Karonga Recovery Programme

Proposed development and amendments to the 'Guidelines for Safer House Construction'

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1 Introduction

'The series of earthquakes that occurred in Karonga and parts of Chitipa Districts in December 2009 caused a lot of damage to buildings as well as injuries and deaths arising from falling buildings. This tragedy brought to the forefront the need to focus on the way we construct buildings and how we can construct safer houses so that they are able to withstand earthquakes better when they occur.' *2010, Guidelines for Safer House Construction*

At the time of the development of the Construction Guidelines, a short assessment was undertaken. The assessment targeted urban and rural communities with a cross section of construction type and building damage within each community.

'The assessment demonstrated that building design and construction is largely determined by: an evolved vernacular, standard building practices, availability of materials, and cost. Whilst many of the buildings are similar in design, the quality of construction varies greatly. All the buildings assessed were found to have common design faults associated with the failure of buildings in earthquakes.' *2009, J Richardson (Consultant for MRCS), Shelter Report*

The Construction Guidelines have been produced as a document to be disseminated through-out Malawi and to encourage better/safer construction methods. The first implementation of the guidelines has been in the re-construction of houses in Karonga district through the Karonga Recovery Programme.

The programme for re-construction is due to complete in March 2011 and currently there is a cross-section of houses at varying stages of completion. This has enabled a short assessment to be carried out to determine whether any further developments or amendments are required to improve the Construction Guidelines and their implementation.

Fig1. One of the damaged houses in the 2009 earthquake, Karonga District

1.1 Assessment Procedure

The assessment of the Guidelines for Safer House Construction has taken place during a period of two months. The assessment has been conducted through a series of field visits in the Karonga district, whereby observations were made and documented through pictures and diagrams.

Much of the assessment involved witnessing the implementation of the guidelines through site supervision, and beneficiary/ artisan training.

Target areas studied in the assessment;

- Dissemination of the guidelines
- Adoption of the guidelines
- Developments/amendments to the guidelines
- Supplementary material to the guidelines

Fig2. Beneficiaries receiving training on the Safer House Construction Guidelines

2 Dissemination of the guidelines

The construction guidelines have been produced as a document to be disseminated across Malawi. This section looks at how the content of the guidelines has been distributed in the Karonga Recovery Programme and what observations can be taken from the field.

2.1 Methods of dissemination

The selected beneficiaries for the Karonga Recovery Programme came into two main categories; repair or new construction. Part of the agreement with the beneficiary was that they would undergo training in Safer Construction before receiving their first cash transfer.

This training was conducted at village level and carried out by a site supervisor. The aim of the training was to engage the beneficiary in the importance of Safer House Construction and the key aspects covered in the guidelines.

The training was conducted in a 'teacher-pupil' scenario, whereby the beneficiaries sat facing a blackboard and speaker. The aim was to relate technical information into layman terms. Teaching materials included blackboards, a copy of the guidelines and when available, posters of the guidelines.

Once the beneficiary had received training the cash transfer was made to their accounts and they could begin to build. Most beneficiaries employed local artisans to carry out the work. The role of the beneficiary was to relay their knowledge of the guidelines and ensure the work on their house was carried out in best practice.

The beneficiaries had support and technical advice from the site supervisors. This enabled a further dissemination of knowledge of the guidelines, and encouraged direct interaction with artisans.

Posters were designed and produced with the intention of been used in training and/or pinned up in villages for beneficiaries and the communities to access.

To summaries the key methods of dissemination;

- Training beneficiaries at village level.
- Site-supervision and on-site informal training of artisans.
- Posters intended to be pinned up in communities.
- A copy of the guidelines available for viewing at Karonga Red Cross headquarters.

Fig3. Site Supervisor holding guidelines

2.2 Observations and recommendations

In order to sustain the development of the guidelines at national level it will require dissemination throughout Malawi and a strategy for encouraging adoption of the guidelines at field level.

One common thread is the lack of printed guidelines available. Beneficiaries and artisans do not have direct access to a copy of the guidelines. Therefore, they are relying on one training session from which to acquire knowledge of safer house construction. The training gave beneficiaries a raised awareness of the guidelines, but, without follow-up training or access to copies of the guidelines much of the knowledge is forgotten.

