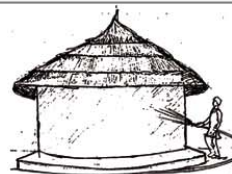
Wet the surface before applying the mud lime plaster

چونا پلاسٹر کرنے سے پہلے دیوار کو پانی سے گیلنا کر لیں۔



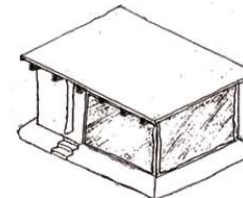
Mix 1:6 (1 lime cream + 2 sand + 3 soil). Add 1 part Slurried dung and 2 parts chopped straw, mix with as little water as possible for easy application.

پلاسٹر بنانے کے لیے (1 حصہ تیار چونا + 2 حصہ ریت + 3 حصہ مٹی) اس میں 1 حصہ گوبر اور 2 حصہ کٹا ہوا پانی کے ساتھ ملا لیں۔



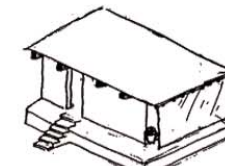
Wet the surface with a mist of hose pipe to prevent from fast drying.

چونے کے پلاسٹر کی سطح کو پانی سے کپاپ سے گیلنا رکھیں تاکہ جلد خشک نہ ہو۔



Hang old blankets or sheets and keep them damp.

پرانے کپڑے یا چادر گولیا کریں اور اس سے دیوار کو ڈھانک لیں۔



If plastic is used, keep it away from the wall to prevent quick drying and place a bucket of water near by.

اگر پلاسٹک کا استعمال کریں تو اس کو دیوار سے دور رکھیں اور باقی میں پانی قریب رکھیں تاکہ جلد خشک نہ ہو۔



Keep the wall plaster damp for 7 days.

چونے کے پلاسٹر کو 7 دن تک گیلنا رکھیں۔

HERITAGE FOUNDATION'S DRR-COMPLIANT SUSTAINABLE CONSTRUCTION LIME INSTRUCTIONS





HERITAGE FOUNDATION'S DRR - COMPLIANT SUSTAINABLE CONSTRUCTION

BUILD BACK SAFER WITH VERNACULAR METHODOLOGIES

Annexure D

Trainer Saad Khan's TOT evaluation



Built Back Safer With Vernacular Methodologies

Training Report for Trainers

This evaluation and reporting form acts as a record of the training, a space for reflection, and provides valuable recommendations for development.

Course Details

Location: Hyderabad

Dates: First Training: Theory sessions 20-22 November 2012, Field Visit 01 December 2012
Second Training: Theory sessions 26-28 November 2012, Field Visit 02 December 2012

Trainers: Theory Sessions Saad Khan, assisted by Ar. Hina Zaidi
Field Sessions Yasmeen Lari, assisted by Heritage Foundation team

Host: IOM for Theory Sessions
HF for Field Sessions

Number of participants:

Number of trainings held: 2 x ToT, 4 days each

Language: English on Presentation/ Delivered in Urdu on Participants request

NB: Please attach the original evaluations (hard copies) as well as soft copies of the following documents to this report:

1. A final list of participants with organizations, posts and e-mail addresses (Annexure 1)
2. A copy of the agenda (page 3)
3. Participants evaluations summary (Annexure 2)
4. Copies of any amended materials (power points, hand-outs, activities and session plans) and any country/context specific handouts
5. 10-15 photos (if available) from the training and camps (Annexure 3)

Training Context

A brief history of the current disaster/conflict (not applicable in regional trainings):

After devastations of 2011 floods in lower Sindh, a widespread research was carried out by Heritage Foundation in 35 Union Councils of 8 priority districts. This research formed bases for determining strength and weaknesses in the face of flood waters of vernacular construction methods such as adobe, local reed as well as the modern/expensive material such as burnt bricks and rolled steel joist girders. The finding of this research enabled Heritage Foundation's team of reputed architects and engineers to introduce interventions resulting in DRR compliant, improved and strengthen vernacular structures. Heritage Foundation has proposed eight typologies of improved Line Room Shelter (LRS) designs that are appropriate to local culture and climate and use sustainable local material. Subsequently, a typology for minimizing the use of earth where flood levels were found to be above 3'6" consisting of stilts was also introduced.

For the implementation of LRS program IFM has engaged Heritage Foundation to provide technical assistance and training for the program "Build Back Safer with Vernacular Methodologies". A comprehensive training program was developed by Heritage Foundations including illustrative training material. In June 2012 IFM's LRS 3 program was started and through ToT Heritage Foundation trained IFM staff and 52 members of implementing partners. Heritage Foundation's experts also provided technical support and mentoring through field visits to each implementing partner and follow-up reports.

The success of LRS 3 program has led to the LRS 5 and LRS 6 programs. Training of Trainer (ToT) program was conducted from 22 November – 02 December 2012, in which 86 technical and social mobilizing staffs of Implementing Partners were trained.

The ToT was done in 2 groups in Hyderabad. The ToT for the first group was from 20 till 22 November with field visit on 01 December 2012 to Mohak Sharief village in Tando Allahyar. The second ToT was from 26 till 28 November 2012 and the field visit was on 02 December.

Program Schedule: HF-IOM Training of Trainers

	ToT Group 1						Group 2			Group 2	Group 1
	20-Nov Tue	21-Nov Wed	22-Nov Thu	23-Nov Fri	24-Nov Sat	25-Nov Sun	26-Nov Mon	27-Nov Tue	28-Nov Wed	01-Dec Sat	02-Dec Sun
08:00	Arrival & Wellcome			Off	Off	Off	Arrival & Wellcome				
09:00	9:00-10:30 Module 1 Introduction	9:00-10:30 Module 3 Location & Foundation	9:00-10:30 Module 5 Ring beam & Roof				9:00-10:30 Module 1 Introduction	9:00-10:30 Module 3 Location & Foundation	9:00-10:30 Module 5 Ring beam & Roof	9:00-10:45 Field visit Mohak Sharif	9:00-10:45 Field visit Mohak Sharif
10:00										Eco-buildings & demo units	Eco-buildings & demo units
11:00	11:00-13:30 Module 2 Material & Typologies	11:00-11:50 Module 3 Cont..	11:00-13:30 Module 5 cont..				11:00-13:30 Module 2 Material & Typologies	11:00-11:50 Module 3 Cont..	11:00-13:30 Module 5 cont..		
12:00		12:00-13:30 Module 4 Plinth and Walls						12:00-13:30 Module 4 Plinth and Walls		12:00-13:30 Field work	12:00-13:30 Field work
13:00	13:30-14:30 Lunch	13:30-14:30 Lunch	13:30-14:30 Lunch				13:30-14:30 Lunch	13:30-14:30 Lunch	13:30-14:30 Lunch	Village Hospitality	Village Hospitality
14:00											
15:00	14:45-17:00 Module 2 Continue "Material"	14:45-17:00 Module 4 Continue	14:45-17:30 Module 6 Way forward Training by Trainers				14:45-17:00 Module 2 Continue "Material"	14:45-17:00 Module 4 Continue	14:45-17:30 Module 6 Way forward Training by Trainers	14:30-16:30 Field work	14:30-16:30 Field work
16:00											

**BUILD BACK SAFER WITH
VERNACULAR METHODOLOGIES
PROGRAMME SCHEDULE**

1ST AND 2ND DECEMBER, 2012
KARAVAN ECOVILLAGE MOHAK SHARIF

0900	Arrival at Eco-Village Mohak Sharif
0915	Visit around Village
1000	Eco-Building Presentation by Yasmeen Lari, Chair & CE Heritage Foundation
1045	Demonstration at Sample Modules Shed
1130	Tea with Local Cookies
1150	Field Work Session A- Layouts and Excavations
1330	Lunch
1430	Field Work Session B- Lime and its Preparations
1450	Field Work Session C- Plaster and Curing
1520	Field Work Session D- Adobe/Mud Brick
1600	Tea
1620	Question/Answer Session
1700	Departure from Mohak Sharif

**The training session is meant to understand the methods of construction and participation in Field Work Sessions is recommended.*

Participants are requested to wear closed shoes, caps and sunglasses to protect themselves against the conditions on site.

Any person(s) wishing to drink mineral water must carry his/her own supplies as only filtered water will be available during the training session.

Objective of the training:

1. To allow easy transfer of knowledge and skills of safer construction practices and DRR construction techniques.
2. Raise awareness of technical weakness of contemporary construction methods
3. To target at technical and social mobilizing staff of implementing partners of IEM, enabling them with tools and techniques to replicate training for beneficiaries at village level to successfully self reconstruct their shelters

Focus of ToT contents:

1. The use of vernacular construction knowledge and practices as per the findings of the HF report
2. The importance of including DRR practices and techniques in shelter reconstruction and repair
3. Description of techniques that will improve construction practices
4. Lessons learnt from the deployment of IRS 3 program

Participants

The participants: number, profile, expectations:**ToT Group 1: Total participants 56:**

- 42 x participants from IP. (22 social mobilizers and 20 Technical Officers)
- 4 x IEM staff
- 2 x Heritage Foundation for Theory Sessions
- 8 x Heritage Foundation for Field Sessions

ToT Group 2: Total participants 57:

- 44 x participants from IP. (18 social mobilizers and 26 Technical Officers)
- 3 x IEM staff
- 2 x Heritage Foundation, for Theory Sessions
- 8x Heritage Foundation for Field Sessions.

Participants' Expectations:

At the onset of the ToT, during the introduction, the participants were encouraged to express their expectations. All expectations were recorded and tracked to assure that they were all met by the end of the ToT.

Was the training relevant for these participants? Explain:

The training was pitched for the technical and non technical staff of IP organizations. It was indeed relevant for the participants.

Training

The Training Materials: Please evaluate the training materials by module (including objectives, power points, handouts, and session plans).

Include comment on which materials were amended, which materials worked well, which materials would benefit from an update, key recommendations for improvements:

Training Tools: The training was based on the following tools

- A comprehensive Training Manual, developed by Heritage Foundation. The content of all other training tools were based on the training manual. The training manual was unfortunately printed in black and white
- PowerPoint presentation, pitched at the Master Trainers who are technical officers and social mobilizer. The PowerPoint presentations were in English language, the ToT was conducted in Urdu on participants request
- Flip Poster (4ft x 3ft), designed for the trainers to conduct training to the beneficiaries at villages level. Important text were translated in Urdu
- Handouts, in color, for each module. The handouts provided Module outlines and trainers notes corresponding to the flip posters.
- Demonstration samples of One Room Shelter designs and DRR structures and live models of various components of ERS designs.
- Demonstration elements showing different stages of construction for all typologies, separately showing bases, walls, ring beams and roof construction comprising adobe/mud as well as Loh kat construction.

Module 1: Introduction. It was designed to get introduced to the participants, their organization and expectations. The group exercise was very useful for the introduction of participants. The method used to document participants' expectation of the ToT was very affective. The ground rules and agenda were effectively communicated

Module 2: Material and Typology: Covered large grounds. It started with a group exercise of SWAT analysis of various shelter designs of ERS 1-2 programs. The exercise was valuable in opening up minds to accept change towards improvement, through lessons learnt from past experiences. Thereafter the findings of Heritage Foundation's widespread research were discussed. Built Back Safer and DRR mainstreaming strategies proposed by Heritage Foundation were reviewed. Various ERS topologies supported by ERS 3-6 programs were illustrated and discussed. Key material such as Soil, Lime and Bamboo were discussed and participants were enabled to identify the right type of material. It was assured that the participant develop deep understanding of use of lime and the factors in selecting correct type of bamboo.

Module 3: Location and Foundation: The module observed the key considerations and best practices in site selection to prevent damages from floods. It examined designing consideration for making ERS suitable to climate. At the end participant learnt innovative ways to make layout templates.

The making of layout template was much appreciated by the participant for its simplicity and precision.

Module 4: Plinth and Walls: The module established core guidelines for plinth sizes suitable for various RS typologies. Wall making techniques were explained based on mud bricks, layered mud or reed (Loh Khat). Wall rendering with mud-lime plaster was described. The lime setting process and the benefits of using lime was examined.

Module 5: Ring Ream and Roof: The module discussed the various roof configurations that are commonly found in the lower Sindh. It examined the recommendations and methods of Heritage Foundation to strengthening these roofs. It also closely examined the KaravanRoof of Heritage Foundation that is an important part of its proposed DRR strategy.

Module 6: Way Forward: “Delivering Training to the beneficiaries at the Village Level” through this module the participants were given opportunity to deliver training at a village level. This also gave the participants opportunities to practice with the training tools and to polish their training skills.

Field Visit (Fourth day):

During the field trip the participants could closely see the vernacular constructions and DRR structures built by the Heritage Foundation. They could also closely study the construction details that were presented through live models. They could practice on the ground layout method. Mrs. Masmeen Lari, the chairperson of Heritage Foundation, personally mentored the ToT participants about crucial aspects of the program, as well as the need for such methodologies to deal with aspects of climate change in the context of global warming. The participants, were formed into groups to practically carry out correct methods for layout, keeping walls in plumb and level, the slaking and mixing of lime, correct use of various mixes, and making earth bricks.

General key recommendations:

The training and its tools were well designed and well delivered. There was a good team work between Heritage Foundation and ICM. The participants were well motivated by ICM to embrace change to their accustomed ways of constructing RS. It all went well; the expectations of trainers and Participants were also met well.

This time the two groups were better composed with a good mix of various strengths of participants. Therefore the learning outcomes were equally well achieved by the both groups.

Like the last ToT the training manual was published in Black and white. It is strongly recommended to get the Training Manual published in full colors and distributed to IP's. This investment will certainly be worth while. It is also recommended to have a web based repository from where IP's could download soft copies of selected material such as

Typology and lime chart etc.

The Training Process: including pace, variety of activity and methodology, your training style, the atmosphere, balance between the two trainers, what worked well, what you would change next time, your overall feeling about the training:

It was an intensive 4 days training program. 22:22hr. – 12:22hr program with 6 hours per day fully loaded training sessions. However the participants did not appear to lose their concentration. The timings were well maintained by the trainers and well respected by the participants. The teaching methodology included a good mix of presentation, group work and class discussions. The presentations included more images and diagrams than text. In participants request the mode of training was changed to Urdu language. Participants were encouraged to ask questions during the presentation. At times the trainer deferred answering the question for later, when the relevant information was discussed. Throughout the training the training tools were discussed and practiced to help participants acquire training skills. The trainer was assisted by an architect of Heritage Foundation, Hina Zaidi, who helped underlining and clarifying technical issues.

During the Field Sessions, in addition to trainer Ar. Tasmeen Lari, Ar. Mariyam Nizam and Ar. Hina Zaidi, along with Heritage Foundation's Field Coordinator Naheem Shah and four master artisans were on hand, due to deal with a very large number of participants.

Perhaps due to shortage of time, the number of sessions were limited to only 2, which resulted in a large number of participants in each session, i.e. ----- in the first session, and -- ---- in the second session. For greater interaction among the trainers and participants, it is recommended that the total number of participants should not exceed 35. It is also recommended that all members of IIM field teams should attend the training sessions including field sessions to have a greater mastery over the HF methodology.

Summary:

Did the training meet its objectives? The needs of the learners?

Yes

Summary of participant evaluations – originals attached (key messages, trends, exceptions):

The participant's evaluation was very encouraging and positive. Their response to all

questions was generally “Good or Excellent”. They appeared fully satisfied and majority of them did not find any deficiency to improve for question 4.
They all appear thankful for learning the improved concepts that are new to them.

Following are key points from participants comments to take note of:

- 4 participants wished to have practically exercised the roof making
- 5 participants would like to have more detailed discussion on Bill of Materials quantity
- 3 participants suggest to include training for focal persons

Signed:



Date:, December 10, 2012

Annexure 1

Attendance Sheets ToT Group 1

Page 1

IOM International Organization for Migration
OIM Organisation Internationale pour les Migrations
OIM Organisation Internationale pour les Migrations

ORS Technical Training (Phase V-VI)

Sl. No.	Name	Organization	Designation	Contact No.	E-mail Address	Signature Day 1	Signature Day 2	Signature Day 3	Signature Field Day 4
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3	Dileep Kumar	SDTS	Social Mobilizer	0331-3706944	IM.SDTS.IOM@gmail.com				
4	Nazir Muhammad	SDTS	Social Mobilizer	0333-2956571	IM.SDTS.IOM@gmail.com				
5	Saifullah	SDTS	Social Mobilizer	03338224772	IM.SDTS.IOM@gmail.com				
6	Jaffar	ILAP	Social Mobilizer	0333-2582944	Jaffar.muschi@yahoo.com				
7	M. Abrar Ali-Haq	ILAP	Social Mobilizer	0331-3788636	abrarali@helmal.com				
8	A. Ahmed Mustafa	I-LAP	Technical Engineer	0341-3945212	ahmedcheemich@yahoo.com				
9	Ahmad N. Ali	I-LAP	Technical Engineer	0308-7487312	ahmadn8186@gmail.com				
10	Rubin Younis	I-LAP	Technical Engineer	0332-2350710	Rubinyounis@yahoo.com				
11	Shajeeha Kabeer	BHR	Social Mobilizer	0336-9196512					

ORS Technical Training (Phase V-VI)

Sl. No.	Name	Organization	Designation	Contact No.	E-mail Address	Signature Day 1	Signature Day 2	Signature Day 3	Signature Field Day 4
12	Fahim Ali Solangi	BHR	Technical Engineer	03002366589	Solangi.fahim@gmail.com				
13	Bashir Ahmed	SEAD	F.M.	03453693534	Bashir.ahmed@gmail.com				
14	Nabeel Ali	SEAD	Field Engineer	0346-3645772	Nabeel.ahmed1979@gmail.com				
15	Nabeel Hayer	SEAD	Field Mobilizer	03003448042	n.hayer@sead.org.pk				
16	Rashid Noorani	MDF	Technical Engineer	03337006586	noorani.rashid@yahoo.com				
17	Ahmed Khalid Hashim	MDF	Social Mobilizer	0333 25 22975	ahmedkhalidhashim@gmail.com				
18	Javed Ali Siddiqui	MDF	Social Mobilizer	0328-7143783	javed.ali2016@hotmail.com				
19	ANEEL JAMAL	LAMP	Social Mobilizer	0314-2858973	Anael.Jamal22@yahoo.com				
20	ANWAR SUNDHU	LAMP	Senior Social Mobilizer	0333-2990186	anwar.sundhu@yahoo.com				
21	Arnold Gulzar	LAMP	Technical Engineer	0346-2722630	Arnold.to53@gmail.com				
22	Aarif Tariq	LAMP	Project Coordinator, Media Training	0500-5511926	aarif.tariq@hotmail.com				



IOM International Organization for Migration
OIM Organisation Internationale pour les Migrations
OIM Organización Internacional para las Migraciones
ORS Technical Training (Phase V-VI)

Group 1

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23	Nadeem Khan	IOM	Technical Assistant	0333-3840571	nadeem_khan@iomi.org				
24	Naveed Khan	SECO Foundation	Technical Engineer	0333-2814625	naveed_khan@seco.org				
25	Qasim Khan	PREPARED Pakistan	Technical Engineer	0333-3920759	qasim_khan@prep.org				
26	Enas Tariq	PREPARED Pakistan	Technical Engineer	0333-3920759	enas_tariq@prep.org				
27	Saeed Zaid	PREPARED Pakistan	Technical Engineer	032-5204153	saeed_zaid@prep.org				
28	Muhammad Saif	PREPARED Pakistan	Technical Engineer	0343-8311543	muhammad_saif@prep.org				
29	Shahzad	BDRD	Technical Engineer	0333-2520533	shahzad@bdrd.org				
30	Zaid	BDRD	Technical Engineer	0333-2886842	zaid@bdrd.org				
31	Najim Hassan	PREPARED Pakistan	Technical Engineer	0333-2060677	najim_hassan@prep.org				
32	Afaqur Daud Khan	CRDO	S.O	0334-2818335	afakur_daud_khan@crdo.org				
33	Waqar Khan	CRDO	Engg	0307-8467482	waqar_khan@crdo.org				

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34	Waqar Anwar	CRDO	S.O	03009319660	waqar_anwar@crdo.org				
35	Kamran	PVDP	Fe. Engg	0333-2767161	kamran@pvdp.org				
36	Wahid Ali	PVDP	F/E	0300-3335494	wahid_ali@pvdp.org				
37	Mariam Noman	PVDP	S/O	0333-5536396	mariam_noman@pvdp.org				
38	Sabbir Jan	MDF	F.E.	0300-3757134	sabbir_jan@mdf.org				
39	Khalid Ghaffar	MOTAF Foundation	S.O	0333-8163551	khalid_ghaffar@motaf.org				
40	Shahzad Shakoor	MOTAF Foundation	T.E	0306-4131180	shahzad_shakoor@motaf.org				
41	Asim Siddique	MOTAF Foundation	T.E	0300-6843463	asim_siddique@motaf.org				
42	Talib Ghaffar	PMDP	S.M	0301-2028420	talib_ghaffar@pmdp.org				
43	Azhar Ahmed	MOTAF Foundation	S.O	03343006001	azhar_ahmed@motaf.org				
44	Waqar Anwar	CRDO	S.O	03009319660	waqar_anwar@crdo.org				

Sr. No.	Name	Organization	Designation	Contact No.	E-mail Address	Signature Day 1	Signature Day 2	Signature Day 3	Signature Field Day 4
45	Mohsin	IOM	Sr. Engg	03008929203	mohsin_hyderabad@iom.org				
46	Noman	IOM	Sr. Asst	0345-5164985	nomman_hyderabad@iom.org				

Attendance Sheets ToT Group 2

<div style="text-align: center;">  IOM International Organization for Migration OIM Organisation Internationale pour les Migrations OIM Organisation Internationale pour les Migrations </div>									
Technical Training (Phase-V and VI)									
Sr. No	Name	Organization	Designation	Contact No.	E-mail Address	Signature Day 1	Signature Day 2	Signature Day 3	Signature Field Day 4
1	AYAZ ALI KHAN	SDI	FIELD ENGINEER	0333-2521132	Ayazk888@gmail.com				
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3	M. KASHIF	SDI	Engineer	0333-3636397	Kashif.Shahid99@yahoo.com				
4	RAKESH KUMAR	SDI	S.O.	0333-2803097	Rakesh7me38@yahoo.com				
5	M. ASHRAF	SRDO	S.O.	0345-876223	ashraf_sherif@yahoo.com				
6	Farida	SRDO	S.O.	0336-2552445					
7	Shahinaz Solangi	SRDO	S.O.	0303-3988027					
8	Waseem Akhlaq	SRDO	Tech person	0342-277357	waseem.waseem@gmail.com				
9	Rifat Zahra	SARCO	C.O.	0333-251666	rifat.zahra@gmail.com				
10	Muhammad Nusrani	SARCO	Tech Engineer	0345-351111	nusrani.m@gmail.com				

Technical Training (Phase-V and VI)									
Sr. No	Name	Organization	Designation	Contact No.	E-mail Address	Signature Day 1	Signature Day 2	Signature Day 3	Signature Field Day 4
11	Abdul Ghani	SARCO	S.O.	0333-250605	meowmeow694@gmail.com				
12	Ehsan Javed	IFC	Eng	32452	ehsan.javed@gmail.com				
13	Tariq Zaid Pathan	IFC	Social mobilizer	0341-3232017	Tia_zaid@yahoo.com				
14	Imran Khan	IFC	Eng	0333-462672	Imran600@gmail.com				
15	M. Sohail	Mudra	F. Engineer	0300-3038691	Sohail_singh@yahoo.com				
16	G. M. Latif	MAP	F. Engineer	0302-3971927	mustapha2@gmail.com				
17	Bashir Ali	SARCO	Technical Person	0332-2659199	bashir_bhatti@yahoo.com				
18	Abdul Khaliq	B.D.C	T. Person	0333-321036	AbdulKhaliq@hotmail.com				
19	M. Afzal	B.D.C	F. Eng	0333-703770	Afzal_mulla@yahoo.com				
20	Krishan Lal	B.D.C	F. Eng	0333-3742002 0301-2511235	Krishan7@yahoo.com				

