

Disaster resistant technology introduced:

- Shape size and proportion of building.
- Adequate foundation with raised plinth.
- Vertical and horizontal reinforcement bands.
- Controlled size and location of openings.

True Story

Ee ghar hamko badhiya laagat ba (I like this house the best)

MRS. BHANDARAIN,
one of the beneficiaries

Brick is expensive and chharrie (mixture of river aggregates and sand) we get in a very cheap price. With two tractors loads of chharrie will be sufficient to erect wall up to five radda (layers of masonry) each layer is about one hat (1'-6") which is almost six feet in height. Bricks cost much more and the brick factories give us the broken and un-burnt bricks and there is plenty of wastage which poor people like me can not afford. If we put every brick that we get from the factory without sorting the wall may collapse and we will again be homeless. We ourselves make the wall with the technical advice from the project personnel and we are more satisfied and have a good faith on our hands.

I have no money and I am making a small house that can be built completely on the financial support that the project is providing. On the other hand flash floods can not easily pull down and wash way small but strong house and I will be safe when there is a disaster. If had chosen bricks as walling material the cost involved will be much more and the house would naturally be very smaller.

Some one came with the noble aim to provide us the houses other wise I could have never built one. We did not know that we ourselves could make our own house like this. If the god provides us with some income source now we can build

as and when we like because we have the skill and know the cost-effective method of construction. It is very easy to make the walls even a *gawar aadmi* (uncivilized, unskilled and uneducated) like myself are making the walls. This house is not only strong and durable but also very cheap.

I like the house very much I have built it with my own hands and I am confident about its strength. The local contractors mix the one bag of cement in 16-18 bags of *chharrie*. I have mixed one bag of cement only in 1:12-13 bags of *chharrie*. Further it has *Khandawa* (over burnt bricks) between the concrete this makes it strong and cheap will put the roof on top of it with the method employed in the community center which also saves money and is strong. Ones I plaster the walls and put a coat of white wash, it will look magnificent. *Ee ghar majboot hamko ba, ee ghar hamko pasand ba!*

If we put bricks we have to hire the *mistri* (mason), who take a minimum of 100 Rupees and who can afford to pay them? Now we can work like *mistri* and earn more wages when we are free from the agricultural activities. All these reason makes us this house affordable and we think this is strong and we like it very much. *Ee ghar hamko badhiya laagat ba!*

Mrs. Bhandarain lives with her husband, three sons and a newly born girl. All the sons are small and can not earn. The family has a small land on which they grow seasonal vegetables and sell it which is the only income source they have. This is not even enough for the daily maintenance of the family and work as agricultural labor when they are free from their own farm. The family is making a small one roomed house which is 11'-6" wide and 12'-6" long. She has opted for composite masonry for wall and pre-cast RCC roofing

Detailed information about ERH is available form:

SHELTER DEVELOPMENT PROGRAM

DCS, Butwal

Post box 126 Kathmandu Nepal

Phone (+) 977 071 40 391, 42 363

Fax (+) 977 071 41391

Email dcs@umn.mos.com.np

प्रविधि विकास



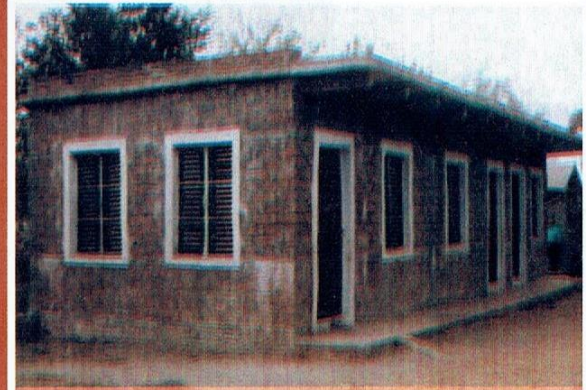
Technology Development

EARTHQUAKE RESISTANT HOUSES IN NEPAL:

*A Demonstration Model for
Tri-agency Region*

Tri-agency initiative on Seismic Safety

A village with 20 houses built by the owners using locally appropriate, cost effective building components and disaster resistant construction technology.



Community Resource Centre

यूनाइटेड मिशन टु नेपाल



United Mission to Nepal



church's auxiliary for social action



Christian Commission for
Development in Bangladesh

December 1999



Ram Tilak and his house during construction

A few families were so poor that they had nothing to offer except their own hands. The ERH project decided to help these families construct a single room building with materials provided by ERH so that the poor would not be excluded.

