Strategies to Mitigate Impacts of Disasters - Capacity Building of Communities

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Introduction

Housing construction in most developing countries generally is a non-engineered self-help process. New housing construction usually takes place in the peripherial areas of fast-growing and continuously expanding cities Of all the man-made structures, the collapse of engineered and non-engineered buildings during the earthquake is the main contributor to the loss of property and lives of the occupants.

In our country more than 55 per cent of land area falls in the seismic zone of moderate to severe intensity. The entire Himalayan range from Kashmir to Assam is most vulnerable from the earthquake point of view.

After the devastating earthquakes in Latur, Uttarkashi, Jabalpur and recently in Chamoli, local communities suffered unprecedented distress because these areas were previously considered seismically dormant. Thousands of houses affected fully or partially made the occupants lose faith in the safety of traditional construction practices

After such earthquakes, immediate reconstruction/repair of the damaged and vulnerable houses by strengthening, retrofitting and reconstruction using disaster resistant technologies becomes mandatory. The affected communities to be made aware of the hazardous features while carrying out the repairing work and the skills of the local artisans need to be upgraded so that they are able to effectively integrate these technologies during the construction process. The community as a whole must also accept these improvements that are required to make their units disaster resistant

Normally it is difficult to convince people of the effectiveness of technological innovations due to the long recurrence of the earthquakes. This resistance of the community can only be tackled by providing them the relevant information and demonstrating benefits in a manner that approximates the original circumstances of earthquakes as closely as possible.

HUDCO's Initiatives in Disseminating Earthquake Resistant Technology

HUDCO with its mandate to housing the urban and rural people through the length and breadth of the country, has always responded swiftly through need based technical solutions in disaster-affected areas

Soon after the earthquakes, training programs on earthquake resistant technologies were organised at Latur, Uttarkashi, Jabalpur and Chamoli (two different programems were organised at Chamoli and August Muni). These training programs were organised by Habitat Polytech at the instance of HUDCO.

These training programs were aimed at strengthening the communities to take precautionary measures in the reconstruction of damaged houses and to make the new construction earthquake-resistant. It was noticed that this particular task becomes further challenging, because of different geographical conditions including quality of soil. Therefore, there are certain set conventional construction practices and any outside intervention needs to be worked-out carefully in consultation with the community. A brief about the difficulties faced and experiences gained in motivating the communities and organising practice-based training programs on earthquake-resistant technologies and various retrofitting techniques to repair the damaged houses in Jabalpur and Chamoli are highlighted below :

Jabalpur

Jabalpur city located at the Center of India, falls under seismic zone 3 according to the seismic zoning map of India, with anticipated maximum seismic intensity of VII on Modified Mercalli (M.M.) Intensity scale The soil in general is black-cotton which is the worst category of soil from construction point of view

The conventional houses in remote rural areas are usually made with earthen adobe with clay tile roofing whereas in semi-urban and urban areas the dwelling are brick houses with clay tile roofing or brick houses with RC slab or stone patti roofing, or with RC frames Under rammed piles with composite structure of RCC became the practice for the last 2-3 decades Old buildings in the city were built by Britishers have thick walls using thin bricks and lime mortar and roofing of Mangalore tiles.

The severe impact of earthquake was on old houses, government buildings or in new multistoried apartments constructed by private builders

Immediately after the earthquake struck Jabalpur city and nearby areas on 22nd May 1997, the team of Habitat Polytech reached Jabalpur. The local community was in panic with no idea as to how the damaged houses could be reconstructed/repaired before mansoon. Those who could able to afford were consulting the local engineers but the technique of retrofitting suggested by local engineers for the repair of the damaged structures were of temporary nature, expensive, and the economic condition of majority of the clients were not permitting them to adopt such techniques HUDCO therefore, realised the need of appropriate training to create awareness amongst these people and a 2 weeks training programme was organised on priority basis. This training programme was fully aimed at developing a pool of skilled manpower so that the immediate needs of the communities are met locally.