Technical Training (Phase-V and VI)									
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23	Shahid Ali Chaudhary	RDP	Field Technical Officer	0306-2078779	shahidali.chaudhary@yahoo.com				
24	Fahid Hussain Khatib	SPO	S.M	0301-3247155	fahidhussain@yahoo.com				
25	Abida Bhatti	SPO	S.M	0332-22669648	Abida.Bhatti73@gmail.com				
26	Mahsin Ansari	SPO	Field Engineer	0333-2638316	Engg. mahsinab@yahoo.com				
27	Muazam Zair	I.F.C	Field Engineer	0332-7905502	Muazam.zair@yahoo.com				
28	Mazhar Ali	I.F.C	S.M	03133348946	Mazhar-ali55@yahoo.com				
29	MANSOOR	SOD	Engg.	0335-2745973	Mansoor_Pasha@yahoo.com				
30	Amin Malik	SOD	Engg.	0333-7551508	Sigal.Amin@yahoo.com				

Technical Training (Phase-V and VI)									
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33	C. Mustafa	BASF	S.O	0345-6207065	Mustafa4023@yahoo.com				
34	Asghar Ali Khan	BASF	Technical Person	0345-8097408	Asghar.ali.khan@yahoo.com				
35	Shamir Ghossein Jureji	N.W.O	S. Manager	0333-2521853					
36	M. Aslam Korepu	N.W.O	M.E.O	0347-3315939	maslamkorepu@gmail.com				
37	Naimatullah Talpur	N.W.O	Technical	0311-2072414	naimatullah.talpur@yahoo.com				
38	Khalid Hussain	B.L.D.P	S.O	0334-4074075					
39	M. Ali Akbar Qureshi	L.H.D.P	S.O	0331-33507	aliakbar110@yahoo.com				
40	Hussain Waseem	L.H.D.P	Technical	0333-226915					

CIM Organisation International pour les Migrations Technical Training (Phase-V and VI)									
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42	Hina Zaidi	Heritage Foundation	Architect	0322 9292 16	hinamzaidi@gmail.com	HinaMzaidi	HinaMzaidi	HinaMzaidi	
43	Saad Khan	H F	Trainer	0302558089	SKhan@swanper.com				
44	Mohsin	OIM	Sr. Tech. Sigr.	0300 8929203	imshydarabne.ste@gmail.com				
45	Sanku H Qureshi	SPM	PM	035988425	imshydarabne.ste@gmail.com				
46	Javed Hussain	IFC	Engg.	0306-85924 28	Engineers Javed Bakaz@yaho.com				
47	Zafarullah Nizami	SPM	Projecting	0300- 2581534	Zafar_nizami@yahoo.com				
48	Zahid Hussain	SPM	Technical Officer	0300 2585090	Zahid_Jahid@yahoo.com				

CIM Organisation International pour les migrations CIM Organisation International pour les Migrations Technical Training (Phase-V and VI)									
Sr No	Name	Organization	Designation	Contact No.	E-mail Address	Signature Day 1	Signature Day 2	Signature Day 3	Signature Field Day 4
51	Hasbullah	OIM							

Annexure 2 Participants evaluations summary

Training of Trainers (ToT) for ORS Training Evaluation Form				
Date of training: 2-12-2012				
1 Please rate the following categories on a scale of 1-4. 1=Poor 2=Adequate 3=Good 4=Very Good				
	1	2	3	4
A. Course design: The overall design and structure of the training	1	2	3	24
B. The Achievement of the training's aims and objectives	2	2	13	12
C. The meeting of your personal expectations	2	1	14	12
D. The relevance of the content of the training to your work	2	3	6	21
The Presentation and facilitation of				
E. Module 1: Course Introduction	2	1	8	22
F. Module 2: Material and Typologies	2	2	12	22
G. Module 3: Location and Foundation	2	2	2	22
H. Module 4: Plinth and Walls	2	3	11	18
I. Module 5: Ring Beams and Roofs	2	2	2	22
J. Module 6: Field visit and Training Delivery	2	2	2	22
K. The level of your own contributions and participation	1	2	13	18
L. The quality of the trainer's experience and preparation	2	1	14	12
M. The quality of the interaction between participants and trainer	1	2	12	12
N. The quality of the learning materials and aids	2	1	8	23
O. The quality of the pre-training information received	1	2	2	12
P. The quality of the venue	1	1	12	22
Q. The quality of food and beverages served	2	2	12	18
2 Which part of the training were most useful for you and why?				
Layout practice	2			
Every part of training was useful	2			
Topologies and Material Identification	2			
Lime usage and Plinth	4			
Module 6	1			
Module 3	1			
Module 2	1			
Field visit was good	8			
No Comments	1			
3 Was there anything not included in the training that needs to be added? If so, what is it?				
Each and every thing was included	12			
Better Discussion	5			
No Comments	11			
IEC Material	1			
Tool for technical work	3			
4 What improvements/changes would you suggest for another training?				
No Comments	18			
Roof practice should be done practically	3			
Tools for technical training should be present to we learn more practically	1			
Training for focal point should be arranged	1			
Training should be conducted before Assessment	1			
More Trainings should be conducted	1			
IPM should arrange big hall and good furniture for participants	3			
Training should be interesting so participants gets involved	2			
5 Other Comments				
Thanking IPM for valuable training	1			
Some more technical Ideas to work in little budget	3			
No Comments	14			
Well organized training for IPM and valuable experience	6			
Certificates should be arranged by IPM	3			
Third day of training was very good	1			

Training of Trainers (ToT) for ORS **Training Evaluation Form**

Date of training: 31-11-2012

1 Please rate the following categories on a scale of 1-4.

1 Poor 2 Adequate 3 Good 4 Very Good

- A. Course design: The overall design and structure of the training
- B. The Achievement of the training's aims and objectives
- C. The meeting of your personal expectations
- D. The relevance of the content of the training to your work

1	2	3	4
---	---	---	---

2	1	2	6
2	1	2	6
2	3	8	5
2	1	2	2

The Presentation and facilitation of

- E. Module 1: Course Introduction
- F. Module 2: Material and Typologies
- G. Module 3: Location and Foundation
- H. Module 4: Plinth and Walls
- I. Module 5: Ring Beams and Roofs
- J. Module 6: Field visit and Training Delivery

2	1	2	8
2	2	2	2
2	1	12	3
2	1	11	4
2	1	12	5
1	2	6	8

- K. The level of your own contributions and participation
- L. The quality of the trainer's experience and preparation
- M. The quality of the interaction between participants and trainer
- N. The quality of the learning materials and aids
- O. The quality of the pre-training information received
- P. The quality of the venue
- Q. The quality of food and beverages served

2	2	4	12
2	1	5	12
2	1	5	12
1	2	8	2
2	1	8	5
2	2	12	4
2	3	2	6

2 Which part of the training were most useful for you and why?

- Layout practice
- Every part of training was useful
- Topologies and Material Identification
- Lime usage and Plinth
- Field visit was good

3
3
2
1
2

3 Was there anything not included in the training that needs to be added? If so, what is it?

- Each and every thing was included
- No Comments
- Tool for technical work
- Needs to be more simplified
- roofing should be more cleared

4
6
1
3
1

4 What improvements/changes would you suggest for another training?

- No Comments
- Tools for technical training should be present to we learn more practically
- Training for focal point should be arranged
- Training should be conducted before Assessment
- More Trainings should be conducted
- IM should arrange big hall and good furniture for participants

4
1
2
3
6
1

5 Other Comments

- Thanking IM for valuable training
- No Comments
- Certificates should be arranged by IM
- Trainers were not giving answers
- Other material rather than bamboos should be used in project

1
12
1
1
1







HERITAGE FOUNDATION'S DRR - COMPLIANT SUSTAINABLE CONSTRUCTION

BUILD BACK SAFER WITH VERNACULAR METHODOLOGIES

Annexure E

Heritage Foundation's Field Visits: Key Findings and
Recommendations



TECHNICAL REFRESHMENTS FOR IOM TECHNICAL TEAMS

7TH DECEMBER, 2012

1.0 INTRODUCTION

ORS Program Officer, IOM, Mr. Manuel Moniz Pereira (MP) welcomed the HF Team for conducting technical refreshment in order to bring about greater clarity in conducting the next phases of ORS being undertaken by IOM in collaboration with HF under its Build Back Safer with Vernacular Methodologies (BBSVM) Program. Mr. Pereira emphasized the need for resilience and to help the IPS and FPs in being able to conduct training of communities in an effective manner. He also emphasized the need for conveying to the beneficiaries the value of joint and cooperative activities in order to achieve economy and effectiveness which would help them to overcome any hurdles in procurement or delivery.

Ar. Yasmeen Lari (YL), CEO, Heritage Foundation, welcomed the initiative of Technical Refreshment taken up by IOM which will lead to further improvements in the delivery of IOM ORS program based on the challenges faced during the first BBSVM program taken up jointly by IOM and HF.

She thanked MP and Mr. Hasballah (HA) in providing full support and facilitation during HF's theory and field ToT sessions and expressed confidence that the joint objectives will be served in helping affected communities to become stronger and more resilient in withstanding next disaster themselves. She also complimented IOM team for translating the concept and objectives of BBSVM, which have resulted in stronger adobe/earth structures. The report prepared by Mr. Magnus Wolfe Murray (Advisor, DFID) prepared in October 2012 of partially built structures of IOM3 shows the excellent properties of the technically improved use of mud and lime in withstanding the onslaught of excessive rains that occurred in August 2012.

2.0 TECHNICAL REFRESHMENT

The session was conducted jointly by Ar. Yasmeen Lari and Mr. Hasballah.

2.1 IMPORTANCE OF CORRECT BRIEFINGS FOR CHANGE OF MINDSET

YL shared her discussion with some of the IPs of ORS 3, which proved the effectiveness of the IOM emphasis on briefing even non-beneficiaries with BBSVM. She was informed by the relevant IPs that in their villages, where they had got built 25 units, there were at least 7-8 more households who immediately began to build the walls according to the correct methodology, thus proving that if technical guidance is available, many households will be able to construct their structures themselves as well. She emphasized that for both IOM and HF teams the objective is to spread the technical knowledge as far and wide as possible.

Therefore, it becomes incumbent upon the field teams to ensure that all briefings and trainings are geared towards the change in mindset of the communities, to use correctly all methodologies provided in the manual and flipcharts with emphasis on the correct use of mud and lime and DRR compliant factors which will provide the households with safety of life.

2.2 IMPORTANCE OF CLARITY AND RESOLUTION OF CONFLICTING POINTS

HA emphasized the need to make sure that in order to convey clear messages, IOM and HF teams must make sure not to have conflicting positions in front of the IPs and/or beneficiaries. Any discussion on points that arise or are unresolved, discussions should be held by the two teams separately.

HA also informed that the schedule/amount for payment has been revised to enable the beneficiaries to buy lime well in time.

2.3 COMPOSITION OF TEAMS

The following procedures for monitoring and mentoring were decided:

- The 2-person HF field teams will be lead by senior HF personnel e.g. Mr. Naheem Shah (NS), Ar. Mariyam Nizam (MN) or Ar. Hina Zaidi (HZ), accompanied by a junior architect.
- The 2-member IOM teams will consist of an engineer and a social mobilizer.
- All visits will be made by HF and IOM teams jointly and according to predetermined schedule.

2.4 COMMUNICATION AND FOCAL POINTS

- The focal points for the field will be as follows:
HF: Mr. NS
IOM: Mr. Mohsin Badar (MB)
- The focal points for administrative control will be as follows:
IOM: HA
HF: MN

2.5 CONTACT INFORMATION

MN will circulate cell phones and email addresses of relevant HF personnel; while MB will circulate those of relevant IOM personnel. It was considered advisable that the above as well as YL and MP will also be kept in the loop.

3.0 FIELD VISIT PROCEDURES

After discussion, YL confirmed the following procedure for field visits:

- Both HF and IOM teams will visit the selected village. The IPs are required to make their presentation and briefing to both beneficiaries and interested non-beneficiaries.
- Both teams are required to take notes ref. any information that conflicts with the requirements and presentation material provided to the IPs. On conclusion of the IP's presentation/briefing, HF Team should provide the correct answer in case any misunderstanding or confusion is found regarding the procedures.

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- It was clarified that the information is provided as part of mentoring process in order to encourage the IPs to understand the correct methodology and enable it to convey it correctly to the community.
- At the conclusion of the presentation/briefing session, HF and IOM teams should spend some time together to analyze the presentation and identify any other points that may have been missed out.
- HF Team will follow the previous procedure of filling in HF monitoring forms along with other data, images and information to provide as candid and clear information of the activity as possible.

4.0 IMPLEMENTATION AND SITE ISSUES

On queries raised regarding acceptable limits of the work carried out the following was conveyed by YL:

- All dimensions shown in the drawings must be followed faithfully by HF, IOM and IPs teams.
- In case of difficulty or non-compliance, or special site issues, queries should be raised by IOM team members and submitted to MN at HF, in writing or in the form of sketches.
- HF will endeavor to provide a response within 3 working days. In case of difficulty or inability to resolve the issue expeditiously, MN will consult with HA in order to bring the matter to a conclusion.
- Since the technical details have been devised with great care by HF, it is important that reduction in the size/mix of various items e.g. excavation, base or wall etc. should not be encouraged.
- HF Field Teams are not authorized to give a response to issues raised which are beyond and above the drawings, details, and data provided in the manual. They should certainly provide clarifications based on the information contained in the manual and other information already provided; however, response to any deviation will be provided by HF Head Office after due consideration.

5.0 SCHEDULING FOR FIELD VISITS

- It was agreed that the visit schedule will be provided by IOM to HF, the names of IPs, related villages and dates, according to the progress at site and/or release of tranches. HF will provide confirmation of the dates expeditiously and joint visits will be organized accordingly.
- Dates of all visits shall be finalized by HF to provide a minimum notice period of 2-3 days prior to the visit date. Since Focal Points of IPs villages are being encouraged to also attend the briefings, IOM emphasized the importance to provide sufficient notice period.
- IOM will circulate the finalized list to all IPs and IOM's own teams.
- The following tentative scheduling was agreed:
 - Visit 1: To be held for 15 new IPs.
 - Visit 2: At the time of completion of PLC. The schedule for the second visit will be finalized by IOM in the first week of January 2013 for the field visits to begin by mid January 2013.

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- Visit 3 & 4: Ring beam level and Roof level. Field visits will need to be organized from Mid February to Mid March.

- HA clarified that the field visits will not necessarily be made in the same villages, but will vary according to the progress at site. Since IOM will have the progress reports, HA will identify the villages that should be visited according to the stages of work reached by appointed dates. Visits to different villages will be preferred to get a broader picture of the quality of work being carried out by the IPs.

6.0 USE OF LIME

The need to reinforce the benefits accruing from the use of lime was emphasized by HF. It was also reiterated that all IPs must emphasize that lime is slaked for a minimum one week before use.

A query from a member of the IOM team pointed out the danger to hands of beneficiaries while using lime.

HF team informed that if lime is slaked for at least a week, it becomes fairly benign and will not harm or hurt hands. However, if anybody did suffer any injury, it was due to the use of lime immediately after it was soaked. It was explained that the beneficiaries must be fully informed about the importance of slaking: only slaked lime that has been left for at least a week in a pit should be used, along with the procedures shown in the lime poster. Further, it is highly uneconomical to use lime that is not slaked properly, since once slaked its volume increases which allows larger area to be covered.

7.0 SALINITY IN SOIL

Among the issues raised by IOM Teams was the presence of salinity in soil in many areas. Clearly, salinity was a major threat and was discussed in detail. YL explained that it is important to get soil tests done so that the results could be shared with HF's structural consultant to see if the saline soil could be treated, and to determine the levels of permissible percentage of salt in the soil.

- HA informed that as per earlier discussion with HF, IOM is arranging for getting representative soil samples which will be sent for testing to determine the levels of salinity found in the area.
- HF agreed to provide the requirements for soil analysis to enable IOM to get lab tests done on selected locations predominantly with high percentage of salinity in the soil.

HF agreed that once the soil analysis has been received, Structural Consultant will be consulted to recommend necessary alternatives for construction.

8.0 QUALITY OF WATER AND SOIL

IOM Team raised the issue of poor results due to use of available water and soil in some of the areas. YL emphasized that in order to achieve acceptable quality of construction, it is imperative to use potable (fit for drinking) water and soil without salinity. Use of soil with high levels of salinity and substandard quality of water will result in poor construction and IPs must help the beneficiaries understand the need to use appropriate materials for strength

and longevity of shelter. In case of difficulty in procurement of appropriate materials, the IPs may be advised to encourage the beneficiaries to procure materials jointly for reduced cost and ease of procurement.

8.0 CONSTRUCTION IN LOH KHAT

In view of non-availability of suitable soil in various areas, particularly in Badin, it was clear that there will be strong preference for Loh Khat construction.

Accordingly, several queries were raised by the IOM teams regarding Loh Khat construction. A detailed discussion took place regarding the need for developing greater understanding on the part of the IPs.

Naheem Shah (NS) pointed out the errors that were found in laying out Loh Khat structures and lack of clarity among the IPs regarding dassa (bamboo plinth beam) and ring beam etc. and their placement and tying with the structure.

YL requested that the IPs working in such areas should be identified in order to assess the problems being confronted by them.

In view of the various issues raised, YL suggested that a special day training session (that could be counted as one field visit) could be organized by HF where various stages of construction will be demonstrated specially focusing on Loh Khat construction including base pads, dassa, ring beams and tying of the entire structure.

The following decisions were taken:

- IOM will provide information regarding the IPs who are interested in Loh Khat construction, who are likely to benefit from a Loh Khat training session.
- HF will arrange for demonstration units showing each stage of Loh Khat construction, and also arrange for live demonstrations at the time of the visits of the IPs undertaking the activity.
- HF will arrange for drawings which will clearly show the construction of burnt brick pads and intervening pozzolana lime concrete as infill, as well as any other details for greater clarity for the IPs.

HERITAGE FOUNDATION'S KEY FINDINGS AND RECOMMENDATIONS FOR VISIT IN DISTRICT BADIN

21ST – 27TH DECEMBER 2013

Heritage Foundation teams visited IPs based on Monitoring and Mentoring Work Schedule provided by IOM. HF teams evaluated IPs on the quality of Training provided by them to the project beneficiaries. IPs assisted included PVDP, SRDO, MDF and MOJAZ.

PVDP – 21ST DECEMBER: *District: Badin; Tehsil: Talhar; UC: Rajo Khanani;*

Village: Khamoon Kohli

- The session included 40 participants. The trainer described the different stages of construction and quality of materials.
- IP representatives had ensured that all materials in use were available during the session to help the beneficiaries understand the quality of materials that would be required during the construction.
- Layout of Loh-khat units on site was incorrect.

RECOMMENDATIONS:

- Method to conduct layouts must be discussed and explained to ensure community receives proper guidance.
- Layout must be corrected using centre lines and Layout template. Drawing of Loh-Khat house with 10'x14 dimensions has been shared with IOM.

SRDO – 24TH DECEMBER: *District: Badin; Tehsil: Matli; UC: Budho Kambrani;*

Village: Piyaro Khan Khoso

- Session was attended by 70 beneficiaries. The session was well conducted by a female trainer discussing each aspect in detail following the Flip Charts provided. Every aspect including site selection, layouts, lime preparation and methods of construction and use and quality of materials. The question and answer session with the community was conducted well, with the IP representatives taking care to help the beneficiaries in understanding the various aspects.
- Beneficiaries have begun carrying out layouts and excavations of their mono-pitched houses on mud walls.
- No Lime preparation has been made.

RECOMMENDATIONS:

- Lime preparation must be carried out well in advance of construction.

MDF – 26TH DECEMBER: *District: Badin; Tehsil: Matli; UC: Budho Qambrani;*

Village: Tanji Khan Jarwar

- 90 beneficiaries attended the session. IP representatives require further understanding of Modules regarding lintols, ring beams and joists as they were unable to describe these aspects in detail.

- IP could not answer questions regarding the advantages and disadvantages of longer and shorter spans for construction.
- The community raised questions regarding the sizes of the shelters. After a detailed discussion beneficiaries have decided to construct smaller 10'x15' houses.
- Since layouts and excavations of larger rooms (12'x15') have been carried out, beneficiaries have decided to redo the layouts and excavations.

RECOMMENDATIONS:

- Layout must be corrected using centre lines and Layout template. Drawing of Loh-Khat house with 10'x14 dimensions has been shared with IOM.
- IP representatives conducting training sessions should study the Technical Support Manual in details to be better able to answer the questions put forward during a training session.

MOJAZ– 27TH DECEMBER: District: Badin; Tehsil: Talhar; UC: Peero Lashari;

Village: Rip Sharif; Mureed Bhatti

- There were 40 focal persons from various villages at the training session held.
- IP held the session partially in English, which could not be understood by the beneficiaries attending the session.
- The Trainer could not connect the various typologies to their respective bases and walls, and thus could not explain that non-accessible roofs must have a 1m plinth.
- Layouts drawn on the board to explain the method were incorrect.
- With regard to ring beams, the trainer explained the split bamboo ring beam but did not explain the full bamboo ring beam which is used in the selected Loh-khat construction.
- Upon the visit to the site to check layouts and excavations, it was noted that beneficiaries had marked layouts for room size 10'x12'. Beneficiaries reported that they had been asked by the IP to construct this size, while the beneficiaries wished for room size 10'x15' and 10'x18'.
- Firm soil was not found till 4'.

RECOMMENDATIONS:

- Session should be conducted in a language that is understandable for the attendees.
- Trainers should ensure that they are well-versed with the various typologies and their requirements.
- Beneficiaries should be given the choice to construct the room size based on their requirements and needs.
- The lack of firm soil till 4' has been forwarded to HF structural consultant and a solution will be provided within a few days.

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HERITAGE FOUNDATION'S KEY FINDINGS AND RECOMMENDATIONS FOR VISIT IN DISTRICT BADIN

28TH – 4TH DECEMBER 2013

Heritage Foundation teams visited IPs based on Monitoring and Mentoring Work Schedule provided by IOM. HF teams evaluated IPs on the quality of Training provided by them to the project beneficiaries. IPs assisted included LHDP, I-LAP, SEAD, SDI and SPO.

LHDP – 28TH DECEMBER: *District: Badin; Tehsil: Shaheed Fazal Raho; UC: Gharo;*

Village: *Haji Khan Tharani*

- The session included 30 focal persons. The trainer began the session by showing images of damaged houses in the area. The session was well conducted giving special emphasis on lime and its preparation.
- Beneficiaries selected typology was mud house with mono-pitched roofs and the session as geared towards the typology.
- There were women focal persons also at the session which was a good sign, as women participate in the construction process.
- Upon visit around the village Haji Khan, HF teams inspected layouts but found that offsets for PLC had not been carried out.
- Lime preparation has been carried out by beneficiaries before the release of the first tranche.

RECOMMENDATIONS:

- Off-sets in excavations must be carried out to ensure the correct laying of PLC.
- Women participation must be encouraged during training sessions.

I-LAP – 31ST DECEMBER: *District: Badin; Tehsil: Badin; UC: Nindo Shahar;*

Village: *Essu Mallah*

- Session was attended by 25 participants. The session was well conducted where every aspect including site selection, layouts, lime preparation and methods of construction and use and quality of materials.
- Layout of Loh-Khat shelters carried out is incorrect.
- No Lime preparation has been made.

RECOMMENDATIONS:

- Layout must be corrected using centre lines and Layout template. Drawing of Loh-Khat house with 10'x14 dimensions has been shared with IOM.

SEAD – 2ND JANUARY: District: Badin; Tehsil: Talhar; UC: SaeedPur;

Village: Gul Mohammad Bahrani

- 50 beneficiaries attended the session. IP representatives conducted the session well, discussing each aspect in detail following the Flip Charts provided. Every aspect including site selection, layouts, lime preparation and methods of construction and use and quality of materials. The question and answer session with the community was conducted well, with the IP representatives taking care to help the beneficiaries in understanding the various aspects.
- A demo for layout of the selected loh-khat walls with mono-pitched roof was conducted which was met with confusion. HF teams helped conduct the Layout demo, which has hopefully helped correct any confusion.

RECOMMENDATIONS:

- Layout must be corrected using centre lines and Layout template. Drawing of Loh-Khat house with 10'x14 dimensions has been shared with IOM. An additional session for IPs carrying out Loh-Khat typology construction may be held at Moak Sharif during the coming weeks to clear any confusion regarding the typology.

SDI– 3RD JANUARY: District: Badin; Tehsil: Talhar; UC: SaeedPur;

Village: SaeedPur

- There were 35 participants at the training session held.
- Trainer discussed lime and bamboo with samples, but had trouble explaining the Loh-Khat typologies, PLC ratios, Base details of shelters and layout methods.
- Upon the visit to the village, HF teams discovered that beneficiaries had demolished their existing homes in order to construct new one, but since they are awaiting the first tranche, they are at the moment living in tents.