With a large amount of houses undergoing repair and new construction (almost 850), it is inevitable that some beneficiaries began work or undertook work before a supervisor could do a follow-up visit, and without direct access to the guidelines some of the construction stages were missed out i.e. insertion of wall plate and lintels. (These were rectified once a supervisor had been to site).

Another common issue within the field was that artisans had limited knowledge of the guidelines. This is due to a number of factors, firstly, that most artisans received no training on the guidelines, secondly that although posters were produced these were not available within the villages. Additionally the beneficiaries were often unsure of how much guidance they needed to give artisans, or, what that guidance should be.

From these main observations the following recommendations can be made;

- Artisans should receive training at village level
- Poster should be made available at village level
- Beneficiaries should have access to a handbook summarising the contents of the guidelines in layman terms.
- Copies of the guidelines should be disseminated to a village representative with training in the guidelines, and given the role of advising beneficiaries. Thus, decentralising the role of supervision.

3 Adoption of the guidelines

The guidelines have been adopted by the Malawi Government and the common aspiration is that they will provide the foundation for building control in Malawi. The dissemination and adoption of the guidelines are two integrated factors in the future continuation and development of the construction standards.

The adoption of the guidelines by the Karonga Recovery Programme has enabled some observations to be made. These mainly look at how readily communities have adopted the guidelines, and recommendations for encouraging and sustaining this.

3.1 Observations and recommendations

The beneficiaries are encouraged to adopt the guidelines so that their houses will be safer. As part of community development facilitation the programme encourages the participation of whole communities to contribute in the construction of the selected houses.

Inevitably the adoption of the guidelines has had an impact on the artisans, as they too are encouraged to follow the guidelines. In scenarios where quality has been poor this has also reflected on the artisan and there have been examples where artisans have lost a contract because of this.

There have been examples whereby people complain about the additional expense the guidelines may incur on their final build cost. Often this is primarily concerned with the additional use of sawn timber in a house.

The guidelines predominately look at construction details for burnt brick and corrugated sheeted houses. This is an option for only a percentage of people within a community, with many still using traditional/vernacular methods.

The reason the 'Safer House Construction Guidelines' focus on brick houses was because it was the most vulnerable and potentially dangerous type of construction, the main type of construction that had failed, and the recognition that while promoting traditional construction is important that it was acknowledged that people want brick built houses.

The following recommendations have been made;

- Safer construction methods for traditional buildings should be included in the guidelines to encourage its adoption into communities.
- Artisans should receive training in the guidelines through their apprenticeship/educational institution to encourage adoption of the guidelines.
- The guidelines should be advocated and used by other NGO's and through district government.

4 Developments/ amendments to the guidelines

The Safer House Construction Guidelines are still undergoing the process of review and initial implementation. It is important that the content is applicable to the majority of people in Malawi, and considers affordability, availability of materials and current construction methods.

This section looks at the existing content of the guidelines and suggests areas for improvement.

4.1 Areas covered in the guidelines

The guidelines are divided into five main sections;

- Site Selection
- Design
- Construction
- Materials
- Methods of construction

4.2 Readability

The guidelines are easy to understand at a technical level and text is accompanied with relevant pictures and diagrams. Most scenarios have been covered and basic principles of construction covered.

The following observations have been made to suggest improvements to the content layout and accessibility;

- Each section to be numbered and added to the contents page.
- Each sub-topic within a section to be numbered (1.1, 1.2, 1.3) and added to the contents page.
- Section 'Methods of construction' also covers workmanship. Suggest re-naming section 'Methods of construction & workmanship'
- Suggest the addition of the section 'Retrofitting/repairing' in the contents page.

4.3 Developments to the content

The guidelines are designed to target affordable safe housing solutions. The term 'guidelines' means that the document offers guidance rather than prescribing any fixed construction solution.

Even so, there is a cross-section of details that can be followed especially concerning brick built houses.

The following recommendations have been made;

4.3.1 Site Selection: Floods, earthquakes, wild fires, subsidence and heave, pit latrine location

- Incorporating an appendix with innovative design solutions for flood prone areas. *UN Habitat in Malawi has a current project specifically researching this area.
- A table of tree species in Malawi with their mature heights and recommended distance to build from each and/or depth of foundation
- Pit latrine location to cover typical urban scenarios where plot sizes are smaller.