Architects' Forum and Institute of Engineers spontaneously came forward to collaborate in our endeavour and extended all possible help specifically in mobilising participation from local communities including private builders. This joint effort proposing to organise practice-based demonstrations at different locations (different types of damages occurred in different locations) and suggesting methods of retrofitting, had a overwhelming response from the curious communities and other volunteers making this effort fruitful and successful

The training programme was followed by two days exhibition-cum-awareness camps jointly organised by Chamber of Commerce, Jabalpur, HUDCO, BMTPC and Development Alternatives. People took keen interest in

HUDCO's mock-ups demonstrating the retrofitting technologies About 8000 people received guidance for tackling their repair problems

The impact of this training programme can be (1) there was a saving of crores of rupees not only on the part of the communities but also on the part of the government, in case the retrofitting work started without organising these events, local communities would have used expensive and temporary measures, (2) the local people were extremely satisfied with the approaches and there had been no further development of cracks or leakage after monsoon and series of after shocks, and (3) there has been a tremendous demand for the manpower trained. They had covered bulk of business with enhanced wages (4) During our later visits we have been informed by the trainees that they have further trained their subordinates in earthquake resistant technologies and they have integrated those technologies in the new construction projects

Gopeshwar

Garhwal region is a north western part of the hilly regions of U P. Hills are always in the grip of earthquakes and other calamities like land-slides, rock fall etc Likewise, Uttarakhand region has witnessed a series of such mishaps The devastating earthquake that struck Chamoli and Rudraprayag region on 29th March, 1999 was measured at 6 8 on the Richter scale. Due to greater depth of focus, the tremours were felt over much larger area. The maximum damage was observed in old Chamoli town where non-engineered buildings were built with random rubble masonry in mud with thick walls. As per estimates around 1,60,000 housing units were damaged in Chamoli, Rudraprayag, Tehri and Pauri region.

In order to upgrade the skills of the local artisans in disaster resistant technologies, a two days programme was organised at Gopeshwar . Here again the collaboration of Government and local voluntary agencies who knew the local geographical conditions and type of construction etc. was crucial. Gyan Vigyan Samiti which is a national-level network of NGOs extended their help in terms of mobilising participation which included master masons & supervisors from the local communities, representative of Block / Tailuk and village panchayats, academicians and local people.

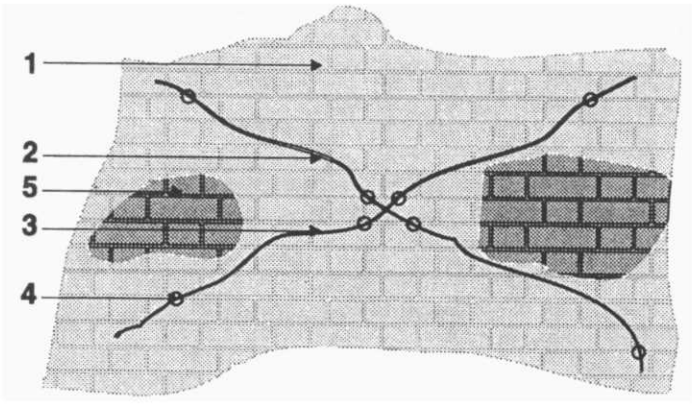


Fig 1 : Filling of cement grout in cracks

1 *Plaster*
2. *Plaster removed and cracks cleaned*
3 *Cracks sealed with 1 2 mortar*
4. *Grout ports*
5 *Plaster fallen*

Agastmuni

Another training programme was organised at Agastmuni. As the geographical, social conditions are almost similar to Chamoli, the same approaches were followed in Agastmuni also

In both the programs it was realised that almost suggested earthquake-resistant technologies were in existence in older buildings of this region in past In the last fifty years without understanding its relevance and importance these technologies were ignored The impact of the programme on the community was clearly visible. The community has realised these facts and were ready to adopt similar technologies with certain modifications Further, the eco-friendly, cost-effective technologies using local resources were appreciated as the burned bricks are not readily available and involve transportation costs to carry them to these far-flung hilly areas.