RECOMMENDATIONS:

- Trainers should ensure that they are well-versed with the various typologies and their requirements.
- Demolition of existing units should not be encouraged.

SPO– 4TH JANUARY: District: Tando Muhammad Khan; Tehsil: Tando Ghulam Haider; UC: Tando Ghulam Haider;

Village: Abdul Majeed Nizamani

- There were 50 beneficiaries present at the training session held.
- Trainer was able to discuss the various typologies and materials with ease, demonstrating difficult steps in construction with samples such as lintols and ring beams. Trainers also discussed the various reasons of structural failure.
- On location, IPs raised problem of trees coming in the way of the layout, which was rectified by HF teams. For one particular shelter, where three trees were blocking the excavations in various points, HF teams have requested that the IPs forward the plan along with the position of the trees for a detailed solution.

RECOMMENDATIONS:

- As many trees as possible should be saved during construction.

HERITAGE FOUNDATION'S KEY FINDINGS AND RECOMMENDATIONS FOR VISIT IN DISTRICT BADIN

7TH – 8TH JANUARY 2013

Heritage Foundation teams visited IPs based on Monitoring and Mentoring Work Schedule provided by IOM. HF teams evaluated IPs on the quality of Training provided by them to the project beneficiaries. IPs assisted included IFC and CRDO.

IFC – 7TH JANUARY: *District: Tando Muhammad Khan; Tehsil: Tando Ghulam Haider; UC: Dando;*

Village: *Ali Muhammad Lashari*

- The session included 40 participants. The trainer began the session by showing images of damaged structures during the flood and the reasons for structural weakness. The session was well conducted, with the IP showing samples of all materials that will be required during the construction. Trainers discussed the various typologies in great detail, but fell short in relation to the Loh-Khat typologies.
- A female social mobilizer was available during the training.
- Upon visit around the village, HF teams found that beneficiaries had bought lime and were slaking them in individual pits since the past 12 days. 50% of the beneficiaries had also procured crush and while 20% had purchased other materials such as bamboo and reed filling.
- IPs require training for Loh-Khat layouts and typology details.

RECOMMENDATIONS:

- A training session must be held for IPs constructing Loh-Khat Shelters during the following weeks.

CRDO – 8TH DECEMBER: *District: Umerkot; Tehsil: Samaro; UC: Samaro;*

Village: *Haji Ghulam Rasool*

- Session was attended by 36 focal persons. IP trainer was unable to carry out the session with interest. Flip charts were missing and due to lack of a well structured session, the focal persons did not show much interest either.
- After the completion of the session, IP trainer informed the HF and IOM technical teams that they were not aware of the visit and the IPs technical team was on casual leave for the day.
- Layouts were not carried out correctly, and excavations undertaken were also incorrect. Some excavations had resulted in water logging.

RECOMMENDATIONS:

- Layout must be corrected using centre lines and Layout template. Drawing of Loh-Khat house with 10'x14 dimensions has been shared with IOM.
- In case of a high water table level, the best solution would be to dewater the trench by dewatering and then place the PLC as per HF drawings. In case it is difficult to dewater, the PLC may be laid to a level as close to the designed base level of the trench as possible. If the trench cannot be dug to the designed level, it will be IMPERATIVE to use the toe detail on the external side as shown in details in HF Manual. It must also be ensured that lime is mixed thoroughly in all mud elements including the mud brick edging of the toe.

OTHER RECOMMENDATIONS

- IN REFERENCE TO ISSUE OF LACK OF FIRM SOIL HIGHLIGHTED BY

MOJAZ– 27TH DECEMBER: District: Badin; Tehsil: Talhar; UC: Peero Lashari;

Ideally a geotechnical and structural engineer who has experience in the local soils and carry out detail investigation for precise recommendations should be consulted. However we realize that this may not be possible. In the absence of geotechnical advice, the following has been recommended by our structural consultant as minimum but not limited to

1. Go down to firm soil level while excavation the foundation trenches staying above water table. (Otherwise do dewatering in comprehensive manner)
2. Backfill the trenches with good quality sand compacted to 95% MPD upto the base of footing making sure it is at least 2 ft embedded into soil below existing NSL.

- IN REFERENCE TO ISSUE OF TREE ROOTS HIGHLIGHTED BY

Zafar Nizamani, Project Manager, ORS, SPO, Tando Muhammad Khan, Email dated Tuesday, January 01, 2013 5:31 PM

The trees roots to be taken out or made dead by some horticulture expert in foundation area. These roots maybe harmful for the structure by lifting or cracking it.

LOH-KHAT TRAINING FOR IOM TECHNICAL TEAMS AND IMPLEMENTING PARTNERS

4TH FEBRUARY, 2013

1.0 INTRODUCTION

While Heritage Foundation Field Teams were conducting the first mentoring and monitoring visits to the Implementing Partners' programme area, it was observed that regions where the beneficiaries had selected the Loh-Khat typology, IPs were unclear about various aspects of Loh Khat construction. Since the Loh-khat typology includes various technical inputs, such as a specific layout, construction of pads, the anchoring of posts, tying of structure together, etc. therefore IPs would be required to spend additional time on the field to ensure that a standard in construction was maintained. With additional supervision intended, along with a lack of through understanding on behalf of the IPs it was decided that an Additional Training session for IPs conducting Loh-Khat construction would be carried out.

The training was attended by, ORS Program Officer, Mr. Manuel Moniz Pereira, DIFD Advisor, Magnus Wolfe Murray, 9 IOM Technical Team Members and 25 Implementing partners (Attendance List attached).

2.0 TECHNICAL TRAINING

It was decided that apart from IPs, IOM technical teams would also attend the training session. A separate briefing for IOM technical team members was conducted followed by a question and answer session. This was followed by a presentation for the IPs and field sessions where all stages of the Loh-khat typology were demonstrated by HF artisans and technical teams.

2.1 IOM TECHNICAL TEAM SESSION

With regard to the Loh-Khat typology, IOM technical teams required a further briefing so they would be able to prove as mentors to the IPs.

A brief presentation was conducted by Heritage Foundation Chair and C.E., Yasmeen Lari outlining the various components of the HF methodology. DIFD advisor, Magnus Wolfe Murray explained the calcination process of lime and its importance in the construction methodology.

This was followed by a question and answer session, where IOM technical teams raised questions relating to quantities of materials required for Loh-Khat typologies.

A query related to the multiple units constructed together was raised, as beneficiaries in most villages are short on space. A minimum standard of 10' between two shelter units has been set by HF, and IOM technical teams wished to know if the space could be reduced. It was decided that the minimum standard would not be reduced; however, specific solutions would be provided for areas where site is restricted.

ORS Program Officer, Mr. Pereira, advised the IOM technical team that they should try to minimize the use of Loh-Khat typologies, as these are more advanced technically and would require additional supervision and technical understanding of the materials. He emphasized that IOM technical teams must investigate into the reasons of the beneficiary selecting the said typology, and if the selection was based on lack of motivation of the IPs, it should be reported accordingly. Mr. Pereira requested his team to collect information of areas where the local landlord had denied the beneficiaries the permission to collect mud for their shelters, so that a discussion could be carried out with the landlord in hope to receive permission.

IOM technical teams also raised queries related to the specifications of materials and their quantities. These will be issued by HF in the form of Bills of Quantities.

2.2 IMPLEMENTING PARTNER TECHNICAL SESSION

The Implementing Partner Theory session was conducted by Chair and C.E., Heritage Foundation, Yasmeen Lari. The presentation discussed the various steps to be taken while undertaking the Loh-Khat Typology. Each step was discussed in great detail to ensure that IP would not encounter problems while construction is being undertaken. The presentation focused on reading technical drawings, described the method for conducting layouts, preparations to be undertaken for construction of bases, walls and roofs.

The theory session was followed by two field sessions conducted before and after lunch. The Session before lunch focused on the construction of brick pads at the base; anchoring of bamboo posts; tying and bolting procedure of bamboo verticals and diagonals.

The second session involved a demonstration with IPs of the Loh-Khat layout method.

The demonstration sessions helped address any issue the IPs were facing in understanding the method of construction and any reservations they felt of the need of a burnt brick pad and its recommended height. HF artisans demonstrated correct technique for grouting the steel bar in the bamboo and anchoring it into the pocket in the burnt brick pad in the base.

The demonstrations were followed by a discussion session with Heritage Foundation teams, IOM technical teams and Implementing partner to address any queries and difficulties that the IPs were facing on site. Implementing Partners raised queries regarding the distance between ORS shelters and the lack of space for toes on any one side. It was explained that the 'toe' needs to be constructed on all four sides and a lack of space would mean that the size of the room be reduced or two shelters to be combined with a common central wall.

IPs raised a query with regard to lime and its increase in volume after it has been slaked. They also required further information of the quantities of materials required for Loh-Khat typology which will be shared by HF shortly.

IPs also raised a query with regard to areas which are water logged or suffer from high water table. As proposed by HF's structural consultant a response in this regard has already been shared with IOM.

Another query made was in regard to the direction of the slope of roofs. The slope of the roof can be towards the front or the rear of the shelter as long as proper drainage of water on ground level has been arranged for. In case of the Mono-Pitched roof, beneficiaries had requested if the slope of the roof be reduced from the 3' mentioned in the Manual. Yasmeen Lari advised that the greater the slope of the mono-pitched roof the lesser the chances of water seepage in the roof, and IPs should take extra care to help the beneficiaries understand the benefits of a greater slope, if they choose to build a mono-pitched roof. In case they want a small pitch of the roof, it might be advisable for them to use a flat roof which has a 6" slope.

An IP member raised a query specific to a village in the project area, where there was no indication of the highest recorded flood level, and that the village was on higher ground, and if the height of platform or plinth could be reduced. It was emphasized by IOM that verification of the highest recorded flood level must be undertaken to ensure that the shelters are constructed above the height.

3.0 IMAGES



Yasmeen Lari conducts Presentation for IOM Technical Team



IOM Technical Team



Yasmeen Lari (HF) , Magnus Wolfe Murray (DIFD), Manuel Pereira (IOM) and Safia Bibi (IOM) chair training session



Implementing Partners' members attend theory session on Loh-Khat



HF artisans demonstrate method to make pad at base for bamboo posts



Implementing partners gather around demonstration unit



HF team demonstrates method to grout steel bar in bamboo post



Naheem Shah (HF) demonstrates method to turn steel bar before anchoring



IPs gather after layout marking

HERITAGE FOUNDATION'S KEY FINDINGS AND RECOMMENDATIONS

26TH – 29TH MARCH 2013

Heritage Foundation teams visited IPs based on Monitoring and Mentoring Work Schedule. HF teams evaluated IPs on the quality of Training provided by them to the project beneficiaries and quality of construction of Base up to plinth level on site. IPs assisted included RDPI, BDRO, SOD, STNAH, BASF and LHDP.

RDPI – 26TH MARCH: District: Mirpur Khas; Tehsil: Digri; UC: Soofan Shah;

Village: Allah Dino Khokar

- The session included 35 participants. The trainer was unable to hold an insightful training session as charts were disordered and missing. Queries raised by beneficiaries were left unanswered.
- Site selection at the village had been determined according to guidelines and lime was being slaked, but preparations for Platforms in case of non-accessible roofs were not underway.
- It was observed that the layouts were not accurately carried out mainly because the method and use of layout templates had not been taught; room sizes varied and were not in accordance to the size mentioned by the IPs and beneficiaries.
- A grave oversight was noticed in the lack of use of lime brick at the edge of the toe.
- Another critical error in walls was noted as these were not carried out with uniform width resulting in a greater width at the base and narrowing down as the walls were taken up. Use of plumb line was not in evidence.
- Door and window sizes were variable and not according to guidelines.

RECOMMENDATIONS:

- Use of the layout template will ensure that shelter size and shape are maintained.
- Walls up to plinth should be prepared first in order to provide necessary strength to the base and wall.
- The use of lime brick at the edge of the toe is essential as well as the use of lime in the base to limit the damage to the base during times of flooding.
- The use of a plumb line is essential to construct walls of uniform thickness from base to the top of the wall in order to assure stability.

BRDO – 27TH MARCH: District: Umerkot; Tehsil: Samaro; UC: Samaro;

Village: Ropo Kholi

- The session was attended by 66 participants of whom 12 were women. IP trainer conducted the session well showing material samples, but fell short on answering queries about the use of a string and plumb line to erect walls.
- Layout of shelter had not been undertaken with a template, therefore specified size and that of the actual layout were different.
- The toes did not employ the 9 inch mud brick masonry that is specified. It also appeared that the walls had not begun from the corners, and the filling in the base was not of the materials specified in the manual.

- Walls which have reached 4ft in height were tapering as they gained height while doors and windows do not follow specific guidelines as mentioned in the manual. It seems that the use of a water level was not employed as the walls leaned towards one side in most of the shelters that were checked.
- All 38 units under construction in the villages shared similar problems.

RECOMMENDATIONS:

- As discussed during the field visit, IOM teams directed halting of further work on the walls till IPs demonstrate a better understanding of wall construction.
- The use of a layout template is essential in ensuring that the shelter is according to size.
- The use of filling of base with lime:mud (1:6) with chopped straw is ensured. The mud brick masonry at the edge of the base is essential to ensure extra strength for the walls of the shelter in order to withstand rising waters during the monsoons season.
- The use of a water level before construction of the base, and use of a string and plumb line during the construction of the walls is mandatory to ensure that walls are straight and uniform in thickness.
- It is essential to begin the construction of walls from the corners which allows proper bonding for adequate strength to withstand the floods.

SOD – 27TH MARCH: District: Umerkot; Tehsil: Kunri; UC: Sher Khan Chandio;

Village: Qazi Shahid Memon

- Session was attended by 23 participants. It was conducted by IPs and IOM teams. The technical team described the different stages of construction but had difficulty in explaining the method of wall construction.
- Beneficiaries requested for construction tools and wanted to know the method of extending a veranda with the shelter.
- Use of saline soil had been observed in the structures.
- Layout had not been marked with a template; therefore each side of the shelter was different in size.
- Where the size of the shelter was equal, the walls were gradually tapering as string and plumb line had not been used.
- Mud brick masonry at the edge of the base had not been carried out. Filling in the base was not of the materials specified in the manual.
- Walls had not begun from the corners and no bonding had been maintained.

RECOMMENDATIONS:

- The use of non saline mud in construction is imperative for long term stability of the structure.
- IPs must ensure that all layouts are carried out with a template.
- The use of plumb line and string will allow for the structure to be uniform in size as the wall is carried upwards.
- Mud masonry at the edge of the toe is important for the strength of the base and walls. Filling of base with lime:mud (1:6) with chopped straw will allow added strength to the wall.
- Walls must begin from the corner and ensure bonding of the masonry.

STNAH – 28TH MARCH: District: Umerkot; Tehsil: Samaro; UC: Padhario;

Village: Ali Bux Talpur

- Session was attended by 50 beneficiaries. It was conducted by IPs and IOM teams. A well conducted session by the IP was followed by a discussion led by the Focal Person who explained each stage in detail. This was the first training session where the focal person had received enough information to conduct the training session himself.
- There are 50 units under construction in the village whose layout, excavations, toes and walls (in progress) have been constructed according to the guidelines. Work on site is commendable.

BASF – 29TH MARCH: District: Badin; Tehsil: Gharo; UC: Gharo;

Village: Muhammad Urs Wado

- Session was attended by 50 beneficiaries. The field session was conducted by IP trainer and IOM teams. Beneficiaries requested information of slope of roof and extension of a veranda.
- Layouts, excavations and PLC carried out in accordance to HF specifications.
- A grave oversight was noticed in the lack of use of lime brick at the edge of the toe in any of the shelters under construction.
- Walls, openings for doors, windows were found to be tapering as the use of string and plumb line has not been employed.

RECOMMENDATIONS:

- Drawings for veranda extension are available in Supplement Handout. (Shelter Type A6)
- Slope in Mono-pitched may be towards the front or the rear, but care must be taken to see where the water will be draining.
- The use of lime brick at the edge of the toe is essential as well as the use of lime in the base to limit the damage to the base during times of flooding.
- The use of a water level before construction of the base, and use of a string and plumb line during the construction of the walls is mandatory to ensure that walls are straight and uniform in thickness.

LHDP – 29TH MARCH: District: Badin; Tehsil: Gharo; UC: Gharo;

Village: Wee Makhan

- Session was attended by 20 Focal Persons of whom 2 were female. The training session conducted by IP was confusing and disordered as the staff had only four flip charts. Focal persons present at the training asked questions about the materials and there quality but since there were no samples available on site the trainer could not address the queries. LHDP staff was constantly receiving phone calls and discussing matters with each other rather than conducting a systemized session. The IP has not made any improvements since the last visit made on 28th December, 2012.
- Lime preparations were undertaken on site.

- All 17 units under construction at the site have been raised up to 1 ft in height.
- Although the beneficiaries have employed local 'odhs' to carry out the construction, IPs lack of guidance has led to a lack of lime use in the toe. Brick masonry at the edge of the toe was also missing.

RECOMMENDATIONS:

- IP should ensure that training sessions are carried out under a proper system as advised in the Technical Support Manual and through flip charts provided. All stages of work must be explained and the trainer must take care to provide samples of materials.
- All hired masons must attend training session to understand the various standards set out by the Programme to ensure that work carried on site is stable and long-lasting.

HERITAGE FOUNDATION'S KEY FINDINGS AND RECOMMENDATIONS

1ST – 5TH APRIL 2013

Heritage Foundation teams visited IPs based on Monitoring and Mentoring Work Schedule. HF teams evaluated IPs on the quality of Training provided by them to the project beneficiaries and quality of construction of Base up to plinth level on site. IPs assisted included AHD, BDO, SEAD, SDI, I-LAP, SAFWCO, SDTS and M. AID.

AHD – 1ST APRIL: District: Tharparkar; Tehsil: Mithi; UC: Moharno; First Visit to IP Project Area

Village: Fotojogi

- The session included 65 participants. Although flip charts were available, the trainer did not refer to them during the session. The IPs technical staff was unable to describe the various sections i.e. opening sizes, ring beam placements, accessible and non-accessible roofs, and material specifications, etc. Queries raised by beneficiaries could not be answered due to lack of understanding of the methodology by the trainer.
- Beneficiaries were not aware of the use of lime, or the method for lime preparation. Hence, there is no preparation of lime on site.
- Layouts were not properly marked. It was observed that all layouts were undertaken without the use of proper tools. Room sizes are 12'x20' while chauras are 16' in diameter.
- Excavation has been made to a depth of 1½'. Upon checking for firm soil, HF team found the level to be deeper than 3'.
- Saline soil and saline water has been used in construction.
- Where beneficiaries have begun manufacturing of bricks, it was found that soil used was of a sandy quality and not suitable for construction purposes.
- A grave error of not placing PLC course before beginning construction was found. Beneficiaries were not aware of the need of PLC as well.
- Construction of base was underway in 25 units, all of which were not following any guidelines; it is clear from HF team reports that IP has begun work without carrying out training sessions in their project areas.
- Majority of the units were in the process of constructing walls of their ORS, but due to lack of guidance construction quality is poor, with walls of substandard quality.
- Lintols have been placed at 5'-6", which is below acceptable standard.
- IP has shown no improvement since ORS programme 2012. Issues that were raised during the previous year have not been rectified and work performance on site is disappointing.

RECOMMENDATIONS:

- Trainers should be well versed in methodologies and should use visual aids such as flip charts, posters, material samples, white/black board, etc. when explaining the various stages of construction to the beneficiaries.
- The importance of the usage of lime has been specified in various sections of the Manual, and emphasis has been made during all HF technical sessions for its advantages, and thus, must be emphasized during training.
- The use of tools and layout templates is essential.
- Excavations must be made till firm soil is reached. It is important to make the distinction between the excavation depth for accessible and non-accessible roofs.
- Non saline soil and potable water must be used for construction.

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- All soil used for construction should be checked with a bottle test. Soil that is too sandy should not be used as it will reduce the strength of construction undertaken.
- The use of PLC allows a water barrier to be formed. It also provides a much needed footing for construction of base.
- It is of utmost importance that beneficiaries be aware of construction methodologies prior to undertaking construction.
- The toe provides protection for the core of walls and will ensure that the shelter does not come under harm in the advent of flooding.
- Walls must be raised using non-saline soil, (1' at a time for layered mud walls). Soil should be prepared as per guidelines before undertaking construction. Care should be taken to follow a bonding pattern and begin construction from corners.
- Lintols are to be placed at 6'-9".
- IP is expected to raise its current standard of technical training, community awareness/mobilization and construction quality.

BDO – 2ND APRIL: District: Tharparkar; Tehsil: Mithi; UC: Chelhar; First Visit to IP Project Area

Village: Chelhar Newabad

- The session was attended by 22 participants. IP trainer conducted the session with the help of visual aids. All queries were noted down and discussed in detail at the end of the session. Beneficiaries have opted for the Chaura typology and raised queries with regard to availability of non saline water and soil for construction.
- Layouts and excavations have been undertaken under correct guidelines.
- Bases of all ORS have been prepared complete with toe and mud-brick masonry on toe edge.
- IP has shown marked improvement since ORS project in 2012.

SDI – 3RD APRIL: District: Badin; Tehsil: Talhar; UC: Saeedpur; Second Visit to IP Project Area

Village: Khuda Bux Mari

- Session was attended by 25 participants. IP had flip charts in an organized fashion ready for use, yet the trainer found it difficult to explain the various stages of construction to the beneficiaries.
- 25 units of Typology A2 were to be constructed in the village. IP team leaders informed HF teams that of the 520 units under construction, 27 were Loh-khat.
- Lime preparations had been made, but HF teams found that the usage of lime has not been undertaken as per instructions of the Manual.
- Saline soil and water has been used in construction.
- Soil has been refilled into excavation trenches without being mixed with lime or compacted. A weak lime water solution has been poured over the base till plinth level.
- Beneficiaries had begun work with the Loh-Khat typology in mind but all shelters have been reverted to layered mud, therefore it is clear that beneficiaries lack understanding of construction technique.
- Walls have been raised to 1' but do not follow a bonding pattern and are less than 18" in width.

RECOMMENDATIONS:

- Lime preparations and usage has been highlighted in various sections of the Technical Support Manual and have been illustrated in flip charts and posters. IPs must ensure that standards and specifications of construction methodology are met.
- Beneficiaries should be requested to procure soil from non-saline sources and use clean potable water for construction.
- Construction of the base should begin after the excavation has been made till firm soil level. Earth should be compacted before laying of PLC. Mud should be mixed with lime (and straw) and filled into trenches in the manner of layered mud construction. A 9" thick mud lime brick masonry wall should be raised at the edge of the toe.
- Beneficiaries should be explained the different methods of construction for Accessible/Non-Accessible Roofs, Layered Mud/Mud Brick/Loh-khat typology. All construction techniques vary and beneficiary should carry out construction for his/her shelter based on the specific techniques outlined for each the modules.
- Wall to be raised using non saline soil beginning from the corners and following a bonding pattern. Use string and plumb line, wooden ruler, scale to keep lines in check.

SEAD – 3RD APRIL: District: Badin; Tehsil: Talhar; UC: Saeedpur; Second Visit to IP Project Area

Village: Jagsi Kohli

- Session was attended by 25 beneficiaries. Session was conducted by IP trainer with the help of flip charts and sample materials. Trainer could not describe the method for wall construction using the aid of a plumb and string.
- 25 units were undertaken in the village, whereas the IP confirmed that it has 500 units under its programme area, of which only 2 are loh-khat.
- Layouts have been marked without using the centre lines of walls, therefore room sizes were incorrect.
- Saline soil has been used in construction. Water source has been identified as a rain water drain near the village. Water in the drain is highly saline and should not be used for construction.
- Beneficiaries had intended to construct Loh-Khat Typology, but have now converted to Layered Mud construction. After observation on site, HF teams have concluded that IPs have not been able to communicate the newly selected layered mud construction technique in detail.
- Size and construction method of toe is not according to standard. 9" thick mud lime masonry on toe edge is missing. Toe bond to wall is missing.
- Layered mud walls are being raised at a very slow pace, i.e. 2"-4" per day.
- Plinth height for some houses is between 1'-18".
- A set to two unit shelters on site have been marked 2'-3" from each other.

RECOMMENDATIONS:

- IP should help the beneficiaries identify a source of non saline soil. Only clean potable water to be used for construction.
- Toe construction to be raised together ensuring that a proper bond is maintained at all times.
- Layered mud walls should be raised 12" (1 foot) per day.
- Plinth of accessible roofs to be 1'-6" and 3'-6" or 6" above highest recorded flood level for non-accessible roofs.
- Distances between two shelters should be minimum 5'.