4.3.2 Design: Shape, roof pitch, size and placement of openings, internal walls, gables, pillars

- Incorporate a detail for seismic joints in 'shape' section.
- Addition of a diagram showing piers been used for support as well as internal walls.
- High brick gable walls present a higher risk of collapse and injury during earthquakes. For this reason it is suggested looking at an alternative gable wall construction using brick to wall plate level and timber frame or traditional bamboo frame from this point upwards. This could be added as an appendix.
- A foundation detail for timber pillars and posts, which is cost effective and using likely available resources. This could be added as an appendix.

4.3.3 Construction: Foundations, walls, roof, surface water drainage

- Detail of wall plate fixings shown in an elevation to complement section. This could be added in appendix.

4.3.4 Materials: brick, mortar, aggregates, mortar, timber, roof covering

- Diagrams/images to accompany the material descriptions*

4.3.5 Methods of construction and workmanship: Mixing mortar, bricklaying, concrete

- Diagrams to accompany the key stages in each method of construction. (suggest artist to draw stages)*

4.3.6 Retrofitting/repairing: Foundations, walls, roof

- Diagrams to accompany the key explanations. *

*Suggest an artist to draw images, as stages should incorporate people i.e. bricklaying

5 Further research opportunities

There are many alternative methods of construction that could be applicable in Malawi, making use of local resources, reducing cost, creating livelihoods, improving on traditional methods for safer construction, and looking at environmental construction.

This area has a big potential for research, and there is already a lot of research that has taken place all over the world from which lessons could be learnt. Examples of this include seismic proof design using bamboo, the use of earth and timber.

Some ideas of alternative construction and benefits will be discussed as a research opportunity for future development/additions to the Safer House Construction Guidelines.

5.1 Sustainability

Modern construction methods across the world on the whole have a detrimental impact on the environment. One example in Africa is deforestation to manufacture burnt bricks, the use of concrete, and transportation of materials over large distances. These contribute towards rising levels of CO2 in the atmosphere, resulting in climate change.

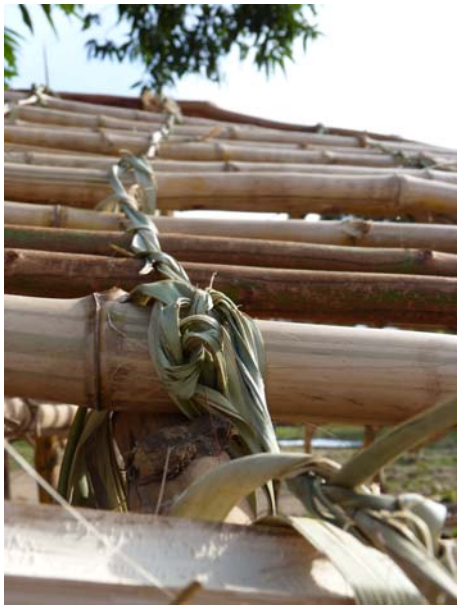
Finding alternatives is important for the sustainable growth of a country, economically, socially and environmentally.

Widening the available construction methods also increases the diversity in design and potential for people to create homes that are affordable and meet all their living requirements.

This section looks at materials that are readily available in Malawi and discusses their availability, cost, environmental impact and future potential.

5.2 Bamboo Construction

Bamboo is widely available in Malawi, the species grown varies on regional/climatic conditions. Bamboo is already used as a construction material in Malawi and is associated with traditional/vernacular building. It is less expensive than timber, but availability depends on location.



Uses of Bamboo

Bamboo can be grown virtually anywhere in the world and has a variety of uses. These include construction, fuel, animal food, household products.

Bamboo grows quickly and within 3-5 years the shoots can grow to a diameter of approximately 150mm, sufficient for construction.

There has been a lot of research into bamboo design and earthquake resistant design using bamboo. It is a very flexible and strong material, which is able to withstand the forces of an

earthquake.

Bamboo can be grown sustainably and also benefits the quality of the soil by countering soil erosion and phyto-remediation of polluted soil and water.