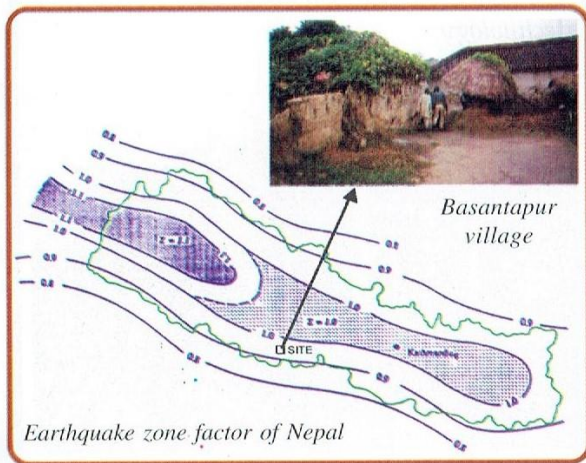
ADDITIONAL BENEFITS

The community also requested the VDC authority to help them construct a primary school. The VDC offered Rupees thirty thousands as an initial grant. The community requested ERH to support the construction of the school. This came with the commitment to provide free labor from the community as their contribution. ERH decided to support this endeavor.

The unity and bargaining capacity of the community with the local authority has considerably increased after the implementation of ERH Project. The villagers have now acted together to formulate a river training project on the bank of Koilihawa river which forms the eastern boundary of the settlement. The VDC has committed to protect the settlement, which certainly is a positive change towards social transformation.

INTRODUCTION

The "Tri-agency" is a network of three Christian based social service agencies - *Christian Commission for Development in Bangladesh (CCDB) Bangladesh; Church's Auxiliary for Social Action (CASA) India and United Mission to Nepal (UMN) Nepal*. The agency undertook a demonstration pilot project on earthquake resistant housing in Nepal. Nepal is highly prone to devastating earthquakes. The National Building Code of Nepal has assigned Earthquake zone factor of 0.9 for the Terai region, 1.0 for the eastern and central hills and 1.1 for the mid and far-western Mahabharat range.



Tri-agency had an idea to transfer simple economic disaster preparedness and mitigation measures with special emphasis to earthquakes in one of the grassroots community of Nepal. A demonstration model village with earthquake resistant buildings was visualized.

Twenty-two out of forty buildings in Basantapur ward number 8, Dhamauli Village Development Committee (VDC) were washed away by flash floods in 1996. Six families rebuilt their buildings

using the conventional technology. Sixteen poor families could not reconstruct their buildings and requested DCS to assist them with rehabilitation. The idea conceived by Tri-agency was developed and implemented as a demonstration project in Basantapur.

Several groups cooperated in the project. The Development and Consulting Services (DCS) and The School of Shelter and Environment (SSE) joined together to develop the concept. Technical inputs were also pursued from the National Society for Earthquake Technology - Nepal (NSET-Nepal and Prof. Ian Davis, Director Oxford Center for Disaster Studies (OCDS). Mr. Noel Vaghela through CASA visited the site. Apart from technical input he also contributed seed money to construct a house for the poorest beneficiary. **Earthquake Resistant Buildings in Nepal: A Demonstration Model for Tri-Agency Region (ERH Project)** was formulated in a way that would ensure full participation from the beneficiary community. The project was started on 1st Sept. 1997 and completed on 31st June 1999.

AWARENESS AND TRAINING

At the request of community the ERH Project began with literacy classes for the potential trainees, in the evening. This program was also



NFE class: vehicle of ERH Project

used as a tool to mobilize the community and make them aware of disaster preparedness and mitigation measures.

One person, from each of the nineteen beneficiary families, was trained to achieve the required building skill. The trainees first learned to fabricate cost effective building components. They constructed a community resource center using the materials they produced. Women also actively participated in the training. Various cost effective building components and disaster resistant construction technology were introduced in the community resource center.



Women acquiring masonry skills

COMMUNITY PARTNERSHIP

The beneficiaries decided on the building components, construction technology, size, and the location of their building to be constructed. The ERH project provided technical input and non-local materials, as required for disaster resistant components. Such input was limited to the materials equivalent to Rupees twenty-four thousand for a building. The owners mobilized their resources for other components of the building.

Earthquake Resistant buildings in Nepal: A Demonstration Model for Tri-agency Region

Objectives

- Raise awareness among the beneficiaries on natural disasters, their effect on buildings and availability of simple economic techniques to minimize them.
- Produce 30 to 45 masons or skilled building workers able to construct disaster resistant buildings.
- Facilitate the construction of 12 to 16 buildings to demonstrate/disseminate simple and economical disaster resistant construction technology with special emphasis on earthquakes.

Input

- Project Budget NRs. 1,510,000.00
- Community Contribution NRs. 1,000,000.00

Output

- Produced 39 skilled building workers.
- 20 disaster resistant buildings (total built up area approximately 8000 square feet) including one community resource center and a primary school.
- The skill and technology has been replicated in neighboring villages.

Building components introduced % economy

- Lean Concrete bricks 16-30%
- Stonecrete Block 32-50%
- Stonecrete wall 45-60%
- Rat trap bond wall 30%
- Pre-cast RCC roofing/flooring 23.5%
- Frame-less openings 85%