SAFWCO – 4TH APRIL: District: Badin; Tehsil: Badin; UC: Peero Lashari; Second Visit to IP Project Area

Village: Ahmed Khan Chandio

- Session was attended by 17 of 23 Focal persons. All 520 target units are to be constructed using Mud typology A2. IP trainers were able to conduct the session using flip charts and sample materials, but had difficulty in explaining the method to construct walls and openings. There also seems to be confusion about mono-pitched roof wall heights and the advantages of using Lime in construction.
- Beneficiaries have used agricultural soil for construction.
- Layouts have been undertaken using a template therefore all 23 units were correctly marked.
- Space has been left for openings 1'-9" from corner, but IP and beneficiaries have been told to rectify their mistake by leaving an opening at least 3'-9" from the corner of the shelter.
- Although size and slope of toe is correct, Mud lime Brick masonry on toe edge and mud infill is not as per guidelines.

RECOMMENDATIONS:

- Mono-pitched back wall should be 11' and front wall to be 8'. If beneficiary wishes to reduce the height of back wall, he may opt for a non-accessible flat roof with 6" slope. This selection will result in the front wall being 8' and the back wall being 8'-6".
- Soil used for agriculture can be used for construction. Care must be taken to remove six inches of the top soil before use.
- 9" mud lime brick masonry on toe edge gives extra strength to base during times of flooding. Use of lime in mud infill in base gives the shelter added strength at base.
- Door opening must be 3'-9" from corner, while window openings should be between two bamboo joists.

I-LAP – 4TH APRIL: District: Badin; Tehsil: Badin; UC: Nindo Khashkheli; Second Visit to IP Project Area

Village: Moso Khashkheli

- Session was attended by 16 of 22 Focal Persons. The training session conducted was well conducted by IP with the help of visual aids and samples, but the trainer could not answer queries raised by IP. Of the total 520 units being constructed by IP, 18 were in this particular village. Progress varies from excavations to walls.
- Layout has not been marked using templates and tools therefore, no room sizes were correct.
- Mud infill in toe is not according to specifications, and mud lime brick masonry at toe edge has not been carried out.
- Shelters in village were initially supposed to be of Loh-khat. The change in Typology has caused construction quality to deteriorate as IP have not been able to guide beneficiaries in the new typology construction technique.
- Soil being used for construction is highly saline.
- A new shelter unit being constructed on site is attached to an old structure. IP is requested to send HF drawing of said shelter for recommendations.

RECOMMENDATIONS:

- All layouts should be marked using layout template.
- Toe should be constructed using a mud lime brick masonry wall 9" thick at the outside edge. Space between inner wall and outer edge toe wall should be filled with a mixture of mud-lime-straw as specified in Technical Support Manual.
- Beneficiaries who have altered their shelter Typologies must be intimated of the construction technique of Mud wall shelters to avoid sub standard construction.
- Non-Saline soil should be procured for construction.

M.AID – 5TH APRIL: District: *MirpurKhas*; Tehsil: *Digri*; UC: *Tando Jan Muhammad*; First Visit to IP Project Area

Village: Qazi Ashraf Jog

- From 44 of the IP's focal persons only 15 were present along with 10 beneficiaries of the village. The trainer found it difficult to explain the various stages of construction to the participants. IP shelter target is 1000 units, 18 of which were under progress in Village Qazi Ashraf Jog.
- Layout templates had not been used as room sizes were not accurate.
- Mud lime brick had not been used at the edge of the toe.
- A critical error was found when wall widths were measured which were not more than 12".
- Plinth height was 1'-6" whereas flood level is 4'.
- Doors were not according to standard.
- It was discovered that the IP has selected the house typology and not the beneficiary.

RECOMMENDATIONS:

- All layouts should be marked using a template.
- The mud lime brick at the edge of the toe provides necessary strength to the base during times of flooding.
- Wall width should be maintained as 18" taking care to use a plumb and string to ensure uniform thickness.
- Plinth height for non-accessible roofs should be 6" above highest recorded flood level.
- Doors openings should 3' to 3'-6" and be marked 3'-9" from shelter corner.
- IOM ORS programme requires that all IPs allow beneficiaries to choose their own shelter typology.

SDTS – 5TH APRIL: District: *Badin*; Tehsil: *Jhudo*; UC: *Roshanabad*; First Visit to IP Project Area

Village: Hanif Khamboo

- HF teams were not aware of change of village. IP was not prepared on site for the session and took a while to organize themselves. The trainer could not relate the methods of construction of excavations, wall making and ring beam placements.
- 24 units were under progress at plinth level.
- Layouts were not carried out accurately as templates and tools had not been used.
- Mud lime brick masonry on edge of toe was not carried out.

- Walls had not been begun from the corners. Wall thickness was not accurate and the lack of use of string and plumb line resulted in tapering walls.

RECOMMENDATIONS:

- All layouts should be marked using a template.
- A 9" thick mud lime brick masonry wall on the outer edge of the toe provides additional strength to base during flooding.
- Wall masonry should be begun from corners ensuring that a proper bonding pattern is maintained.
- The Use of a plumb and string allow for wall thickness to be uniform. All walls are to be no less than 18".

HERITAGE FOUNDATION'S KEY FINDINGS AND RECOMMENDATIONS

8TH – 11TH APRIL 2013

Heritage Foundation teams visited IPs based on Monitoring and Mentoring Work Schedule. HF teams evaluated IPs on the quality of Training provided by them to the project beneficiaries and quality of construction of Base up to plinth/ wall level on site. IPs assisted included AHD, BDO, SEAD, SDI, I-LAP, SAFWCO, SDTS and M. AID.

PVDP –8TH APRIL: *District: Badin; Tehsil: Talhar; UC: Raju Khanani; Second Visit to IP Project Area*

Village: Jargar Malha

- The session was held by a female social mobilizer and a two person technical team. While the social mobilizer conducted the first half of the session well based on materials and site selection, the technical team could not explain the methodology of wall construction in a sequenced manner. All trainers used visual aids during their presentation.
- Layouts had been undertaken on site, but due to change in Typology from Loh-khat shelter sizes varied.
- Lime pits had been excavated and lime had been prepared but HF teams found that lime ratios had not been maintained.
- No 9" mud brick masonry wall on the edge of the toe was found.
- Walls thicknesses had been maintained, but were not begun from corners.

RECOMMENDATIONS:

- Trainers should be well versed in methodologies and should use visual aids such as flip charts, posters, material samples, white/black board, etc. when explaining the various stages of construction to ensure that all stages of construction are explained in a systematic manner.
- The importance of the usage of lime has been specified in various sections of the Manual, and emphasis has been made during all HF technical sessions for its advantages. IP teams should ensure that Lime is being used in proper ratios in construction.
- A 9" mud brick masonry wall is required at the edge of the toe to provide added strength to the base and protect the core of walls.
- Work progress on site is slow.

PREPARED PAKISTAN – 8TH APRIL: *District: Badin; Tehsil: Talhar; UC: Raju Khanani; Second Visit to IP Project Area*

Village: Mithu Kori

- 44 participants attended the session which was conducted by two trainers. Flip charts were available, but were not referred to during the presentation. IP Representatives had trouble in explaining the methodology to the FP and Beneficiaries present. Lack of material samples made caused further confusion. Beneficiaries continually interrupted the session with complaints of funding and delays in payment.
- Layouts and excavations have been undertaken on site, but various problems such as insufficient toe slopes, wall thicknesses, 9 inch mud brick masonry wall of toe edge and lack off use of lime were observed.
- A week lime solution has been poured over the construction.

RECOMMENDATIONS:

- Trainers should be well versed in methodologies and should use visual aids such as flip charts, posters, material samples, white/black board, etc. when explaining the various stages of construction to the beneficiaries.
- The usage of lime is a requirement under the ORS programme and IPs are requested to ensure that all ratios and mixes with respect to lime are maintained.
- The outer edge of the toe with 9" thick mud masonry wall should be raised 1'-6" while the inner edge should be raised 3'-3". The space in between should be filled with a mud-lime mix and a slope of 30 degrees is achieved.
- Wall should be begun from corners and follow a bonding pattern. In case of layered mud walls, each course should be raised 1' per day.

MDF – 8TH APRIL: *District: Badin; Tehsil: Matli; UC: Bhudo Kambhrani; Second Visit to IP Project Area*

Village: Ghulam Nabi Jarwar

- Session was attended by 22 participants. Session was conducted by three trainers but due to lack of flip charts, material samples the session was missing key elements. Beneficiaries displayed dissatisfaction with the information that was disseminated, as trainers were unable to explain the construction methodology and answer queries raised by participants. IP technical team was confused about roofs and preparation required during wall construction for roof placement.
- There was no sign of lime preparation on site.
- No preparations were underway for mud brick fabrication.
- Layouts were not marked using templates, thus sizes varied and were not on the set 10' x 14' as mentioned by IPs and Focal person.
- Openings for doors and windows were not according to guidelines.
- Walls were not uniform in thickness or height which is a grave oversight.

RECOMMENDATIONS:

- Trainers should be well versed in methodologies and should use visual aids such as flip charts, posters, material samples, white/black board, etc. when explaining the various stages of construction to the beneficiaries.
- Lime preparations and usage has been highlighted in various sections of the Technical Support Manual and have been illustrated in flip charts and posters. IPs must ensure that standards and specifications of construction methodology are met.
- Where Mud brick construction is to be undertaken, IPs should request beneficiaries to fabricate mud brick well in advance as it takes a minimum of 7 days to dry.
- Layouts should be marked using templates.
- Doors and opening should not be directly under a roof joist and at a distance from the corner of the shelter.
- Walls should be maintained in thickness and height. Tools for use have been specified in the manual to achieve a non-tapering 18" thick wall.

SRDO – 8TH APRIL: District: *Badin*; Tehsil: *Matli*; UC: *Bado Kambhrani*; Second Visit to IP Project Area

Village: *Ali Muhammad Punjab*

- Session was attended by 17 of 23 focal persons. Session was conducted by a Focal Person with the help of visual aids such as flip charts and sample materials.
- 25 shelters were in progress, all following HF guidelines.

MOJAZ – 9TH APRIL: District: *Badin*; Tehsil: *Talhar*; UC: *Peero Lashari*; Second Visit to IP Project Area

Village: *Thar Khaskheli*

- Session was attended by 20 Focal persons. The trainer conducted the session using flip charts, material samples and an illustration board, but the session was not conducted in a systematic fashion. Beneficiaries raised queries with regard to a mono-pitched roof – if the back wall height could be reduced from 11' to 9'.
- Layouts not marked properly, as the beneficiaries had begun with the intention of a Loh-khat shelter and later reverted to mud/mu brick walls.
- A beneficiary reported that they had been using lime for construction but upon prompting informed HF team that they had not. The remaining beneficiaries informed that slaked lime had been used up and therefore they had stopped using it.
- Although agricultural soil is being used for construction it displays saline properties.
- Time between each layered mud courses is extended resulting in lack of bonding. Application of plaster between each course was also observed.
- Although size and slope of toe is correct, Mud lime Brick masonry on toe edge and mud infill is not as per guidelines.

RECOMMENDATIONS:

- Mono-pitched back wall should be 11' and front wall to be 8'. If beneficiary wishes to reduce the height of back wall, he may opt for a non-accessible flat roof with 6" slope. This selection will result in the front wall being 8' and the back wall being 8'-6".
- Use of lime is essential. IPs should ensure that lime is used after slaking and in correct ratios as specified in the Manual.
- 9" mud lime brick masonry on toe edge gives extra strength to base during times of flooding. Use of lime in mud infill in base gives the shelter added strength at base.

NOW – 9TH APRIL: District: *Badin*; Tehsil: *Badin*; UC: *Kadhan*; Second Visit to IP Project Area

Village: *Bhalw Kholi*

- Session was attended by 27 Focal Persons. The training session conducted was well conducted by IP with the help of visual aids and samples.
- Layout was marked with the intention of a Loh-Khat Shelter, therefore room sizes are 9' x 11'.
- All work has been conducted to HF standards except the use of mud lime brick masonry at toe edge.

BHR – 9TH APRIL: District: Badin; Tehsil: Digri; UC: Dadah; First Visit to IP Project Area

Village: Allah Bachaio

- From 48 of the IP's focal persons 23 were present. The trainer found it difficult to explain the various stages of construction and materials to the participants.
- Layout templates had not been used as room sizes were not accurate.
- Lime was stored in the open and therefore should not be used in construction.
- Mud lime brick had not been used at the edge of the toe and the base had been filled with loose soil.
- A critical error was found when wall widths were measured as walls were tapering as they gained height as plumb lines and string had not been used.
- Another grave error observed was that walls had not been begun from the corners and did not follow a bonding pattern.
- Lintols being used were affected with termite and did not overlap 1' on both sides as per guidelines.
- HF teams were requested to visit a neighboring village as IP said construction standard was better. Upon visiting it was found that all shelters displayed the same issues and problems.

RECOMMENDATIONS:

- All layouts should be marked using a template.
- Lime should be stored in a cool dry place at a height.
- Wall width should be maintained as 18" taking care to use a plumb and string to ensure uniform thickness and height.
- Walls should be begun from corners and maintain a bonding pattern.
- Doors openings should 3' to 3'-6" and be marked 3'-9" from shelter corner.
- Lintols should be termite free and extend a 1 foot on both sides of the opening.

IFC – 10TH APRIL: District: Tando Muhammad Khan; UC: Tando Ghulam Haider; Second Visit to IP Project Area

Village: Abdul Karim Nazimani

- 21 of 24 FPs were present for the session. The trainers could not relate the shelter typologies, methods of construction of excavations base and wall making and ring beam placements.
- Room sizes varied from 11'x15' to 12'x18'.
- Lime pits had been excavated and lime was slaked, but no precautionary measures were taken.
- Work had been achieved till plinth level, but base filling had been carried out with loose soil.
- Mud lime brick masonry on edge of toe was not carried out.

RECOMMENDATIONS:

- All layouts should be marked using a template.
- A 9" thick mud lime brick masonry wall on the outer edge of the toe provides additional strength to base during flooding.
- Wall masonry should be begun from corners ensuring that a proper bonding pattern is maintained.
- The Use of a plumb and string allow for wall thickness to be uniform. All walls are to be no less than 18".

SPO – 10TH APRIL: District: Tando Muhammad Khan; UC: Tando Ghulam Haider; Second Visit to IP Project Area

Village: Mersi Jongo

- 22 of 24 FPs were present for the session. Session was conducted with the use of visual aids, but the trainer had problem describing ring beams. Beneficiaries raised queries with regard to a mono-pitched roof – if the back wall height could be reduced from 11' to 9'.
- Room sizes varied from 10'x10' to 10'x12' and had not been marked using templates.
- Lime had been bought but not slaked according to prescribed method.
- Work had been achieved till plinth level, but base filling had been carried out with loose soil. Beneficiaries said they did not know about the filling or of the use of mortar.

RECOMMENDATIONS:

- Mono-pitched back wall should be 11' and front wall to be 8'. If beneficiary wishes to reduce the height of back wall, he may opt for a non-accessible flat roof with 6" slope. This selection will result in the front wall being 8' and the back wall being 8'-6".
- All layouts should be marked using a template.
- Use of lime is essential. It must be prepared according to instruction in Manual and Lime Use Poster.

CRDO – 11TH APRIL: District: Badin; Tehsil: Sammaro, UC: Sammaro; Second Visit to IP Project Area

Village: Allah rakhio Domki

- 18 of 20 FPs along with beneficiaries including women and children were present for the session. Session was well conducted with the use of visual aids.
- Two room sizes have been selected – 10'x14' and 12'x14'.
- All work on site was done as per guidelines except for 9" thick mud brick wall at toe edge.

LAMP – 10TH APRIL: District: Mirpur Khas; Tehsil: Digri; UC: Kangro; First Visit to IP Project Area

Village: Raees Atta Muhammad

- 46 FPs were present for the session along with village beneficiaries. The trainer did not follow any sequence during the session.
- Room sizes varied from 10'x15' to 10'x14'.
- Work had been achieved till plinth level as per guidelines with the exception of 9" mud brick masonry wall on toe edge.
- IP work has seen significant improvement since ORS III.

HERITAGE FOUNDATION'S KEY FINDINGS AND RECOMMENDATIONS

24TH – 26TH APRIL, 2013

Technical Refresher Session was held at Moak Sharif between 24th and 26th April, 2013. The session was attended by all 25 Implementing partners. Each IP had been requested to share the issues and problems being encountered on site. Solutions were discussed by Heritage Foundation and International Organization for Migration teams. This was followed by the technical training session which evaluated the IP's ability to conduct a thorough, clear and systemized session; their understanding of the construction methodology and answer queries successfully.

Key Findings

1. 18 out of 25 IPs reported obtaining correct quality of soil: either the soil was saline or sandy in nature.
2. 16 IPs reported water shortage in their area, while 3 said water in their area was saline.
3. 1 IP said they could not find good quality bamboo in their project area.
4. 2 IPs said they have a problem with termite infestation in their project area.
5. Five IPs noted that prices of materials had either been raised in the market, or transportation charges increased the cost per unit of materials.
6. 10 IP said that progress on site was slow due to beneficiaries being involved in harvesting, sowing or elections.
7. 9 IPs pointed out that the irregularities in construction were because beneficiaries did not have proper tools for construction.
8. 8 IPs said that beneficiaries faced problems while seeking permissions from landlords to collect soil or were being pressured by landlord to work in the fields.
9. 1 IP said that they were facing a shortage of brick dust in their project area.
10. 1 IP said it had problems getting beneficiaries to carry out the usage of lime according to specifications.
11. 2 IP said that beneficiaries did not have proper land ownership documents, or there was a shortage of plots in the villages.
12. 2 IP said plots available on site for ORS were in close proximity to old shelters or structures.
13. 1 IP said that the height of plinths posed as a problem for elderly people.
14. 1 IP said that dry filling of soil in the toe had been noted and rectified.
15. 2 IPs said they had ensured the construction of the missing 9" mud/lime brick masonry wall at the edge of the toe.
16. 1 IP had noted wall shrinkage issue.
17. 1 IP inquired whether the filling in the flooring could be undertaken with saline soil.
18. 2 IP said that it had encountered cracks on walls.
19. 1 IP noted that opening sizes varied as the height of walls were raised.
20. 4 IP inquired if doors and windows could be placed along the shorter walls of the ORS.
21. 1 IP inquired if door could be placed at the centre of the wall while 2 IP inquired if door could be placed along the corner of the wall.
22. 2 IP requested if height of Chaura walls could be reduced.
23. 1 IP inquired if lintels could be tied with binding wire instead of being bolted.
24. 1 IP inquired if lintols could be made of wood instead of bamboo.
25. 1 IP noted that the pits dug out for collection of mud or slaking lime posed as a hazard on site.
26. 1 IP informed that the inter-religious communities within a village cluster had problems with interaction.
27. 1 IP informed that 2 BHH had fallen from the tops of walls during construction.
28. 3 IP wished to know if the back wall of a mono-pitched roof could be reduced in size.
29. I-LAP raised a specific query about the difference in Ground level from the front and the rear of the ORS.

30. MA raised specific queries about ORS layouts in series, sharing common walls and close proximity of new and old ORS.
31. MDF raised specific question with regard to filling of ramp for later addition of Veranda and the construction of shelves or niches in walls.
32. SOD made a specific request for layout and joists placement for ORS with common long wall. BDO proposed the use of a wooden peg or “billy” to tie Chaura Joists to mud wall.

RECOMMENDATIONS

1. Quality of soil: Non Saline mud must be used as saline soil is highly reactive to lime. Soil with a higher concentration of sand can be used but in areas where water table is not high. It must be confined and compacted.
2. Water should be potable and non saline. It can be procured in tankers. Beneficiaries should store water in tanks or pits. Heritage Foundation shared a method for making pits: A conical pit 6' deep; 6' in diameter at the top and 3' in diameter at the base should be excavated. The base and walls of the pit should be compacted and cured with water. A plaster of cow dung, water and straw should be prepared and applied along the interior of the pit. After drying water can be stored in the pit for longer durations with less seepage.
3. Beneficiaries may form committees and procure good quality bamboo from a supplier from a reliable source in bulk.
4. Bamboo members should be treated with lime putty and ends should be filled with lime. The length of bamboo of wooden members should be painted with good quality oil based enamel.
5. IPs should investigate the reason for price hikes in the market.
6. Although work progress may have been slower during the construction of the base, less effort and time will be involved while construction of walls and roof.
7. Local home based solutions for lack of tools can be found. Donkey carts can be used to transport mud and water. String and a home fashioned plumb may be used for checking wall alignments. Sticks or bamboos may also be used to check wall alignments and widths.
8. IPs have been requested to engage in discussions with local landlord for permissions.
9. Beneficiaries may form committees and procure brick dust from a supplier from a reliable source in bulk.
10. The use of lime is essential to the methodology. IPs should share the advantages of using lime with their beneficiaries.
11. Land ownership issues should be solved on site before commencing construction.
12. HF has already provided solutions for shelters in close proximity. Please follow previous instructions and guidelines.
13. The height of plinths provide necessary DRR component and should not be reduced.
14. Dry filling of soil in the toe should be rectified by excavation and refilling with mud-lime mix as specified in Technical Support Manual.
15. 9" mud-lime brick masonry wall at the edge of the toe protects the core of walls and foundations and should be ensured.
16. Each course of wall should be placed before the previous course has not completely dried. This will allow better bonding of each course and reduce the shrinkage of walls.
17. Flooring may be filled with any type of soil, but care should be taken to place a polythene sheet after filling has been undertaken. The flooring may be finished with a layer of mud-lime-brick dust mixture to ensure that no water, seepage or salinity will rise from within the shelter.
18. There are two types of cracks:
 - Cracks that run along the width of the wall: These are considered dangerous and that section of the wall should be reconstructed.
 - Surface Cracks appear on either side of the wall: These should be filled with mud mortar and plastered after completion of wall construction.

19. Two sticks/bamboos can be placed on either side of the wall, while another stick/bamboo cut in the size of the opening should be used to measure the opening size after placement of each course of mud wall.
20. Door and windows can be placed along the shorter walls. Care must be taken to ensure proper cross ventilation.
21. Door should not be placed underneath a joist or at the corner of the wall.
22. Height of walls should not be reduced.
23. Lintel may be tied with binding wire, but bolting provides a safer option.
24. Wooden lintels may be allowed. IP should have the wood inspected by IOM technical team before use.
25. Pits can be refilled with bushes of mud or may be made shallow by shifting the soil and planting plants.
26. IP should act as a mediator between communities.
27. Bags of straw or blankets may be kept along the wall as a safety precaution.
28. Height of mono-pitched walls may not be reduced, but beneficiaries can construct a non-accessible flat roof with front wall at 8' and back wall at 8'-6".
29. Solution for I-LAP has been provided in attached Sketch 1.
30. Queries raised by MA have been addressed in attached Sketches 2, 3 and 4.
31. Query for Veranda has been illustrated in Sketch 5. Niches not more than 9" -12" inches in width of limited height can be added into the width of the wall. Shelves or larger width can be added as per Sketch 8.
32. Solution for SOD query has been illustrated in Sketch 7.
33. The use of a wooden peg of 'billy' (Sketch 6) is not appropriate and will result in a weak connection, therefore its use is not recommended.