It also makes a good fuel and bamboo charcoal maintains a constant heat longer than hardwood charcoal.

Additionally bamboo provides high protein feed for goats and cattle kept by communities.

There is also a worldwide market for bamboo, especially in construction and household furniture, flooring and even cloth.

For these reasons there is an opportunity for the generation of livelihoods from growing bamboo at a local and worldwide level. It is sustainable wood fuel, easy to grow as it needs relatively little water, benefits the climate and soil quality, and enables cost-effective safe housing.

Developing bamboo construction techniques for affordable housing in Malawi

There is scope to adopt and develop traditional bamboo construction techniques that are seismic resistant, cost effective and, which also reflect flexible living requirements.

The construction details produced by a research project would become part of the construction guidelines, or, as supplementary material to the guidelines.

5.3 Earth Construction

‘Earth as a building material has lost its credibility mainly because of the fact that most modern houses with earth walls could not withstand earthquakes’ *(2007, Minke.G, Construction Manual for earthquake resistant houses build of earth).*

Additionally earth-construction is mostly associated with low-income status.

Yet, the possibility of earthquake resistant earth construction is great, and has been demonstrated in research from around the world.

Earth construction can be made suitable for modern living standards and there is a need to dissociate the image of poverty from earth construction.

There is a traditional vernacular of earth construction in Malawi, but with changing times, most people aspire to live in burnt brick houses. Burnt brick is expensive and can take individuals up to 15-20 years to gather the funds to build such a house.

Safe earth houses that meet peoples living requirements could be built in a fraction of the time, enabling their funds to be used for the development of livelihoods.

5.4 Research Opportunity

The production of the 'Safer House Construction Guidelines' has presented an excellent opportunity to research and develop example affordable housing types to supplement the construction guidelines. These housing types would use alternative construction techniques as described in the examples above.

Part of the proposal would be to allocate a plot of land to build 3 houses, each built from different materials. The designs would incorporate the following factors;

- Cost
- Material availability
- Innovative design to meet living aspirations/flexibility
- Thermal efficiency
- Earth-quake resistant design
- Low-skills requirement / training of artisans

The project could involve members of communities to take-part in the construction process to enable skills to be passed on and heighten awareness. Additionally the finished plot of houses could become an information centre for people to visit.

** Images shown demonstrate alternative methods of constructing using earth.*

6 Key Observations

- There is limited information material on the Guidelines for dissemination to individuals and communities. Beneficiaries and artisans do not own copies of the guidelines and have no other material to refer to when constructing their house. Only beneficiaries to the programme have direct knowledge of the guidelines from the training they received. The wider community has limited means of gaining information or knowledge of the Construction Guidelines.

- The wider use of the Construction Guidelines will rely on the affordability of the safer construction methods.

- There are many alternative and traditional methods of construction in Malawi, which rely on local resource. The guidelines mainly focus on brick built construction and do not focus on alternative materials in construction.

- The guidelines need to be understood be non-technical users as well as users with a technical background. The 'readability' of the guidelines for non-technical users has been hard to assess as the beneficiaries and artisans do not own copies of the guidelines.

7 Conclusion

- Further copies of the guidelines need to be printed for wider dissemination. As the guidelines have been adopted by the Ministry for Land, Housing and Urban Development, national government has a significant role to play in educating local government about the advantages of building using the Guidelines for Safer House Construction. Additionally the guidelines need to reach future artisans and technical users during their education and training, suggesting dissemination of the guidelines to educational institutes such as colleges and polytechnics.

- Further study and research is required to develop alternative construction methods using local materials and traditional techniques. Any study should look to improve existing traditional methods for greater resilience against earthquakes and flooding. The added advantages of providing alternative means of construction in the guidelines are that it targets a wider cross-section of people, depending on their available funds / income and available resources. This study would have the added advantage of taking into consideration the generation of livelihoods and sustainable construction.

- Local government leadership and guidance is needed to overcome lack of knowledge and resistance from communities to build more seismic resistant housing.

- The development of a supplementary handbook aimed at non-technical users will pictorially demonstrate the key aspects of the guidelines. This is to be seen as an appendix to the main guideline document. It is suggested that this handbook should be readily available within communities.

8 Bibliography

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