DAY 1 - 24TH APRIL, 2013

BASF

ASSESSMENT	Good	Fair	Poor	Blank	PROBLEMS ON SITE
1.1 Ability to conduct training in a systematic manner		1	2		Poor quality Bamboo; Quality of mud Either Saline or Sandy Lack of permission to collect soil; Higher Cost of materials;
1.2.1 Skillful use of Flip Charts			2	1	
1.2.2 Skillful use of Illustration Board	1	1		1	
1.2.3 Skillful use of Material Samples		1	1	1	
1.3.1 Understanding of Methodologies Base		2	1		
1.3.2 Understanding of Methodologies Walls		3			
1.3.3 Understanding of Methodologies Roof	1		1	1	
1.4 Dissemination of Technical information					
1.5 Level of skill in providing explanation		1	2		
1.6 Handling of queries	1	1	1		
1.7 Level of general competence		2	1		
1.8 Standard of Construction Performance		2	1		
	3	14	12	4	

CRDO

ASSESSMENT	Good	Fair	Poor	Blank	PROBLEMS ON SITE
1.1 Ability to conduct training in a systematic manner		2		1	<p>Quality of Mud Saline</p> <p>Quality of Water Saline</p> <p>Construction of 9" mud-lime brick toe wall</p> <p>Higher Cost of materials;</p>
1.2.1 Skillful use of Flip Charts	1		2		
1.2.2 Skillful use of Illustration Board		2		1	
1.2.3 Skillful use of Material Samples			1	2	
1.3.1 Understanding of Methodologies Base		3			
1.3.2 Understanding of Methodologies Walls		1	2		
1.3.3 Understanding of Methodologies Roof	1	1		1	
1.4 Dissemination of Technical information	1	1		1	
1.5 Level of skill in providing explanation		3			
1.6 Handling of queries	1	2			
1.7 Level of general competence	1	2			
1.8 Standard of Construction Performance		3			
	5	20	5	6	

I-LAP

ASSESSMENT	Good	Fair	Poor	Blank	PROBLEMS ON SITE
1.1 Ability to conduct training in a systematic manner		1	1	1	<p>Quality of Mud Saline</p> <p>Quality of Water Saline</p> <p>Construction of 9" mudlime brick toe wall</p> <p>Higher Cost of materials;</p> <p>Lack of tools</p> <p>Expanding layered mud walls; Cracks in walls</p> <p>Height of Plinth from L due to variance of L</p> <p>Setch 1"</p> <p>dry filling with soil in toe</p>
1.2.1 Skillful use of Flip Charts			2	1	
1.2.2 Skillful use of Illustration Board		2		1	
1.2.3 Skillful use of Material Samples			2	1	
1.3.1 Understanding of Methodologies Base		2	1		
1.3.2 Understanding of Methodologies Walls	1	1	1		
1.3.3 Understanding of Methodologies Roof	1	1		1	
1.4 Dissemination of Technical information	2	1			
1.5 Level of skill in providing explanation	1	2			
1.6 Handling of queries	2	1			
1.7 Level of general competence		1	1	1	
1.8 Standard of Construction Performance		2	1		
	7	14	9	6	

LHDP

ASSESSMENT	Good	Fair	Poor	Blank	PROBLEMS ON SITE
1.1 Ability to conduct training in a systematic manner			2	1	Quality of mud: Either Saline or Sandy Shortage of Water Construction of mudlime brick toe wall Higher Cost of materials; Pits where mud has been lifted from pose as a hazard
1.2.1 Skillful use of Flip Charts			2	1	
1.2.2 Skillful use of Illustration Board			2	1	
1.2.3 Skillful use of Material Samples			2	1	
1.3.1 Understanding of methodologies: Base		1	2		
1.3.2 Understanding of methodologies: Walls		1	2		
1.3.3 Understanding of methodologies: Roof			2	1	
1.4 Dissemination of Technical information		1	2		
1.5 Level of skill in providing explanation			3		
1.6 Handling of queries		1	2		
1.7 Level of general competence		1	2		
1.8 Standard of Construction Performance		1	2		
	0	6	25	5	

MOJAZ

ASSESSMENT	Good	Fair	Poor	Blank	PROBLEMS ON SITE
1.1 Ability to conduct training in a systematic manner		2	1		Quality of mud: Either Saline or Sandy Quality of Water: Saline Lack of hand pumps Construction of mudlime brick toe wall Higher Cost of materials; Lack of permission to collect soil; Old shelters very close to new shelters Lack of available plots Lack of ownership documents Dry filling with soil in toe
1.2.1 Skillful use of Flip Charts			2	1	
1.2.2 Skillful use of Illustration Board	3				
1.2.3 Skillful use of Material Samples			1	2	
1.3.1 Understanding of methodologies: Base		2	1		
1.3.2 Understanding of methodologies: Walls		1	1	1	
1.3.3 Understanding of methodologies: Roof		1	1	1	
1.4 Dissemination of Technical information	1	1	1		
1.5 Level of skill in providing explanation		2	1		
1.6 Handling of queries	1	1	1		
1.7 Level of general competence	2		1		
1.8 Standard of Construction Performance		2	1		
	7	12	12	5	

SDTS

ASSESSMENT	Good	Fair	Poor	Blank	PROBLEMS ON SITE
1.1 Ability to conduct training in a systematic manner			2	1	Quality of Mud Saline or Sandy Lack of tools Irregular wall thicknesses
1.2.1 Skillful use of Flip Charts			2	1	
1.2.2 Skillful use of Illustration Board		2		1	
1.2.3 Skillful use of Material Samples		2		1	
1.3.1 Understanding of Methodologies Base	1	1	1		
1.3.2 Understanding of Methodologies Walls		2	1		
1.3.3 Understanding of Methodologies Roof		1	1	1	
1.4 Dissemination of Technical information	1		2		
1.5 Level of skill in providing explanation		1	2		
1.6 Handling of queries		1	2		
1.7 Level of general competence	1	1	1		
1.8 Standard of Construction Performance		1	2		
	3	12	16	5	

STNAH

ASSESSMENT	Good	Fair	Poor	Blank	PROBLEMS ON SITE
1.1 Ability to conduct training in a systematic manner	2	1			No problems on Site
1.2.1 Skillful use of Flip Charts			1	2	
1.2.2 Skillful use of Illustration Board	3				
1.2.3 Skillful use of Material Samples			1	2	
1.3.1 Understanding of Methodologies Base	2			1	
1.3.2 Understanding of Methodologies Walls	2			1	
1.3.3 Understanding of Methodologies Roof	1	1		1	
1.4 Dissemination of Technical information	2	1			
1.5 Level of skill in providing explanation	2	1			
1.6 Handling of queries	1	2			
1.7 Level of general competence	2	1			
1.8 Standard of Construction Performance		3			
	17	10	2	7	

RDPI

ASSESSMENT	Good	Fair	Poor	Blank	PROBLEMS ON SITE
1.1 Ability to conduct training in a systematic manner			2	1	Termite Shortage of water Warabandi Cost of good quality mud Unskilled labour
1.2.1 Skillful use of Flip Charts		1	2		
1.2.2 Skillful use of Illustration Board		1	2		
1.2.3 Skillful use of Material Samples		1	2		
1.3.1 Understanding of methodologies Base	1	2			
1.3.2 Understanding of methodologies Walls		1	2		
1.3.3 Understanding of methodologies Roof		2	1		
1.4 Dissemination of Technical information		3			
1.5 Level of skill in providing explanation		2	1		
1.6 Handling of queries	1		2		
1.7 Level of general competence		3			
1.8 Standard of Construction Performance		3			
	2	19	14	1	

DAY 2 - 25TH APRIL, 2013

BDRO

ASSESSMENT	Good	Fair	Poor	Blank	PROBLEMS ON SITE
1.1 Ability to conduct training in a systematic manner	1			2	Quality of mud Saline Shortage of Water Land Ownership Lack of plots Opening sizes vary from top to bottom Windows or doors in Short wall Wall shrinkage
1.2.1 Skillful use of Flip Charts	1		2		
1.2.2 Skillful use of Illustration Board		1	2		
1.2.3 Skillful use of Material Samples	2	1			
1.3.1 Understanding of methodologies Base	1			2	
1.3.2 Understanding of methodologies Walls	1	2			
1.3.3 Understanding of methodologies Roof		1		2	
1.4 Dissemination of Technical information	1	2			
1.5 Level of skill in providing explanation	1	2			
1.6 Handling of queries		2	1		
1.7 Level of general competence		3			
1.8 Standard of Construction Performance		2	1		
	8	16	6	6	

BHR

ASSESSMENT	Good	Fair	Poor	Blank	PROBLEMS ON SITE
1.1 Ability to conduct training in a systematic manner			2	1	Quality of mud Shortage of Water Lack of tools Slow progress due to harvesting and sowing season Lack of Lime usage
1.2.1 Skillful use of Flip Charts	1		2		
1.2.2 Skillful use of Illustration Board		1	2		
1.2.3 Skillful use of Material Samples			2	1	
1.3.1 Understanding of Methodologies Base	1	2			
1.3.2 Understanding of Methodologies Walls	1	2			
1.3.3 Understanding of Methodologies Roof		2		1	
1.4 Dissemination of Technical information	1	2			
1.5 Level of skill in providing explanation	1	2			
1.6 Handling of queries		3			
1.7 Level of general competence		3			
1.8 Standard of Construction Performance		2	1		
	5	19	9	3	

LAMP

ASSESSMENT	Good	Fair	Poor	Blank	PROBLEMS ON SITE
1.1 Ability to conduct training in a systematic manner	1	2			Quality of mud Shortage of Water Lack of tools Slow progress due to harvesting and sowing season Communal feuds on religious matters Height of plinths problematic for elderly Landlord pressures Photographs for Tranche distribution verification 2 BHH fell from Wall tops during construction Filling of lime pits required by landlord
1.2.1 Skillful use of Flip Charts	1		2		
1.2.2 Skillful use of Illustration Board			2	1	
1.2.3 Skillful use of Material Samples	1	2			
1.3.1 Understanding of Methodologies Base	1	2			
1.3.2 Understanding of Methodologies Walls	1	1		1	
1.3.3 Understanding of Methodologies Roof	1	2			
1.4 Dissemination of Technical information	2	1			
1.5 Level of skill in providing explanation	2	1			
1.6 Handling of queries	1	1	1		
1.7 Level of general competence	2			1	
1.8 Standard of Construction Performance	1	2			
	14	14	5	3	

MA

ASSESSMENT	Good	Fair	Poor	Blank	PROBLEMS ON SITE
1.1 Ability to conduct training in a systematic manner		2		1	Series of Shelters Sketch 2 Attached Shelters Sketch 3 Space between old and new shelters Sketch 4
1.2.1 Skillful use of Flip Charts	1		2		
1.2.2 Skillful use of Illustration Board	1	2			
1.2.3 Skillful use of Material Samples		1	2		
1.3.1 Understanding of Methodologies Base		2		1	
1.3.2 Understanding of Methodologies Walls		3			
1.3.3 Understanding of Methodologies Roof		1	2		
1.4 Dissemination of Technical information		1	2		
1.5 Level of skill in providing explanation		2	1		
1.6 Handling of queries		2	1		
1.7 Level of general competence		2	1		
1.8 Standard of Construction Performance		1	2		
	2	19	13	2	

MDF

ASSESSMENT	Good	Fair	Poor	Blank	PROBLEMS ON SITE
1.1 Ability to conduct training in a systematic manner			2	1	Door in centre of wall BHH wish to fill area at the front of the shelter like a ramp as they wish to construct a veranda Sketch 5 Slow progress due to harvesting and sowing season Landlord pressures for working in fields Less space between ORS and adjacent Temple Addition of shelves in Walls
1.2.1 Skillful use of Flip Charts		1	2		
1.2.2 Skillful use of Illustration Board			2	1	
1.2.3 Skillful use of Material Samples			2	1	
1.3.1 Understanding of Methodologies Base	1		2		
1.3.2 Understanding of Methodologies Walls		1	2		
1.3.3 Understanding of Methodologies Roof			2	1	
1.4 Dissemination of Technical information			3		
1.5 Level of skill in providing explanation			3		
1.6 Handling of queries		2	1		
1.7 Level of general competence		1	2		
1.8 Standard of Construction Performance		1	2		
	1	6	25	4	

NWO

ASSESSMENT	Good	Fair	Poor	Blank	PROBLEMS ON SITE
1.1 Ability to conduct training in a systematic manner		1	1	1	Quality of Mud Saline or Sandy Shortage of water Slow progress due to harvesting and sowing season Tying of Lintols with binding wire Non-Availabilty of brick dust Reduce back wall size in mono-pitched roof Typology
1.2.1 Skillful use of Flip Charts	2		1		
1.2.2 Skillful use of Illustration Board			2	1	
1.2.3 Skillful use of Material Samples	2		1		
1.3.1 Understanding of Methodologies Base	1	2			
1.3.2 Understanding of Methodologies Walls		3			
1.3.3 Understanding of Methodologies Roof		1	1	1	
1.4 Dissemination of Technical information	1	1	1		
1.5 Level of skill in providing explanation		2	1		
1.6 Handling of queries			3		
1.7 Level of general competence		2	1		
1.8 Standard of Construction Performance	1	1	1		
	7	13	13	3	

SDI

ASSESSMENT	Good	Fair	Poor	Blank	PROBLEMS ON SITE
1.1 Ability to conduct training in a systematic manner	1	1	1		Quality of Mud Saline or Sandy Shortage of water Slow progress due to harvesting and sowing season Door opening along corner of room
1.2.1 Skillful use of Flip Charts	1		2		
1.2.2 Skillful use of Illustration Board	1		2		
1.2.3 Skillful use of Material Samples	1	1	1		
1.3.1 Understanding of Methodologies Base	1	1		1	
1.3.2 Understanding of Methodologies Walls		2		1	
1.3.3 Understanding of Methodologies Roof			2	1	
1.4 Dissemination of Technical information	1	1		1	
1.5 Level of skill in providing explanation	1		1	1	
1.6 Handling of queries		3			
1.7 Level of general competence		2		1	
1.8 Standard of Construction Performance		1	1	1	
	7	12	10	7	

SEAD

ASSESSMENT	Good	Fair	Poor	Blank	PROBLEMS ON SITE
1.1 Ability to conduct training in a systematic manner	2	1			Quality of mud Saline or Sandy Shortage of water Slow progress due to harvesting and sowing season etc.
1.2.1 Skillful use of Flip Charts	2	1			
1.2.2 Skillful use of Illustration Board	1	1		1	
1.2.3 Skillful use of Material Samples	1	1		1	
1.3.1 Understanding of methodologies Base	3				
1.3.2 Understanding of methodologies Walls	1	1		1	
1.3.3 Understanding of methodologies Roof		1		2	
1.4 Dissemination of Technical information	1	1		1	
1.5 Level of skill in providing explanation	1	1		1	
1.6 Handling of queries		3			
1.7 Level of general competence	1	2			
1.8 Standard of Construction Performance		2	1		
	13	15	1	7	

SOD

ASSESSMENT	Good	Fair	Poor	Blank	PROBLEMS ON SITE
1.1 Ability to conduct training in a systematic manner	1	2			Quality of mud Saline after mixing lime Opening placement along short wall Use of salvaged doors and windows Addition of veranda Common long wall with arch 7 Use of single piece of chid and plastic sheet for 2 units sharing long wall Joist placement on Common long wall Shortage of water; etc.
1.2.1 Skillful use of Flip Charts	1		2		
1.2.2 Skillful use of Illustration Board	2	1			
1.2.3 Skillful use of Material Samples	1		1	1	
1.3.1 Understanding of methodologies Base	2	1			
1.3.2 Understanding of methodologies Walls	2	1			
1.3.3 Understanding of methodologies Roof	1	1		1	
1.4 Dissemination of Technical information	2			1	
1.5 Level of skill in providing explanation	2			1	
1.6 Handling of queries		3			
1.7 Level of general competence	2			1	
1.8 Standard of Construction Performance		1	2		
	16	10	5	5	

SRDO

ASSESSMENT	Good	Fair	Poor	Blank	PROBLEMS ON SITE
1.1 Ability to conduct training in a systematic manner		1	1	1	Technical Team hired 10 days prior to workshop Problems similar to previously discussed
1.2.1 Skillful use of Flip Charts			2	1	
1.2.2 Skillful use of Illustration Board	1	1	1		
1.2.3 Skillful use of Material Samples		1	1	1	
1.3.1 Understanding of Methodologies Base	1	2			
1.3.2 Understanding of Methodologies Walls		1	2		
1.3.3 Understanding of Methodologies Roof		3			
1.4 Dissemination of Technical information	1	2			
1.5 Level of skill in providing explanation		3			
1.6 Handling of queries		3			
1.7 Level of general competence	1	2			
1.8 Standard of Construction Performance	1	1		1	
	5	20	7	4	

DAY 3 - 26TH APRIL, 2013

AHD

ASSESSMENT	Good	Fair	Poor	Blank	PROBLEMS ON SITE
1.1 Ability to conduct training in a systematic manner		2	1		Water Shortage Quality of Mud Sandy Termite Temporary migration during harvesting seasons Height of Chaura walls BHH concerned about high roof walls with respect to high wind pressure
1.2.1 Skillful use of Flip Charts		2	1		
1.2.2 Skillful use of Illustration Board			3		
1.2.3 Skillful use of Material Samples			2	1	
1.3.1 Understanding of Methodologies Base	2	1			
1.3.2 Understanding of Methodologies Walls	1	1	1		
1.3.3 Understanding of Methodologies Roof		2	1		
1.4 Dissemination of Technical information	1		2		
1.5 Level of skill in providing explanation		1	2		
1.6 Handling of queries		2	1		
1.7 Level of general competence	1	1	1		
1.8 Standard of Construction Performance		1	2		
	5	13	17	1	

BDO

ASSESSMENT	Good	Fair	Poor	Blank	PROBLEMS ON SITE
1.1 Ability to conduct training in a systematic manner	1		1	1	Water Shortage Quality of mudSandy Shortage of good quality Bamboo Lack of toolsdrilling holes–splitting bamboo difficult Height of Chaura walls IP introduced addition of billywooden peg in Chaura Typology Roof Sketch 6
1.2.1 Skillful use of Flip Charts			2	1	
1.2.2 Skillful use of Illustration Board	1	1	1		
1.2.3 Skillful use of Material Samples	1	2			
1.3.1 Understanding of MethodologiesBase	1		1	1	
1.3.2 Understanding of MethodologiesWalls	1		1	1	
1.3.3 Understanding of MethodologiesRoof			1	2	
1.4 Dissemination of Technical information	1		1	1	
1.5 Level of skill in providing explanation	1		1	1	
1.6 Handling of queries		1	2		
1.7 Level of general competence	1		2		
1.8 Standard of Construction Performance		1	2		
	8	5	15	8	

IFC

ASSESSMENT	Good	Fair	Poor	Blank	PROBLEMS ON SITE
1.1 Ability to conduct training in a systematic manner			2	1	Landlord not giving permission to collect soil
1.2.1 Skillful use of Flip Charts			2	1	
1.2.2 Skillful use of Illustration Board		1	2		
1.2.3 Skillful use of Material Samples			2	1	
1.3.1 Understanding of MethodologiesBase		1	1	1	
1.3.2 Understanding of MethodologiesWalls			3		
1.3.3 Understanding of MethodologiesRoof			2	1	
1.4 Dissemination of Technical information			3		
1.5 Level of skill in providing explanation			3		
1.6 Handling of queries			3		
1.7 Level of general competence			3		
1.8 Standard of Construction Performance			3		
	0	2	29	5	

Prepared Pakistan

ASSESSMENT	Good	Fair	Poor	Blank	PROBLEMS ON SITE
1.1 Ability to conduct training in a systematic manner	2	1			Water shortage Landlord not giving permission to collect soil Lack of tools Temporary migration due to elections Use local wood instead of bamboo in lintol Doors–windows in short wall Reduce back wall height in mono-pitched typology
1.2.1 Skillful use of Flip Charts			2	1	
1.2.2 Skillful use of Illustration Board	3				
1.2.3 Skillful use of Material Samples			1	2	
1.3.1 Understanding of Methodologies Base	1	2			
1.3.2 Understanding of Methodologies Walls	1	1		1	
1.3.3 Understanding of Methodologies Roof	2			1	
1.4 Dissemination of Technical information	2			1	
1.5 Level of skill in providing explanation	2	1			
1.6 Handling of queries	2	1			
1.7 Level of general competence	2	1			
1.8 Standard of Construction Performance	1	2			
	18	9	3	6	

PVDP

ASSESSMENT	Good	Fair	Poor	Blank	PROBLEMS ON SITE
1.1 Ability to conduct training in a systematic manner		2		1	Water shortage Landlord not giving permission to collect soil Unskilled labour Termite Reduce back wall height in mono-pitched typology
1.2.1 Skillful use of Flip Charts			2	1	
1.2.2 Skillful use of Illustration Board		1	2		
1.2.3 Skillful use of Material Samples			2	1	
1.3.1 Understanding of Methodologies Base	3				
1.3.2 Understanding of Methodologies Walls	1	1		1	
1.3.3 Understanding of Methodologies Roof		1		2	
1.4 Dissemination of Technical information	1	2			
1.5 Level of skill in providing explanation		3			
1.6 Handling of queries	1	2			
1.7 Level of general competence		3			
1.8 Standard of Construction Performance	1	2			
	7	17	6	6	

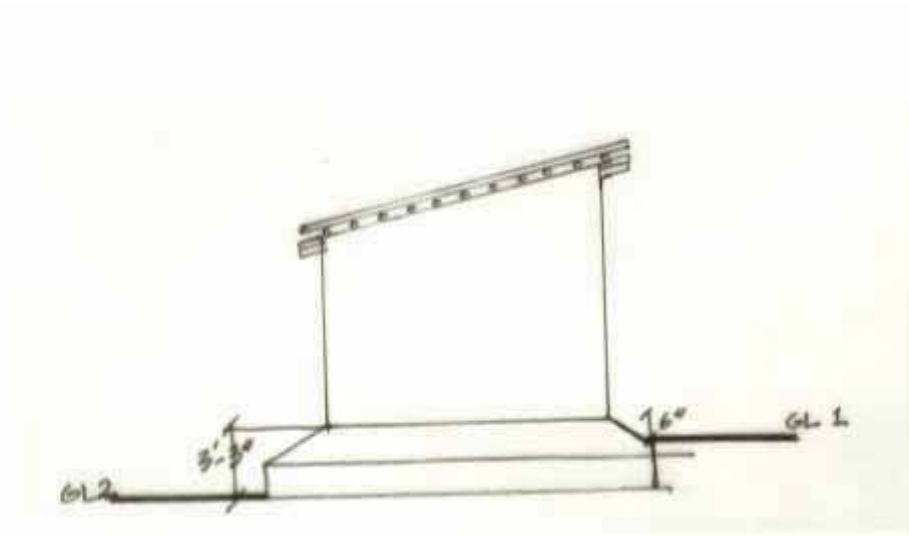
SAFWCO

ASSESSMENT	Good	Fair	Poor	Blank	PROBLEMS ON SITE
1.1 Ability to conduct training in a systematic manner		3			Water shortage Landlord not giving permission to collect soil Unskilled labour Placement of openings along corner of room
1.2.1 Skillful use of Flip Charts			1	2	
1.2.2 Skillful use of Illustration Board		3			
1.2.3 Skillful use of Material Samples			1	2	
1.3.1 Understanding of Methodologies Base	1	2			
1.3.2 Understanding of Methodologies Walls		2		1	
1.3.3 Understanding of Methodologies Roof			3		
1.4 Dissemination of Technical information		3			
1.5 Level of skill in providing explanation		3			
1.6 Handling of queries		1	2		
1.7 Level of general competence		3			
1.8 Standard of Construction Performance		3			
	1	23	7	5	

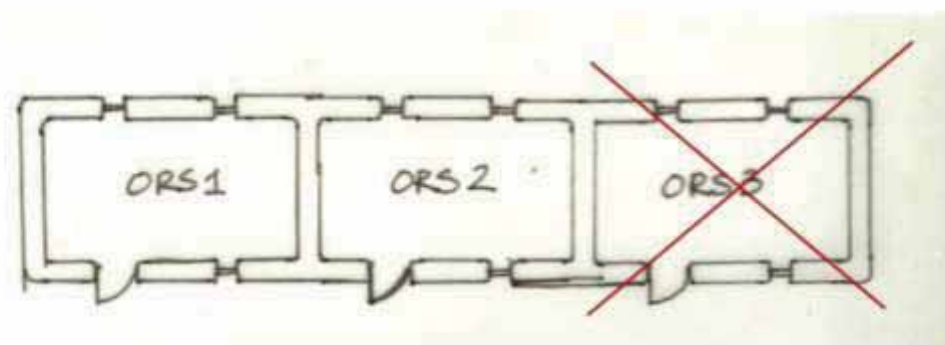
SPO

ASSESSMENT	Good	Fair	Poor	Blank	PROBLEMS ON SITE
1.1 Ability to conduct training in a systematic manner			3		Water shortage Quality of Soil Sandy Slow progress due to harvesting and sowing season Cracks in walls Placement of openings along short wall Non-availability of plots Back filling inside shelter i.e. flooring
1.2.1 Skillful use of Flip Charts		2	1		
1.2.2 Skillful use of Illustration Board	1	1	1		
1.2.3 Skillful use of Material Samples	2		1		
1.3.1 Understanding of Methodologies Base	1	2			
1.3.2 Understanding of Methodologies Walls			3		
1.3.3 Understanding of Methodologies Roof			1	2	
1.4 Dissemination of Technical information		1	2		
1.5 Level of skill in providing explanation		2	1		
1.6 Handling of queries			3		
1.7 Level of general competence		1	2		
1.8 Standard of Construction Performance		1	2		
	4	10	20	2	

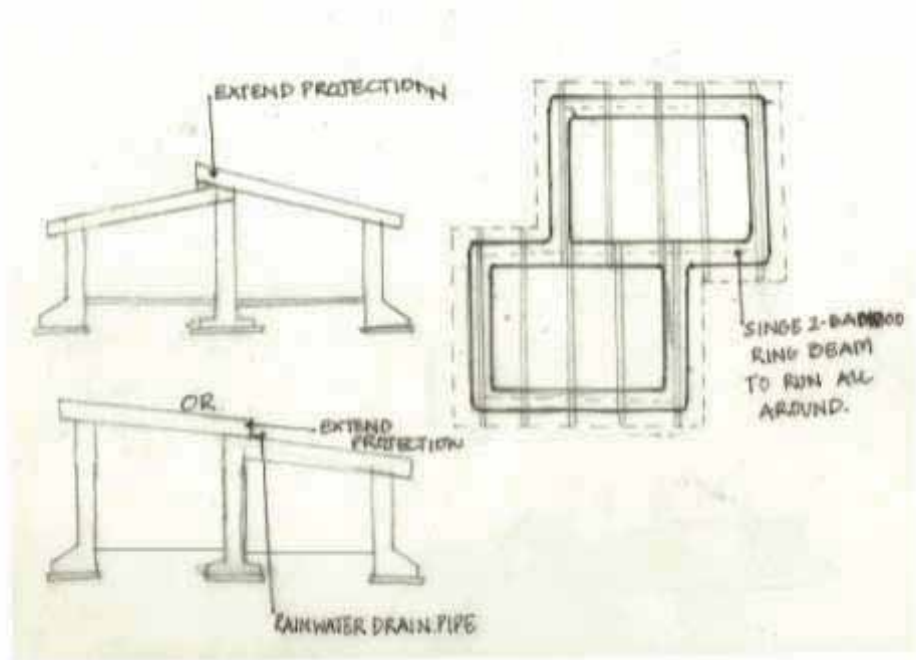
SKETCHES



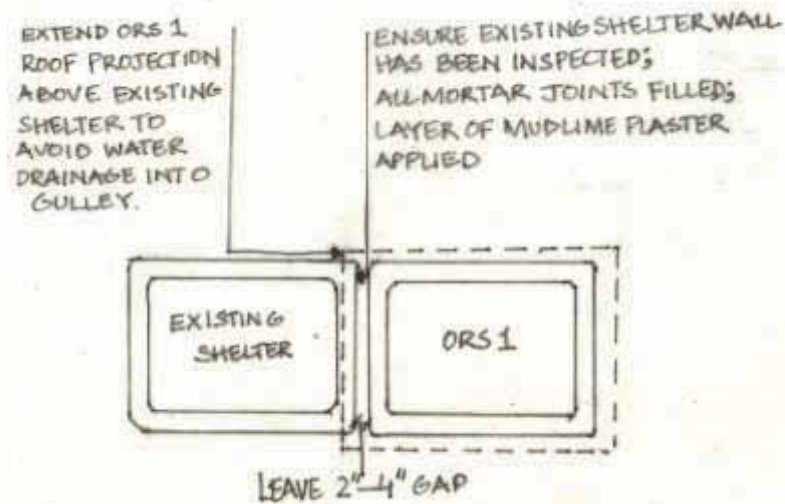
SKETCH 1: If foundations have been constructed on firm soil, and flood water drains from site, this may be allowed.



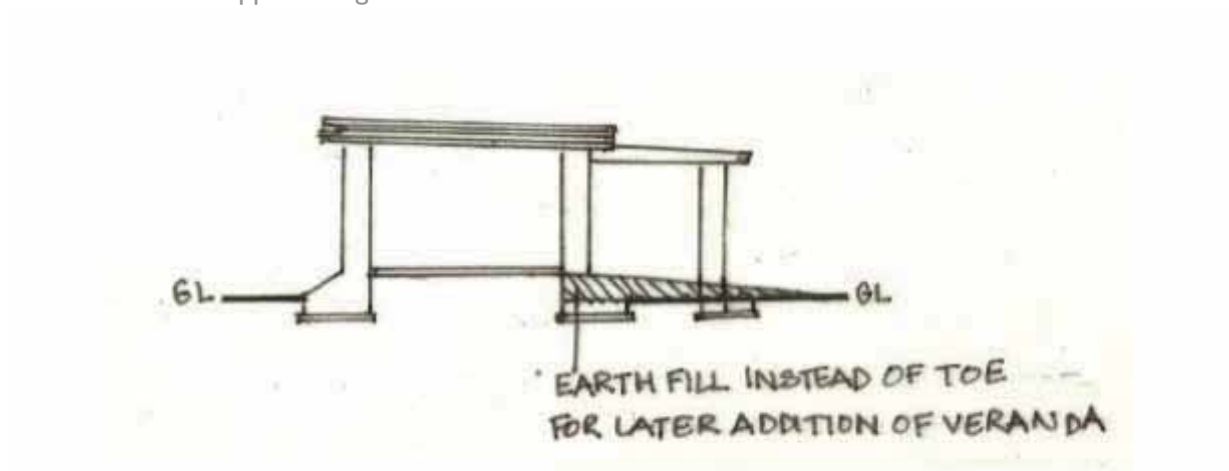
SKETCH: More than 2 shelters with common walls are not recommended.



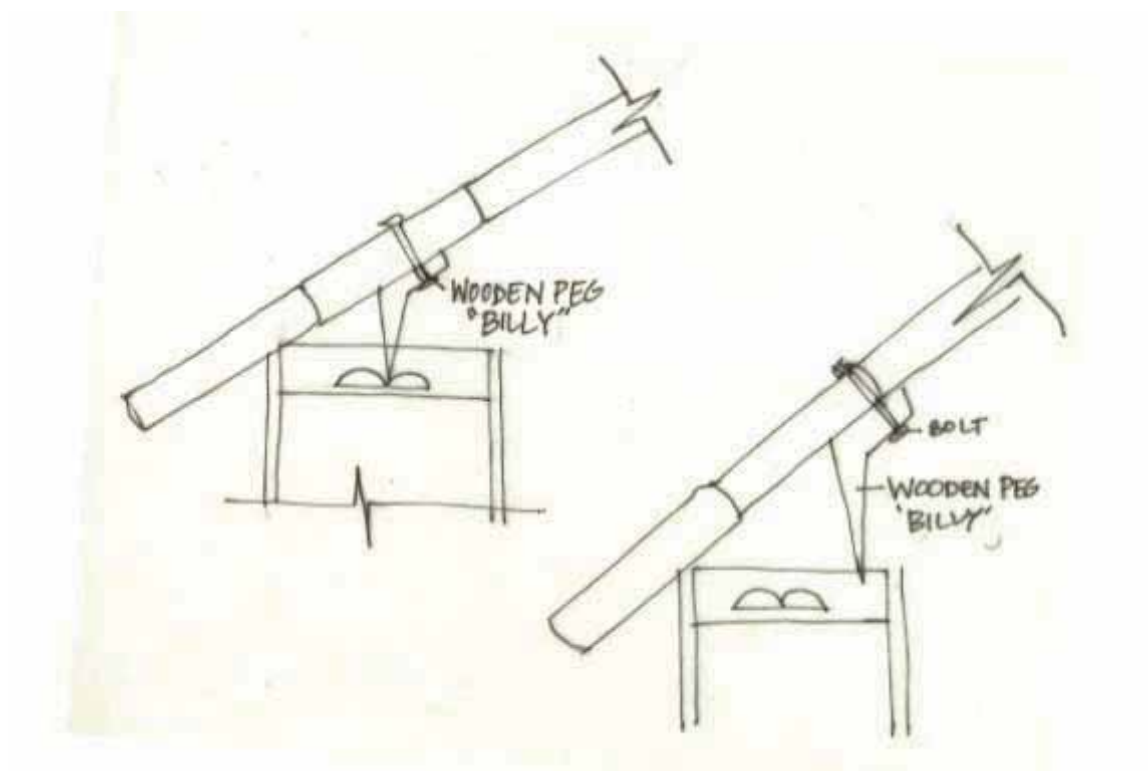
SKETCH 3: ORS shelters sharing long wall



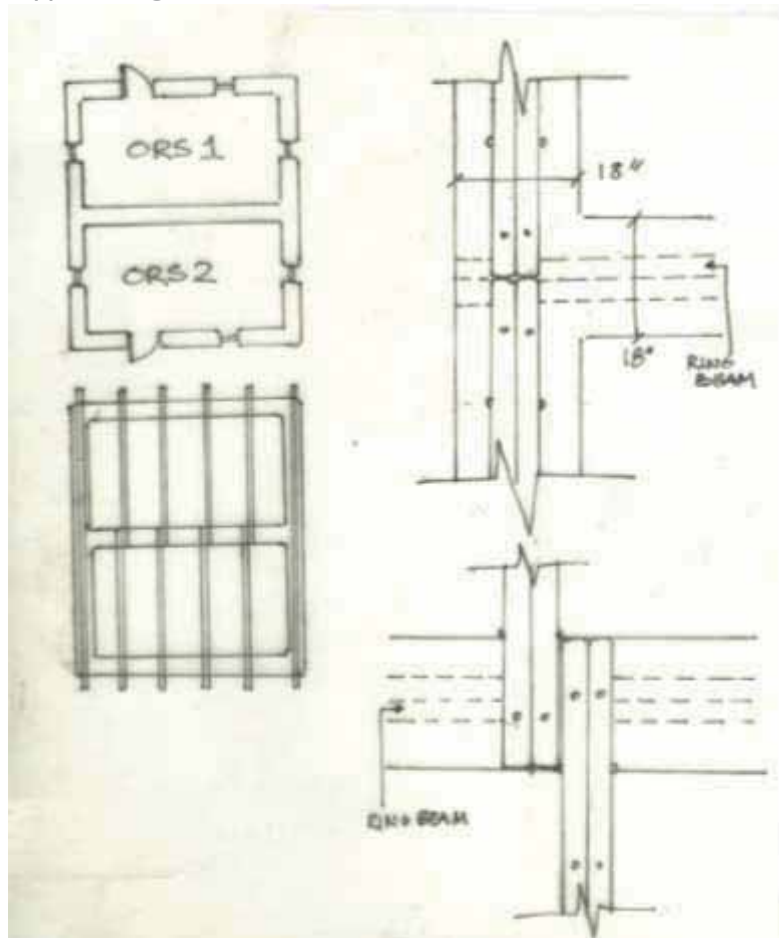
SKETCH 4: Close proximity of old and new shelter



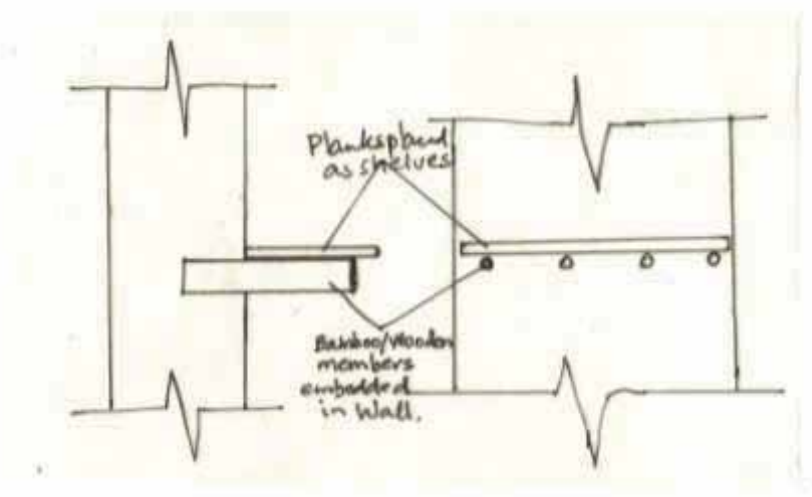
SKETCH 5: Earth fill instead of toe at the front of the ORS for later addition of Veranda



SKETCH 6: Use of Wooden peg NOT RECOMMENDED



SKETCH 7: 2 ORS sharing common long wall



SKETCH 8: Method to make shelves in wall.

HERITAGE FOUNDATION'S KEY FINDINGS AND RECOMMENDATIONS

20TH - 24TH MAY 2013

Heritage Foundation teams visited IPs based on Monitoring and Mentoring Work Schedule. HF teams evaluated IPs on the quality of Training (Roof) provided by them to the project beneficiaries and quality of construction of walls and placing of ring beams on site. IPs assisted included AHD, BASF, BDO, BHR I-LAP, NOW Prepared Pakistan, RDPI, SEAD and STNAH.

AHD – 20TH MAY: District: Tharparkar; Tehsil: Mithi; UC: Moharno;

Village: Rustam Khan Chandio

- The session was well conducted but the trainer did not mention the use of a water level to check the height of wall and the method of placement and importance of the bamboo joist.
- 2 shelters (Size: 12'x18') have been completed in the village. Shelters had been fixed with 4 bamboo joists and since walls had not been checked with a water level, the height of walls was uneven.
- Span of door was 4 feet.
- A heavy wooden log had been used as a lintel beam.
- 9" thick mud/lime brick masonry wall was missing at the edge of the toe.

RECOMMENDATIONS:

- Checking of walls with water level should be emphasized during training. Bamboo joists allow for the roof to be light therefore, placement and methodology of use should be well explained.
- Shelters exceeding a 10' span should have 6-bamboo joists. Please refer to Drawings shared with IOM for Joist placements in larger units.
- Door opening should be maximum 3'-6".
- Use of wooden beams/logs is not recommended.
- 9" thick mud/lime brick masonry wall should be constructed at the edge of the toe to ensure strength to wall during times of rain and flooding.

BDO – 20TH MAY: District: Tharparkar; Tehsil: Mithi; UC: Chelhar; First Visit to IP Project Area

Village: Chelhar Newabad

- Session was well conducted; IP trainer was able to discuss each aspect of roof construction.
- Toes have been constructed according to specifications.
- Wall lintel level has been kept at 5 feet.
- Project beneficiaries do not know the method for placing joists and ring beams for a conical roof.

RECOMMENDATIONS:

- Recommended height for lintels is 6'-9".
- Placement of joists and ring beams for conical roof is important for a strong roof.

BHR – 21ST MAY: District: Badin; Tehsil: Tando Bago; UC: Dada;

Village: Chuto Kambrani

- Session was conducted by IP trainer with the help of flip charts and sample materials. Trainer described each stage of roof construction with confidence.
- All units in the village have completed the walls construction.
- Toes are missing the 9" thick mud-lime brick masonry wall.
- Door opening size is 4 feet or more, resulting in the space between each joist to have increased.
- IP and IOM team has informed Hf that a similar condition of increased door opening size has been implemented in 50 other houses in various villages.

RECOMMENDATIONS:

- Toe construction should be completed with a 9" thick mud-lime brick masonry wall.
- Door opening size should not be more than 3'-6". The door size should be reduced and joists placed as per drawings issued by HF.

PREPARED PAKISTAN– 21ST MAY: District: Badin; Tehsil: Talhar; UC: Rajo Khanani;

Village: Haji Metlo

- Session was well conducted. Trainer capability to impart knowledge and conduct work on site has improved greatly since HF's last visit.
- All units (size: 10' x 14') in the village are at the finishing stage of the walls.
- Base and wall along with placement of ring beams and tying of roof members has been undertaken with HF specifications except 9" lime-mud brick masonry wall at the edge of the toe.

RDPI – 22ND MAY: District: Mirpur Khas; Tehsil: Digri; UC: Phaban;

Village: Mandrawala

- All Focal persons attended the session. The trainer was unable to discuss the method of roof construction. He had difficulty in explaining the method of fabricating the ring beam and its placement for both mud wall and loh-khat wall structures. IP has not improved quality of training or construction since last visit.
- 9" mud-lime brick masonry wall at the edge of the toe was missing.
- Door opening sizes were above 4' in width.
- A termite ridden wooden lintel was used in one of the houses with 1 inch overlap.
- Wall heights had not been checked with water level.
- There was no preparation for placement of ring beam.

RECOMMENDATIONS:

- The 9" mud-lime brick masonry wall at the edge of the toe is essential to ensure strength of inner core of wall.
- Door sizes should be 3' to 3'-6".
- Use of wood is not recommended, In case of wooden lintels, Beneficiaries must have the member inspected by the IOM Technical team.
- Wall heights should be checked with a water level.

STNAH– 22ND MAY: District: Umerkot; Tehsil: Samaro; UC: Padario;

Village: Mir M. Talpur

- Session as conducted by Focal person Partab from Village Sooro Hayat from UC Hyder Khoso. All Fps were very well organized and well versed with the roof construction. FP used material samples to explain methods for constructing the roof.
- One unit has been prepared by the IP as a demonstration unit that can be used for reference purposes.
- Base, Walls Lintels, Ring beams, purlins, and Joists have been placed according to HF specifications.

NWO – 23RD MAY: District: Badin; Tehsil: Badin; UC: Kadan;

Village: Thair Bajeer

- FPs for all 520 units were present. Trainer discussed all stages of the roof construction in detail.
- Units in the village have been completed till the wall tops.
- 9" thick mud masonry wall has not been constructed at the edge of the base. In some cases the toe is only 6" in width.
- Mud masonry used to construct wall is of poor quality. Bonding patterns have not been used.
- Bamboo used for lintel beam was of poor quality.
- Ring beam placement of only one shelter was undertaken according to specifications.

RECOMMENDATIONS:

- Toe should be 3'-6" from the outer edge of the wall. A 9inch thick mud-lime brick masonry wall at the edge of the toe prevents water seepage into the core of the wall.
- Mud masonry walls should follow a bonding pattern.
- For lintel placement: good quality bamboo should be tied with a binding wire and placed over the door opening with 1 foot overlap on both edges.
- IP should improve quality of construction.

SEAD – 23RD MAY: District: Badin; Tehsil: Talhar; UC: Saeedpur;

Village: Umer Khaskheli

- Session was attended by Focal Persons from all villages and beneficiaries from village Umer Khaskheli. Trainer conducted the session well.
- Toe, wall alignments and heights, opening sizes and placement of lintels for Mud wall construction was according to HF specifications. Beneficiaries have also constructed shelves inside their homes.
- Units using Loh-khat shelter were in poor condition. Vertical posts had not been aligned. Cross bracing had not been undertaken. And ring beam had not been tied with the vertical posts.
- Ip has requested further guidance in Loh-khat shelter construction.

RECOMMENDATIONS:

- Loh Khat typology shelters should be corrected based on HF specifications and recommendations. IPs may visit Eco-Village Moak Sharif to understand loh-khat construction methodology or may send a list of queries to IOM to be forwarded to HF.

BASF – 24TH MAY: District: Badin; Tehsil: Badin; UC: Gharo;

Village: Ramzan Abaro

- FPs for all units were present. Trainer discussed all stages of the roof construction according to HF guidelines. An FP conducted the training on placements of ring beams.
- Ring beams were being placed in all the units (size: 10' x 14') in the village.
- Construction of base and walls had been completed according to HF specifications.

I-LAP – 24TH MAY: District: Badin; Tehsil: Badin; UC: Nindo Khaskheli;

Village: MOSO Khaskheli

- FPs for all units were present for the session which was well conducted using material samples to explain methodology.
- Ring beams were being placed on all the units (size: 12' x 14') in the village.
- Construction of base and walls had been completed according to HF specifications.

HERITAGE FOUNDATION'S KEY FINDINGS AND RECOMMENDATIONS

27TH – 30TH MAY 2013

Heritage Foundation teams visited IPs based on Monitoring and Mentoring Work Schedule. HF teams evaluated IPs on the quality of Training provided by them to the project beneficiaries and quality of construction of walls on site. IPs assisted included BDRO, SOD, CRDO, SDTS, LAMP, M. Aid, PVDP, SAFWCO

BDRO–27TH MAY: District: Umerkot; Tehsil: Konari; UC: Bustan;

Village: Shafqat Dhani

- The session included 24 Focal Persons and 50 female beneficiaries. Trainer held the session with great detail showing sample materials.
- 11 shelters in the village were checked for compliance.
- Walls had been constructed without the use of tools therefore walls were tapering, i.e. 18" thick at the bottom and 9" on the top.
- Openings left for doors and windows were not as per requirements.
- Lintols used above openings were of poor quality.

RECOMMENDATIONS:

- It is commendable that BDRO has taken the initiative to involve the female members of the community in the training sessions. This will act as a positive change in the social structure of the community. Other IPs should also encourage female participation.
- Wall should be uniform in thickness for the entire height of the wall.
- Door openings should be 3'-6" and windows should not exceed 2' x 2'.
- The use of tools and layout templates is essential.
- Good quality lintols should be used to ensure that openings in walls should not cave in.
- Non saline soil and potable water must be used for construction.

SOD – 27TH MAY: District: Umerkot; Tehsil: Konari; UC: Sher Khan Chandio;

Village: Bachal Kham Chandio

- IP trainer conducted the session with the help of visual aids and material samples.
- 25 houses in the village (size 10' x 14') have been completed to ring beam preparations. All stages of construction have been carried out as per HF guidelines.

CRDO – 28TH MAY: District: Badin; Tehsil: Samaro; UC: Samaro; Second Visit to IP Project Area

Village: Allah Rakio Donkae

- All focal persons were present for the session. IP had flip charts in an organized fashion ready for use and trainer was able to conduct the session well using material samples as visual aids.
- 12 units have been checked for compliance at the village.
- Progress in the village is slow, with only two shelters up to lintel level, while some shelters have reached 4'-5' height in walls and other still at base.
- Door and window sizes have been undertaken as per guidelines.
- No preparations have been made for ring beam and roof joists.

RECOMMENDATIONS:

- IP teams should mobilize the village to speed up the process of construction if they are to complete the shelters in programme timeline.

STDS – 28TH MAY: District: Badin; Tehsil: Jhudo; UC: Roshanabad;

Village: Ramzan Khoso

- Session was attended by all FPs of the area. The trainer conducted each stage of the shelter in great detail with material samples. IPs had constructed a sample wall to better explain the method for construction, i.e. bonding patterns, preparation for ring beam and joists.
- Room sizes vary from 10' x 14', 10' x 15'-6" to 10' x 16'.
- Walls had been constructed without the use of proper tools, therefore walls were not uniform in thickness.
- Lintols did not have a 1' overlap on walls.
- No preparation for ring beam and roof joists had been made.
- Beneficiaries had decorated their units with plaster motifs but they require further guidelines from the IPs for better construction quality.

RECOMMENDATIONS:

- Construction should be undertaken with the help of tools.
- All walls should be 18" in thickness.
- IPs should mobilize beneficiaries to speed up construction of shelters if they are to be completed within the project timeline.

LAMP – 29TH MAY: District: Mirpur Khas; Tehsil: Digri; UC: Kangro;

Village: Raees Atta Muhammad

- Session was attended by 20 of 46 Focal persons. 21 loh-khat shelters, 1 Chaura Units and remaining 978 units are of mud typology. IP changed the village to be checked without giving prior notice to HF or IOM. Session trainer was unable to explain various stages of construction i.e. lintol and ring beams and their placements.
- Work progress is slow.
- Lintols had been placed in only two of the units and with an overlap of 2" on windows and 4"-6" on doors.
- Beneficiaries lacking understanding of methodology of placement and preparation of ring beam and construction of roof.

RECOMMENDATIONS:

- IPs should mobilize community to speed up construction of units if they are to complete shelters in time with project deadline. Further training should also be incorporated as beneficiaries lack understanding in methodologies.
- Lintols used should overlap 1' on both sides of the opening.

M. AID – 29TH MAY: District: Mirpur Khas; Tehsil: Digri; UC: Tando Jan Muhammad;

Village: Muhammas Saleh Dal

- IP trainer was unable to explain the methodology of roof construction. Due to lack of material samples, all focal persons present were unable to understand the information being disseminated. Queries raised by trainees were not answered as trainer was unaware of the details of the methodology.
- HF teams did not find any sign of lime use in the construction.
- Construction has been undertaken with mud blocks sized 12" x 5" x 6".
- Walls of units constructed with layered mud were not uniform in thickness due to lack of proper tools for monitoring construction.
- Beneficiaries were unaware of the use of string and plumb line for monitoring construction.
- Lintols used for construction were of poor quality and ridden with termite.

RECOMMENDATIONS:

- Trainer should be well versed in the construction typologies.
- The use of lime is essential to the programme and has been emphasized constantly. IPs should ensure its use as per guidelines.
- HF guidelines suggest that mud brick module size should be no larger than 9" x 4.5" x 3".
- All walls should be 18" in thickness. Thickness of walls can be maintained using string and plumb line.
- Poor quality lintols should be replaced with good quality bamboo tied together with binding wire. Lintols should have a 1 foot overlap on either side of the opening.
- IP should mobilize beneficiaries to undertake construction in a more efficient manner to ensure that the construction is completed within project timeline.

PVDP – 30TH MAY: District: Badin; Tehsil: Talhar; UC: Rajo Khanani;

Village: Kamo Kholi

- The trainer began the session from the walls but could not explain the construction of walls with accuracy. He was also unable to instruct the trainees correctly with regard to the lintols, ring beams, and roof construction. Queries raised by beneficiaries were also left unanswered.
- All 42 units in the village had been constructed with mud bricks.
- HF teams observed lack of use of lime at the base.
- Mud lime brick had not been used at the edge of the toe.
- A critical error was found when wall heights for one unit were measured which were 13'-6". Another unit's walls measured between 7' and 7'-6".
- Poor quality lintols had been used over openings with an overlap of 4" only.
- Wall thickness in one unit was 13'-6".
- No preparation for ring beams in the village

RECOMMENDATIONS:

- The use of lime is essential to the programme. All IPs are requested to emphasize the importance of its use.
- The mud lime brick at the edge of the toe provides necessary strength to the base during times of flooding.
- Wall width should be maintained as 18" taking care to use a plumb and string to ensure uniform thickness.
- Wall heights have been advised in Technical Support Manual and should be followed as per typology.
- Poor quality lintols should be replaced with good quality bamboo tied together with binding wire. Lintols should have a 1 foot overlap on either side of the opening.
- IP should mobilize beneficiaries to undertake construction in a more efficient manner to ensure that the construction is completed within project timeline.

SAFWCO – 30TH MAY: District: Badin; Tehsil: Takhar; UC: Pero Lashari;

Village: Ahmed Khan Chandio

- 21 of 23 FPs were present at the site. Session was well conducted, with the trainer beginning the discussion from wall construction up to completing the roof and final finishing with plaster. Two female social mobilizers present were also part of the session and were able to further motivate the community to undertake construction before end of project timeline.
- All 21 units (size 10' x 14') in the village had been completed till the tops of walls as per Hf guidelines.
- Ring beams had been fabricated and pockets had been made ready for installation of beams.

HERITAGE FOUNDATION'S KEY FINDINGS AND RECOMMENDATIONS

3RD – 5TH JUNE 2013

Heritage Foundation teams visited IPs based on Monitoring and Mentoring Work Schedule. HF teams evaluated IPs on the quality of their Training for roof construction to the project beneficiaries and quality of construction of walls on site. IPs assisted included LHDP, MOJAZ, SRDO, MDF, IFC, SPO and SDI.

LHDP–3RD JUNE: District: Badin; Tehsil: Shaheed Fazal; UC: Gharo;

Village: Dudu Malha

- The session conducted by the IP lacked understanding as trainer has been recently employed and was not well versed in the methodology.
- All construction monitored in village was as per HF guidelines.

RECOMMENDATIONS:

- New employees should examine resource material and may be briefed by their supervisors/colleagues to ensure that training sessions disseminate correct information to beneficiaries.

MOJAZ – 3RD JUNE: District: Badin; Tehsil: Talhar; UC: Pero Lashari;

Village: Thair Khaskheli

- IP trainer conducted the session with the help of visual aids and material samples.
- This is the second visit to this village. Work progress has been brought to speed as walls had not been started during previous visit.
- Room sizes varied from 11' x 14', 12' x 14' and 10' x 13'.
- Wall thickness was not uniform reducing from 18" at the base to 12"-13" at the top.
- 9" mud lime brick masonry wall at the outer edge of the toe was missing.
- Lintols, doors and windows installed according to HF guidelines.

RECOMMENDATIONS:

- Wall should be constructed using tools such as plumb line and string to ensure wall thicknesses are uniform.
- Mud lime brick masonry wall at the edge of the toes protects the core of walls and ensures strength during times of flooding.

MDF – 4TH JUNE: District: Badin; Tehsil: Matli; UC: Bhudo Kambrani;

Village: Jani Khan Jarar

- All focal persons were present for the session. IP trainer was able to conduct the session well using material samples as visual aids.
- 17 units (size: 10' x 14') in the village have completed construction of walls.
- 9" mud lime brick masonry wall at the outer edge of the toe was missing.
- Walls constructed with layered mud were less than 18" thick while mud brick walls were 18" thick.
- Height of opening for door was 5'-9".
- Wooden lintels used were termite infested, and overlap on either side of the opening was less than 2".

RECOMMENDATIONS:

- Mud lime brick masonry wall at the edge of the toes protects the core of walls and ensures strength during times of flooding.
- Wall constructed in both mud brick masonry and layered mud should be at least 18" thick. Wall thickness should be constantly monitored during construction with the help of a string and plumb line.
- Door opening heights have been recommended as 7'.
- Poor quality lintols should be replaced with good quality bamboo tied together with binding wire. Lintols should have a 1 foot overlap on either side of the opening.

SRDO – 4TH JUNE: District: Badin; Tehsil: Budho Kambrani; UC: Budho Kambrani;

Village: Dhodhal Jaskhani

- Session was attended by all FPs of the area and beneficiaries of the village. The session was well conducted and the trainer was able to discuss construction methodology for walls, lintel, ring beam and roof finishing.
- 24 shelters in the village had been completed till ring beam in which three has begun installing the kabla and ring beam.
- 9" mud lime brick masonry wall at the outer edge of the toe was missing.
- Walls had been constructed without the use of proper tools, therefore walls were not aligned. This led to the room size to increase to 10'-6" x 14'-6".

RECOMMENDATIONS:

- Mud lime brick masonry wall at the edge of the toes protects the core of walls and ensures strength during times of flooding.
- All walls should be 18" in thickness. Wall thickness should be constantly monitored during construction with the help of a string and plumb line.

IFC – 5TH JUNE District: Tando Muhammad Khan; Tehsil: Tando Ghulam Haider; UC: Dando;

Village: Karim Bux Nizmani

- The trainer began the session from the walls but could not explain the construction of walls with accuracy. He was also unable to instruct the trainees correctly with regard to the lintols, ring beams, and roof construction. Focal persons did not display much interest during the session.
- All 17 units in the village have been constructed with mud brick.
- Walls have not been begun from corners and do not follow a proper bonding pattern.
- Lintel levels have been maintained at 6'-9". Multiple bamboo tying method not followed. Lintel overlap on either side of the openings is insufficient.
- Beneficiaries paying masons Rs. 600 per day to complete construction, but work quality is poor and construction standard in the village is poor.

RECOMMENDATIONS:

- Wall width should be maintained as 18" taking care to use a plumb and string to ensure uniform thickness.
- Wall heights have been advised in Technical Support Manual and should be followed as per typology.
- Poor quality lintols should be replaced with good quality bamboo tied together with binding wire. Lintols should have a 1 foot overlap on either side of the opening. Bamboo tying method has been specified in the Technical support manual and Flip charts.
- IP should mobilize beneficiaries to undertake construction in a more efficient manner to ensure that the construction is completed within project timeline.

SDI – 5TH JUNE: District: Badin; Tehsil: Takhar; UC: Saeedpur;

Village: Khuda Bux Khaskheli

- All FPs were present at the site. Session was well conducted, with the trainer beginning the discussion from wall construction up to completing the roof.
- Only three units have been constructed in the village.
- 9" mud brick masonry wall at the edge of the toe is missing.
- Walls are not aligned as no tools were used to check walls during construction.
- Lintel tying method incorrect as there is no use of kabla, string or binding wires.
- Poor quality bamboo has also been used for lintols.

RECOMMENDATIONS:

- Mud lime brick masonry wall at the edge of the toes protects the core of walls and ensures strength during times of flooding.
- Wall width should be maintained as 18" taking care to use a plumb and string to ensure uniform thickness.
- Wall heights have been advised in Technical Support Manual and should be followed as per typology.

- Poor quality lintols should be replaced with good quality bamboo tied together with binding wire. Lintols should have a 1 foot overlap on either side of the opening. Bamboo tying method has been specified in the Technical support manual and Flip charts.
- IP should mobilize beneficiaries to undertake construction in a more efficient manner to ensure that the construction is completed within project timeline.

SPO – 5TH JUNE: District: Tando Muhammad Khan; Tehsil: Tando Ghulam Haider; UC: Tando Ghulam Haider;

Village: Muhammad Oto

- Session was well conducted, with the trainer beginning the discussion from wall construction up to completing the roof using material samples.
- Walls have not been begun from corners. Walls thicknesses are less than 18" as no tools i.e. plumbline and string were used to check walls during construction.
- Lintel tying method incorrect as there is no use of kabla, string or binding wires. Overlap on either side of the opening and not been undertaken.
- Ring beams have been installed.
- Distance left between pockets for placement of joists is 5'-6".
- No ventilators for cross ventilation have been left in any of the shelters in the village.

RECOMMENDATIONS:

- Walls should be begun from corners.
- Wall width should be maintained as 18" taking care to use a plumb and string to ensure uniform thickness.
- Wall heights have been advised in Technical Support Manual and should be followed as per typology.
- Poor quality lintols should be replaced with good quality bamboo tied together with binding wire. Lintols should have a 1 foot overlap on either side of the opening. Bamboo tying method has been specified in the Technical support manual and Flip charts.
- Please follow drawings shared with IOM for joists placements for different shelter sizes.
- Ventilators should be constructed in all shelters to provide cross ventilation.
- IP should mobilize beneficiaries to undertake construction in a more efficient manner to ensure that the construction is completed within project timeline.



HERITAGE FOUNDATION'S DRR - COMPLIANT SUSTAINABLE CONSTRUCTION

BUILD BACK SAFER WITH VERNACULAR METHODOLOGIES

Annexure F

BBS Forms for Construction Progress on Site



District

Tehsil

Union Council

Village

GPS Location

Nearest Market for Purchases

Implementing Partner

IP Representative

Contact No.

Estimated Village Population

Village Focal Person

Contact No.

No. of Existing Shelters:

No. of Shelters to be Constructed:

Existing Shelter Typology:

☐ Mud ☐ Loh Khat ☐ Burnt Brick ☐ Bamboo ☐ Wood

Existing Roof Typology:

☐ Flat Roof ☐ Mono-Pitched Roof ☐ Double Pitched Roof ☐ Conical Chaura Roof

Materials Available:

Nature of Soil:

Depth of Firm Soil:

Water Table Level:

Maximum Flood Level:

Samples:

☐ Water ☐ Soil ☐ Sand ☐ Bamboo

HH Preferred Typology:

☐ A1 ☐ A2 ☐ A3 ☐ A4 ☐ B1 ☐ B2 ☐ B3 ☐ Other

Remarks:

Heritage Foundation Rep.

Date

IOM - IP Rep.

A blank sheet of graph paper with a light gray background and a faint grid of thin gray lines. The grid consists of small squares covering the entire page. There are no margins or other markings on the paper.

Sketches/Drawings

A full-page sheet of white graph paper with a light gray grid. The grid consists of small squares, approximately 10 units wide by 10 units high. There are no margins or additional markings on the page.

<i>District</i>	<i>Tehsil</i>	<i>Union Council</i>	<i>Shelter Typology</i>
<i>Village</i>	<i>GPS Location</i>	<i>Implementing Partner</i>	<i>Date of Visit</i>

SITE &SHELTER TYPOLOGY SELECTION

Is the site on higher ground

Is the orientation of shelter north south

Are preparation for platform (6" above highest recorded flood level) made in case of non-accessible roofs

Has the Layout been marked with the Layout Template

Kit that includes:

- String mould according to house size
- Guniya Template – 3:4:5
- Lime Powder

Has a lime pit been made, soaked with water for one day and slaking process started

Before Starting Construction Determine Typology of Shelter

- Karavan Roofs require 12"-18" (300mm-450mm) Plinth
- Non-accessible Roofs require: min. 3'3" (1m) Platform

SHELTER CONSTRUCTION USING ADOBE/MUD WALLS

I. Base Preparation

Check if the top soil 6" (150mm) has been removed.

Check if the base trenches have been dug to a depth of 1'6" (450mm).

Check if the bottom of the trench has been compacted by tamping effectively.

Check if lime concrete base lime: sand: aggregate (1:2:4) been laid.

Check if the base has been checked with water level before starting masonry.

2. Construction of Base and Toe

Mortar of soil and water should be mixed for 4 days to 1 week prior to application.

Check if 9" (275mm) mud brick masonry at edge of base has been started.

Check if wall has been begun from the corners.

Check if bond in masonry has been maintained.

Check if the filling in the base is of layered lime-mud (1:6) mixed with chopped straw.

Check if a slope of 30 degrees has been maintained in the toe up to plinth level.

Check that in the case of Karavan Roof plinth level is min. 1'-6" (450mm); in case of non-accessible roofs the platform is min. 3'3" (1m).

Check that the toe level is the same as the floor level.

SHELTER CONSTRUCTION USING REED/LOH KHAT WALLS

I. Base Preparation

Check if the top soil 6" (150mm) has been removed.

Check if the base trenches have been dug to a depth of 1'6" (450mm).

Check if the bottom of the trench has been compacted by tamping effectively.

2. Construction of Base and Toe

Check that the pad (lime concrete (1:2:3) or burnt brick) is 18"x18" (450mmx450mm).

Check that the pad is taken 18" (450mm) below ground.

Check that the bamboo posts are anchored in the pad with 15" (400mm) steel bar.

Check that the steel bar and bamboo posts have been grouted properly.

Check that the bamboo plinth beam (dhassa) been placed in the centre of the wall.

Check if a slope of 30 degrees has been maintained in the toe up to plinth level.

Check that in the case of Karavan Roof plinth level is min. 1'-6" (450mm); in case of non-accessible roofs the platform is min. 3'3" (1m).

Check that the toe level is the same as the floor level.

[illegible]

[illegible]

Photographs

[illegible]

SHELTER CONSTRUCTION USING LOH-KHAT WALLS

I. Raise Wall to Lintel Level

Check that the bamboo plinth beam (dhassa) been placed in the centre of the wall.

Check that the reed/khat has been attached securely to the bamboo skeleton with a rope.

Check that the horizontal khat rope has been tied with rope at 2' (600mm) centres.

Check that thickness wall is maintained.

Check that the lintol level is maintained at 7' (2100mm).

Check that multiple bamboo lintol extends 1' (300mm) on both sides of door or window opening.

Check that the door has a width of min. 3' (900mm) and window of min. 1'6" (450mm).

2. Check Wall Heights with Water Level

KaravanRoof – Front wall at 8' (2400mm); Rear wall at 8'6" (2550).

Mono-pitched roof – Front wall at 8' (2400mm); Rear wall at 11' (3300mm).

Double-pitched roof – 8' (2400mm) height all around.

KaravanChaura – 8' (2400mm) height all around.

3. Wall Plaster

Check that soil is tested with 'Bottle Test'.

Check if sand has been added in case clay content is high.

Check that soil has been soaked 1 week prior to application

Check that long stick straw (bhoosa) has been added (short stick straw should be avoided).

Check that plaster is shaded and kept damp from direct heat and sunlight. Install by gunny bags, old blankets or other shading device hung from the roof.

Check that curing is carried out for min. one week after application.

Drawing/Sketch

[illegible]

[illegible]

Photographs

ROOF FINISH

I.Application of Roof Finishes

- Check that reed matting on bamboo purlins covers entire surface including projections.
- Check that polythene sheet min. 3mm thickness covers the entire matting surface.
- Check that 2" (50mm) thick lime: sand: brickdust (1:2:4) layer is applied on accessible KaravanRoofs.
- Check that 2" (50mm) thick lime: sand: soil (1:2:3) layer is applied on in-accessible roofs except conical roofs.
- Check that grass is used to stabilize roof edges.

2. Curing of Lime Roof Finish

- Protect top finishing layer from direct heat and sunlight by use of jute or plastic sheet.
- Check that curing is carried out for a minimum 7 days.

FLOORING

- ### I. Earth filling
- Check earth is laid in 6" (150mm) layers and fully compacted.
Check level of base of floor with water level to ensure 2" (50mm) slope towards the door opening.

2. Mud-Lime Layer

- Check base layer of 3" (75mm) thickness of lime: sand: gravel (1:2:3).
- Check finishing layer of 2-1/2" (63mm) thickness of lime: sand: earth (1:2:3).
- Check finishing layer with water level to ensure with 2"(50mm) slope towards the door opening.

3. Protection for Curing

- Check if flooring is protected from direct heat and sunlight.
- Check if curing has been carried out for one week.

Drawing/Sketch

A full-page sheet of white graph paper with a light gray grid. The grid consists of small squares, approximately 1 cm by 1 cm each. There are 20 columns and 20 rows of squares. A vertical margin line is present on the left side, creating a narrow column of 2 squares wide. A horizontal margin line is present at the top, creating a row of 2 squares high. The margins are consistent on all sides.

[illegible]

Photographs



HERITAGE FOUNDATION'S DRR - COMPLIANT SUSTAINABLE CONSTRUCTION

BUILD BACK SAFER WITH VERNACULAR METHODOLOGIES

Annexure G
IP Evaluation Database



BUILD BACK SAFER WITH VERNACULAR METHODOLOGIES

IP Evaluation Form

IP Name: _____

1.1	Ability to conduct training in a systematic manner:	<input type="checkbox"/> Good	<input type="checkbox"/> Fair	<input type="checkbox"/> Poor
1.2	Skilful use of Visual Aids:			
1.2.1	Flip charts	<input type="checkbox"/> Good	<input type="checkbox"/> Fair	<input type="checkbox"/> Poor
1.2.2	Illustration Board	<input type="checkbox"/> Good	<input type="checkbox"/> Fair	<input type="checkbox"/> Poor
1.2.3	Material Samples	<input type="checkbox"/> Good	<input type="checkbox"/> Fair	<input type="checkbox"/> Poor
1.3	Understanding of Methodologies:			
1.3.1	Base	<input type="checkbox"/> Good	<input type="checkbox"/> Fair	<input type="checkbox"/> Poor
1.3.2	Walls	<input type="checkbox"/> Good	<input type="checkbox"/> Fair	<input type="checkbox"/> Poor
1.3.3	Roofs	<input type="checkbox"/> Good	<input type="checkbox"/> Fair	<input type="checkbox"/> Poor
1.4	Capability in dissemination of technical information	<input type="checkbox"/> Good	<input type="checkbox"/> Fair	<input type="checkbox"/> Poor
1.5	Level of skill in providing explanation	<input type="checkbox"/> Good	<input type="checkbox"/> Fair	<input type="checkbox"/> Poor
1.6	Handling of queries	<input type="checkbox"/> Good	<input type="checkbox"/> Fair	<input type="checkbox"/> Poor
1.7	Level of general competence	<input type="checkbox"/> Good	<input type="checkbox"/> Fair	<input type="checkbox"/> Poor
1.8	Standard of construction performance	<input type="checkbox"/> Good	<input type="checkbox"/> Fair	<input type="checkbox"/> Poor

General Comments: _____

Form Filled by: _____

Date: _____



SHNo	Date	JPIN/IME	Evaluation	Good	Fair	Poor	Blank	Problems/Issue
DAILY								
L	OP/HT	B/SF			1	2		Poor quality Bamboo;
			1.1 Ability to conduct training in a systematic manner			2	1	quality of mud/ Either Saline or Sandy
			1.2.1 Skillful use of Flip Charts			2	1	Lack of permission to collect soil;
			1.2.2 Skillful use of Illustration Board	1	1		1	Higher Cost of materials;
			1.2.3 Skillful use of Material Samples		1	1	1	
			1.3.1 Understanding of Methodologies/ Base		2	1		
			1.3.2 Understanding of Methodologies/ Walls		3			
			1.3.3 Understanding of Methodologies/ Roof	1		1	1	
			1.4 Dissemination of Technical information					
			1.5 Level of skill in providing explanation		1	2		
			1.6 Handling of queries	1	1	1		
			1.7 Level of general competence		2	1		
			1.8 Standard of Construction Performance		2	1		
				T	L	LO		

O	OP/HT	CDR			2		1	quality of mud/ Saline
			1.1 Ability to conduct training in a systematic manner					quality of Water/ Saline
			1.2.1 Skillful use of Flip Charts	1		2		Construction of mudlime brick toe wall
			1.2.2 Skillful use of Illustration Board		2		1	Higher Cost of materials;
			1.2.3 Skillful use of Material Samples			1	2	
			1.3.1 Understanding of Methodologies/ Base		3			
			1.3.2 Understanding of Methodologies/ Walls		1	2		
			1.3.3 Understanding of Methodologies/ Roof	1	1		1	
			1.4 Dissemination of Technical information	1	1		1	
			1.5 Level of skill in providing explanation		3			
			1.6 Handling of queries	1	2			
			1.7 Level of general competence	1	2			
			1.8 Standard of Construction Performance		3			
				V	OW	V		



SHNo	Date	JPIN/IME	Evaluation	Good	Fair	Poor	Blank	Problems/Issue
T	OCT 2018	JZP						
			1.1 Ability to conduct training in a systematic manner		1	1	1	Quality of mud
			1.2.1 Skillful use of Flip Charts			2	1	Quality of Water
			1.2.2 Skillful use of Illustration Board		2		1	Construction of mudlime brick toe wall
			1.2.3 Skillful use of Material Samples			2	1	Higher Cost of materials;
			1.3.1 Understanding of Ethnologies/Tools		2	1		Lack of tools
			1.3.2 Understanding of Ethnologies/Walls	1	1	1		Expanding layered mud walls; Cracks in walls
			1.3.3 Understanding of Ethnologies/Roof	1	1		1	Height of Plinth from L due to variance of L
			1.4 Dissemination of Technical information	2	1			Soil filling with soil in toe
			1.5 Level of skill in providing explanation	1	2			
			1.6 Handling of queries	2	1			
			1.7 Level of general competence		1	1	1	
			1.8 Standard of Construction Performance		2	1		
				2	1	2	2	

	OCT 2018	JZP						
			1.1 Ability to conduct training in a systematic manner			2	1	Quality of mud
			1.2.1 Skillful use of Flip Charts			2	1	Shortage of Water
			1.2.2 Skillful use of Illustration Board			2	1	Construction of mudlime brick toe wall
			1.2.3 Skillful use of Material Samples			2	1	Higher Cost of materials;
			1.3.1 Understanding of Ethnologies/Tools		1	2		Pits where mud has been lifted from pose as a hazard
			1.3.2 Understanding of Ethnologies/Walls		1	2		
			1.3.3 Understanding of Ethnologies/Roof			2	1	
			1.4 Dissemination of Technical information		1	2		
			1.5 Level of skill in providing explanation			3		
			1.6 Handling of queries		1	2		
			1.7 Level of general competence		1	2		
			1.8 Standard of Construction Performance		1	2		
				2	1	2	2	



SHNo	Date	JPIN/IME	Evaluation	Good	Fair	Poor	Blank	Problems/Issue
V	02/04/2017	M2/M3/M4						
			1.1 Ability to conduct training in a systematic manner		2	1		Quality of material used: Either Saline or Sandy
			1.2.1 Skillful use of Flip Charts			2	1	Quality of Water: Saline
			1.2.2 Skillful use of Illustration Board	3				Lack of handpumps
			1.2.3 Skillful use of Material Samples			1	2	Construction of mudlime brick toe wall
			1.3.1 Understanding of Ethnologies/ Base		2	1		Higher Cost of materials;
			1.3.2 Understanding of Ethnologies/ Walls		1	1	1	Landlord Permission to collect soil;
			1.3.3 Understanding of Ethnologies/ Roof		1	1	1	Old shelters very close to new shelters
			1.4 Dissemination of Technical information	1	1	1		Lack of available plots
			1.5 Level of skill in providing explanation		2	1		Lack of ownership documents
			1.6 Handling of queries	1	1	1		Every filling with soil in toe
			1.7 Level of general competence	2		1		
			1.8 Standard of Construction Performance		2	1		
				2	LO	LO	V	

SDcS	02/04/2017							
			1.1 Ability to conduct training in a systematic manner			2	1	Quality of material used: Saline or Sandy
			1.2.1 Skillful use of Flip Charts			2	1	Lack of tools
			1.2.2 Skillful use of Illustration Board		2		1	Irregular wall thicknesses
			1.2.3 Skillful use of Material Samples		2		1	
			1.3.1 Understanding of Ethnologies/ Base	1	1	1		
			1.3.2 Understanding of Ethnologies/ Walls		2	1		
			1.3.3 Understanding of Ethnologies/ Roof		1	1	1	
			1.4 Dissemination of Technical information	1		2		
			1.5 Level of skill in providing explanation		1	2		
			1.6 Handling of queries		1	2		
			1.7 Level of general competence	1	1	1		
			1.8 Standard of Construction Performance		1	2		
				T	LO	LO	V	

SHNo	Date	JPIN/IME	Evaluation	Good	Fair	Poor	Blank	Problems/On Site
1	02/11/17	ScN/17						
			1.1 Ability to conduct training in a systematic manner	2	1			No problems on Site
			1.2.1 Skillful use of Flip Charts			1	2	
			1.2.2 Skillful use of Illustration Board	3				
			1.2.3 Skillful use of Material Samples			1	2	
			1.3.1 Understanding of Methodologies/ Base	2			1	
			1.3.2 Understanding of Methodologies/ Walls	2			1	
			1.3.3 Understanding of Methodologies/ Roof	1	1		1	
			1.4 Dissemination of Technical information	2	1			
			1.5 Level of Skill in providing explanation	2	1			
			1.6 Handling of queries	1	2			
			1.7 Level of general competence	2	1			
			1.8 Standard of Construction Performance	3				
				L/2	LW	O	2	

1	02/11/17	RDPJ						
			1.1 Ability to conduct training in a systematic manner			2	1	Termite
			1.2.1 Skillful use of Flip Charts		1	2		Shortage of water/ Warabandi
			1.2.2 Skillful use of Illustration Board		1	2		Cost of Good quality mud
			1.2.3 Skillful use of Material Samples		1	2		Unskilled labour
			1.3.1 Understanding of Methodologies/ Base	1	2			
			1.3.2 Understanding of Methodologies/ Walls		1	2		
			1.3.3 Understanding of Methodologies/ Roof		2	1		
			1.4 Dissemination of Technical information		3			
			1.5 Level of Skill in providing explanation		2	1		
			1.6 Handling of queries	1		2		
			1.7 Level of general competence		3			
			1.8 Standard of Construction Performance		3			
				O	L/2	L/2	L	



SHNo	Date	JPIN/IME	Evaluation	Good	Fair	Poor	Blank	Problems/Issue
D2YIO								
2	OM/HT	BDR2						
			1.1 Ability to conduct training in a systematic manner	1			2	Quality of 2 udSaline
			1.2.1 Skillful use of Flip Charts	1		2		Shortage of Water
			1.2.2 Skillful use of Illustration Board		1	2		Land Ownership/Location of plots
			1.2.3 Skillful use of Material Samples	2	1			Opening sites vary from top to bottom
			1.3.1 Understanding of Methodologies/Base	1			2	Windows or doors in Short wall
			1.3.2 Understanding of Methodologies/Walls	1	2			Wall shrinkage
			1.3.3 Understanding of Methodologies/Roof		1		2	
			1.4 Dissemination of Technical information	1	2			
			1.5 Level of Skill in providing explanation	1	2			
			1.6 Handling of queries		2	1		
			1.7 Level of general competence		3			
			1.8 Standard of Construction Performance		2	1		
				2	L2	2	2	
LW	OM/HT	BDR2						
			1.1 Ability to conduct training in a systematic manner	1			2	Quality of 2 udSaline
			1.2.1 Skillful use of Flip Charts	1		2		Shortage of Water
			1.2.2 Skillful use of Illustration Board		1	2		Land Ownership/Location of plots
			1.2.3 Skillful use of Material Samples	2	1			Opening sites vary from top to bottom
			1.3.1 Understanding of Methodologies/Base	1			2	Windows or doors in Short wall
			1.3.2 Understanding of Methodologies/Walls	1	2			Wall shrinkage
			1.3.3 Understanding of Methodologies/Roof		1		2	
			1.4 Dissemination of Technical information	1	2			
			1.5 Level of Skill in providing explanation	1	2			
			1.6 Handling of queries		2	1		
			1.7 Level of general competence		3			
			1.8 Standard of Construction Performance		2	1		
				2	L2	2	2	

SHNo	Date	JPIN	IME	Evaluation	Good	Fair	Poor	Blank	Problems	Site
LL	OM	HT	B	R						
				1.1 Ability to conduct training in a systematic manner			2	1		Quality of udil
				1.2.1 Skillful use of Flip Charts	1		2			Saline
				1.2.2 Skillful use of Illustration Board		1	2			Shortage of Water
				1.2.3 Skillful use of Material Samples				1		Lack of tools
				1.3.1 Understanding of Ethnologies Base	1	2				Slow progress due to harvesting and sowing season
				1.3.2 Understanding of Ethnologies Walls	1	2				Lack of Lime usage
				1.3.3 Understanding of Ethnologies Roof		2		1		
				1.4 Dissemination of Technical information	1	2				
				1.5 Level of Skill in providing explanation	1	2				
				1.6 Handling of queries		3				
				1.7 Level of general competence		3				
				1.8 Standard of Construction Performance		2	1			
					V	L		T		

LO	OM	HT	MP								
				1.1 Ability to conduct training in a systematic manner	1	2					Quality of material
				1.2.1 Skillful use of Flip Charts	1		2				Shortage of Water
				1.2.2 Skillful use of Illustration Board			2	1			Lack of tools
				1.2.3 Skillful use of Material Samples	1	2					Slow progress due to harvesting and sowing season
				1.3.1 Understanding of Ethnologies Base	1	2					Communal funds on religious matters
				1.3.2 Understanding of Ethnologies Walls	1	1	1	1			Height of plinths problematic for elderly
				1.3.3 Understanding of Ethnologies Roof	1	2					Landlord pressures for working in fields
				1.4 Dissemination of Technical information	2	1					Photographs for Tranche distribution verification
				1.5 Level of skill in providing explanation	2	1					2 BHH fell from Wall tops during construction
				1.6 Handling of queries	1	1	1				Filling of lime pits required by landlord
				1.7 Level of general competence	2			1			
				1.8 Standard of Construction Performance	1	2					
					L	L	V	T			

SHNo	Date	JPIN/IME	Evaluation	Good	Fair	Poor	Blank	Problems/Issue
LT	OM/HT	M/						
			1.1 Ability to conduct training in a systematic manner		2		1	Series of Shelters Sketch 2
			1.2.1 Skillful use of Flip Charts	1		2		Attached Shelters Sketch 3
			1.2.2 Skillful use of Illustration Board	1	2			Space between old and new shelters Sketch 4
			1.2.3 Skillful use of Material Samples		1	2		
			1.3.1 Understanding of Methodologies/Base		2		1	
			1.3.2 Understanding of Methodologies/Walls		3			
			1.3.3 Understanding of Methodologies/Roof		1	2		
			1.4 Dissemination of Technical information		1	2		
			1.5 Level of Skill in providing explanation		2	1		
			1.6 Handling of queries		2	1		
			1.7 Level of general competence		2	1		
			1.8 Standard of Construction Performance		1	2		
				O	L	LT	O	

L	OM/HT	MDF						
			1.1 Ability to conduct training in a systematic manner			2	1	Door in centre of wall
			1.2.1 Skillful use of Flip Charts		1	2		BHH wish to fill area at the front of the shelter like a ramp as they wish to construct a veranda Sketch 5
			1.2.2 Skillful use of Illustration Board			2	1	
			1.2.3 Skillful use of Material Samples			2	1	Slow progress due to harvesting and sowing season
			1.3.1 Understanding of Methodologies/Base	1		2		Landlord pressures for working in fields
			1.3.2 Understanding of Methodologies/Walls		1	2		Less space between ORS and adjacent Temple
			1.3.3 Understanding of Methodologies/Roof			2	1	Addition of shelves in Walls
			1.4 Dissemination of Technical information			3		
			1.5 Level of Skill in providing explanation			3		
			1.6 Handling of queries		2	1		
			1.7 Level of general competence		1	2		
			1.8 Standard of Construction Performance		1	2		
				L		OV		

SHNo	Date	JPIN/IME	Evaluation	Good	Fair	Poor	Blank	Problems/Issue
LV	OM/HT	N/2/2						
			1.1 Ability to conduct training in a systematic manner		1	1	1	Quality of material used Saline or Sandy
			1.2.1 Skillful use of Flip Charts	2		1		Shortage of water
			1.2.2 Skillful use of Illustration Board			2	1	Slow progress due to harvesting and sowing season
			1.2.3 Skillful use of Material Samples	2		1		Tying of Untols with binding wire
			1.3.1 Understanding of Methodologies/Base	1	2			Un-Availability of brick/dust
			1.3.2 Understanding of Methodologies/Walls		3			Reduce back wall slope in mono-pitched roof Typology
			1.3.3 Understanding of Methodologies/Roof		1	1	1	
			1.4 Dissemination of Technical information	1	1	1		
			1.5 Level of skill in providing explanation		2	1		
			1.6 Handling of queries			3		
			1.7 Level of general competence		2	1		
			1.8 Standard of Construction Performance	1	1	1		
				2	LT	LT	T	

LT	OM/HT	SDJ						
			1.1 Ability to conduct training in a systematic manner	1	1	1		Quality of material used Saline or Sandy
			1.2.1 Skillful use of Flip Charts	1		2		Shortage of water
			1.2.2 Skillful use of Illustration Board	1		2		Slow progress due to harvesting and sowing season
			1.2.3 Skillful use of Material Samples	1	1	1		Door opening along corner of room
			1.3.1 Understanding of Methodologies/Base	1	1		1	
			1.3.2 Understanding of Methodologies/Walls		2		1	
			1.3.3 Understanding of Methodologies/Roof			2	1	
			1.4 Dissemination of Technical information	1	1		1	
			1.5 Level of skill in providing explanation	1		1	1	
			1.6 Handling of queries		3			
			1.7 Level of general competence		2		1	
			1.8 Standard of Construction Performance		1	1	1	
				2	LO	LW	2	

SHNo	Date	JPIN	IME	Evaluation	Good	Fair	Poor	Blank	Problems	Site
L2	OM	HT	SED							
				1.1 Ability to conduct training in a systematic manner	2	1				Quality of material used Saline or Sandy
				1.2.1 Skillful use of Flip Charts	2	1				Shortage of water
				1.2.2 Skillful use of Illustration Board	1	1		1		Slow progress due to harvesting and sowing season
				1.2.3 Skillful use of Material Samples	1	1		1		etc.
				1.3.1 Understanding of Methodologies Base	3					
				1.3.2 Understanding of Methodologies Walls	1	1		1		
				1.3.3 Understanding of Methodologies Roof		1		2		
				1.4 Dissemination of Technical information	1	1		1		
				1.5 Level of skill in providing explanation	1	1		1		
				1.6 Handling of queries		3				
				1.7 Level of general competence	1	2				
				1.8 Standard of Construction Performance		2	1			
					LT	LV	L			

L2	OM	HT	SED							
				1.1 Ability to conduct training in a systematic manner	1	2				Quality of material used Saline after mixing lime
				1.2.1 Skillful use of Flip Charts	1		2			Opening placement along short wall
				1.2.2 Skillful use of Illustration Board	2	1				Use of salvaged doors and windows
				1.2.3 Skillful use of Material Samples	1		1	1		Addition of veranda
				1.3.1 Understanding of Methodologies Base	2	1				Common long wall (Sketch 7)
				1.3.2 Understanding of Methodologies Walls	2	1				Use of single piece of chicken and plastic sheet for 2 units sharing long wall
				1.3.3 Understanding of Methodologies Roof	1	1		1		
				1.4 Dissemination of Technical information	2			1		Joist placement on Common long wall
				1.5 Level of skill in providing explanation	2			1		Shortage of water; etc.
				1.6 Handling of queries		3				
				1.7 Level of general competence	2			1		
				1.8 Standard of Construction Performance		1	2			
					L2	LW	V	V		



SHNo	Date	JPIN/IME	Evaluation	Good	Fair	Poor	Blank	Problems/Issue
L1	09/01/17	SRD1						
			1.1 Ability to conduct training in a systematic manner		1	1	1	Technical Team hired 10 days prior to workshop
			1.2.1 Skillful use of Flip Charts			2	1	Problems similar to previously discussed
			1.2.2 Skillful use of Illustration Board	1	1	1		
			1.2.3 Skillful use of Material Samples		1	1	1	
			1.3.1 Understanding of Ethnologies/ Base	1	2			
			1.3.2 Understanding of Ethnologies/ Walls		1	2		
			1.3.3 Understanding of Ethnologies/ Roof		3			
			1.4 Dissemination of Technical information	1	2			
			1.5 Level of Skill in providing explanation		3			
			1.6 Handling of queries		3			
			1.7 Level of general competence	1	2			
			1.8 Standard of Construction Performance	1	1		1	
				V	OW	2	2	

D2YIT								
OW	09/01/17	D2D						
			1.1 Ability to conduct training in a systematic manner		2	1		Water Shortage
			1.2.1 Skillful use of Flip Charts		2	1		Quality of mud/Sandy
			1.2.2 Skillful use of Illustration Board			3		Termite
			1.2.3 Skillful use of Material Samples			2	1	Temporary migration during harvesting seasons
			1.3.1 Understanding of Ethnologies/ Base	2	1			Height of Chaura walls
			1.3.2 Understanding of Ethnologies/ Walls	1	1	1		BHH concerned about high roof walls w.r.t high wind pressure
			1.3.3 Understanding of Ethnologies/ Roof		2	1		
			1.4 Dissemination of Technical information	1		2		
			1.5 Level of Skill in providing explanation		1	2		
			1.6 Handling of queries		2	1		
			1.7 Level of general competence	1	1	1		
			1.8 Standard of Construction Performance		1	2		
				V	LT	L2	L	



SHNo	Date	JPIN/IME	Evaluation	Good	Fair	Poor	Blank	Problems/Issue
Q.	Q.	BD						
			1.1 Ability to conduct training in a systematic manner	1		1	1	Water Shortage
			1.2.1 Skillful use of Flip Charts			2	1	Quality of wood
			1.2.2 Skillful use of Illustration Board	1	1	1		Shortage of good quality Bamboo
			1.2.3 Skillful use of Material Samples	1	2			Lack of tools/drilling holes-splitting bamboo difficult
			1.3.1 Understanding of Ethnologies/Artefacts	1		1	1	Height of Chaura walls
			1.3.2 Understanding of Ethnologies/Walls	1		1	1	IP introduced addition of wooden peg in Chaura Typology
			1.3.3 Understanding of Ethnologies/Roof			1	2	Roof Pitch
			1.4 Dissemination of Technical information	1		1	1	
			1.5 Level of Skill in providing explanation	1		1	1	
			1.6 Handling of queries		1	2		
			1.7 Level of general competence	1		2		
			1.8 Standard of Construction Performance		1	2		
				2	V	LV	2	

CO	Q	HT	JFC						
			1.1 Ability to conduct training in a systematic manner				2	1	Landlord not giving permission to collect soil
			1.2.1 Skillful use of Flip Charts				2	1	
			1.2.2 Skillful use of Illustration Board		1		2		
			1.2.3 Skillful use of Material Samples				2	1	
			1.3.1 Understanding of Ethnologies/Artefacts		1		1	1	
			1.3.2 Understanding of Ethnologies/Walls				3		
			1.3.3 Understanding of Ethnologies/Roof				2	1	
			1.4 Dissemination of Technical information				3		
			1.5 Level of Skill in providing explanation				3		
			1.6 Handling of queries				3		
			1.7 Level of general competence				3		
			1.8 Standard of Construction Performance				3		
				W	O	O	V		



SHNo	Date	JPIN/IME	Evaluation	Good	Fair	Poor	Blank	Problems/Issue
OT	OT/HT	Prepared/DP						
			1.1 Ability to conduct training in a systematic manner	2	1			Water shortage
			1.2.1 Skillful use of Flip Charts			2	1	Landlord not giving permission to collect soil
			1.2.2 Skillful use of Illustration Board	3				Lack of tools
			1.2.3 Skillful use of Material Samples			1	2	Temporary migration due to elections
			1.3.1 Understanding of Ethnologies/Artefacts	1	2			Use local wood instead of bamboo in lintel
			1.3.2 Understanding of Ethnologies/Walls	1	1		1	Doors/windows in short wall
			1.3.3 Understanding of Ethnologies/Roof	2			1	Reduce back wall height in mono-pitched typology
			1.4 Dissemination of Technical information	2			1	
			1.5 Level of skill in providing explanation	2	1			
			1.6 Handling of queries	2	1			
			1.7 Level of general competence	2	1			
			1.8 Standard of Construction Performance	1	2			
				L2	L2	T	L2	

OT	OT/HT	Prepared/DP						
			1.1 Ability to conduct training in a systematic manner		2		1	Water shortage
			1.2.1 Skillful use of Flip Charts			2	1	Landlord not giving permission to collect soil
			1.2.2 Skillful use of Illustration Board		1	2		Unskilled labour
			1.2.3 Skillful use of Material Samples			2	1	Termite
			1.3.1 Understanding of Ethnologies/Artefacts	3				Reduce back wall height in mono-pitched typology
			1.3.2 Understanding of Ethnologies/Walls	1	1		1	
			1.3.3 Understanding of Ethnologies/Roof		1		2	
			1.4 Dissemination of Technical information	1	2			
			1.5 Level of skill in providing explanation		3			
			1.6 Handling of queries	1	2			
			1.7 Level of general competence		3			
			1.8 Standard of Construction Performance	1	2			
				L2	L2	L2	L2	

SHNo	Date	JPIN	IME	Evaluation	Good	Fair	Poor	Blank	Problems	Site
OV	O	H	T	S	F	C				
				1.1 Ability to conduct training in a systematic manner		3				Water shortage
				1.2.1 Skillful use of Flip Charts			1	2		Landlord not giving permission to collect soil
				1.2.2 Skillful use of Illustration Board		3				Unskilled labour
				1.2.3 Skillful use of Material Samples			1	2		Placement of openings along corner of room
				1.3.1 Understanding of Methodologies/ Base	1	2				
				1.3.2 Understanding of Methodologies/ Walls		2		1		
				1.3.3 Understanding of Methodologies/ Roof			3			
				1.4 Dissemination of Technical information		3				
				1.5 Level of Skill in providing explanation		3				
				1.6 Handling of queries		1	2			
				1.7 Level of general competence		3				
				1.8 Standard of Construction Performance		3				
					L	OT		V		

O	O	H	T	S	F	C				
				1.1 Ability to conduct training in a systematic manner			3			Water shortage
				1.2.1 Skillful use of Flip Charts		2	1			Quality of Soil/Sandy
				1.2.2 Skillful use of Illustration Board	1	1	1			Slow progress due to harvesting and sowing season
				1.2.3 Skillful use of Material Samples	2		1			Cracks in walls
				1.3.1 Understanding of Methodologies/ Base	1	2				Placement of openings along short wall
				1.3.2 Understanding of Methodologies/ Walls			3			Non-availability of plots
				1.3.3 Understanding of Methodologies/ Roof			1	2		Backfilling inside shelter i.e. flooring
				1.4 Dissemination of Technical information		1	2			
				1.5 Level of Skill in providing explanation		2	1			
				1.6 Handling of queries			3			
				1.7 Level of general competence		1	2			
				1.8 Standard of Construction Performance		1	2			
						LW	OW	O		



HERITAGE FOUNDATION'S DRR - COMPLIANT SUSTAINABLE CONSTRUCTION

BUILD BACK SAFER WITH VERNACULAR METHODOLOGIES

Annexure H List of Visit Dates



LIST OF HF FIELD VISITS



Sl No	Date	Visit	Location
1	7.12.12	IO Technical Refresher	IO Office Hyderabad
2	17.12.12	BASF	Abdullah Hashmi Badin
3	18.12.12	SAFWCO	M. Umer Tur Badin
4	19.12.12	OW	Sain Bux Samali Badin
5	20.12.12	Prepared Pakistan	Haq Sadique Tle Badin
6	21.12.12	PVP	Shamoon Dholi Badin
7	24.12.12	SRO	Piyaro Khan Khoso Badin
8	26.12.12	DF	Tan Khan Jarwar Badin
9	27.12.12	OJA	Rip Sharif-Ureid Bhatti Badin
10	28.12.12	LHP	Haq Khan Tharani Badin
11	31.12.12	I-LAP	Essu Allah Badin
12	2.1.13	SEA	Mul M. Bahrani Badin
13	3.1.13	SI	Saeedpur Badin
14	4.1.13	SPO	Abdul Azeed Imani Tando M. Khan
15	7.1.13	IFC	Ali M. Lashari Tando M. Khan
16	8.1.13	CRO	Haq Humam Rasool Umerkot
17	4.2.13	Loh-Rhat Training	Eco-Village M. oa Sharif Tando Allahyar
18	26.3.13	RPI	Allah Deeno Dhoar Mirpur Has
19	27.3.13	SO	M. a Shaheed M. emon Umerkot
20	27.3.13	BRO	Ropo Hali 1-2 Umerkot
21	28.3.13	STAH	Ali Bux Talpur Umerkot
22	29.3.13	BASF	M. Urs Wadho Badin
23	29.3.13	LHP	Wee M. a Khan Badin
24	1.4.13	AH	Fotoogi Tharpar
25	2.4.13	BO	Chelhar Dewabad Tharpar
26	3.4.13	SI	Dhuda Bux M. ari Badin
27	3.4.13	SEA	Jagsi Dholi Badin
28	4.4.13	I-LAP	M. aso Has Dali Badin
29	4.4.13	SAFWCO	Ahmen Khan Chandio Badin
30	5.4.13	A	M. a Ashraf Jogi Mirpur Has
31	5.4.13	STS	Hanif Dhambo Mirpur Has
32	8.4.13	DF	Dhulam M. abi Jarwar
33	8.4.13	Prepared Pakistan	M. etho Dori Badin
34	8.4.13	PVP	Jargar M. alha Badin
35	8.4.13	SRO	Ali M. Punabi Badin
36	9.4.13	BHR	Allah Bachio Badin
37	9.4.13	OJA	Tahar Has Dholi Badin
38	9.4.13	OW	Bhala Dholi Badin
39	10.4.13	IFC	Abdul Karim M. a Imani Tando M. Khan
40	10.4.13	SPO	M. esri Jango Tando M. Khan
41	11.4.13	CRO	Allah Raehio M. om Badin
42	11.4.13	LAP	Raees Atta Laghari Mirpur Has
43	24.4.13	Technical Refresher for all IPs	Eco-Village M. oa Sharif Tando Allahyar
44	25.4.13	Technical Refresher for all IPs	Eco-Village M. oa Sharif Tando Allahyar
45	26.4.13	Technical Refresher for all IPs	Eco-Village M. oa Sharif Tando Allahyar
46	20.5.13	BO	Chelhar Dewabad Tharpar
47	20.5.13	AH	Rustam Khan Chandio Tharpar
48	21.5.13	BHR	Chuto M. umbrani Badin
49	21.5.13	Prepared Pakistan	Haq M. etlo Badin

LIST OF HF FIELD VISITS



SHNo	Date	Visit	Location
50	22.5.13	RPI	Andrawala irpur has
51	22.5.13	STAH	ir . TalpurUmerot
52	23.5.13	OW	Thair BaerBadin
53	23.5.13	SEA	Umer hasheliBadin
54	24.5.13	BASF	RamAn AbroBadin
55	24.5.13	I-LAP	asa hasheliBadin
56	27.5.13	BRO	Shefqat haniUmerot
57	27.5.13	SO	Bachal han ChandioUmerot
58	28.5.13	CR O	Allah Rao eaarUmerot
59	28.5.13	STS	RamAn hass irpur has
60	29.5.13	LA P	Raees Atta uhammad irpur has
61	29.5.13	A	uhammad Saleh al irpur has
62	30.5.13	PVP	amo holiBadin
63	30.5.13	SAFWCO	Ahmed han ChandioBadin
64	3.6.13	LHP	odo Allah- isri ohani-Shiari uhallahBadin
65	3.6.13	OJA	Tahir hasheliHa oosa harmo ohliBadin
66	4.6.13	F	Jani han JarwarBadin
67	4.6.13	SRO	hodhal Jas haniBadin
68	5.6.13	IFC	Abdul arim almaniTando . han
69	5.6.13	SPO	. OtoTando . han
70	5.6.13	SI	huda Bux hasheliBadin