Long Term Initiatives

The bottom line for the success of any such effort is indeed adequate community awareness The resistance to adopt any new technology can only be over-come by providing them with complete information and by demonstrating. The beneficial effects which would help protect their lives in future incidences of earthquake The role of NGOs in this regard becomes significant to mobilise the community opinion to adopt earth-quake resistant features. Gyan Vigyan Samiti, in this context has show interest to educate the people at local level by using their network in Tehri, Garwal and Pauri areas. This activity shall be implemented by the agency in phased manner.

After organising all these training cum awareness programs it has been realised that programs for mass awareness generation needs to be initiated in those regions to introduce the people the causes, reasons of earthquakes and losses there off and interventions that are eco-friendly and cost-effective. Propagation of appropriate disaster resistant features in building construction could be done through posters displayed at the prominent sites, highlighting the **Do's** and **Don'ts** for basic earthquake resistant features, retrofitting methods, precautions that need to be taken during dismantling of the damaged portion of the house. The powerful media like Doordarshan, All India Radio and other audio-visual means can be used to generate the awareness amongst the affected community. Last but not the least, availability of counselling services on a continuous basis should also be ensured through building centres, NGOs etc.

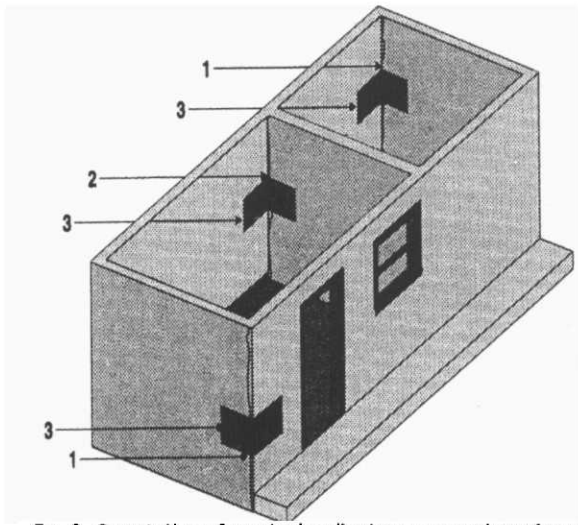
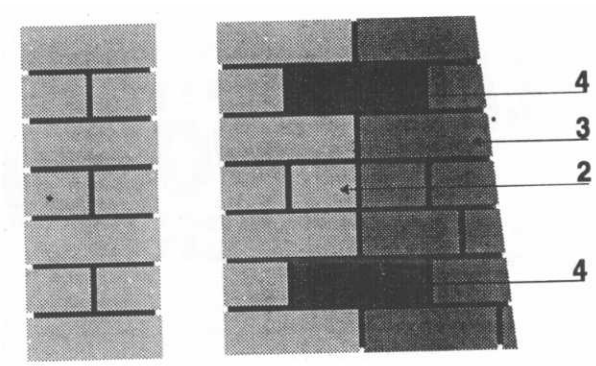


Fig. 2 Connection of cracked walls at corners and junctions

1. *Connecting Corners*
2. *Connecting walls at T-Junction*
3 *Weld-Mesh*



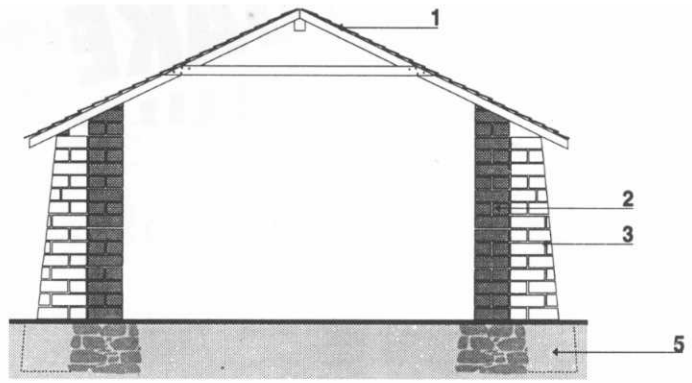


Fig. 3 : Strengthening of long or high walls by buttress

1. *Roof with Rafters*
2. *Original wall*
3. *Buttress, new brick work*
4. *'Key' bricks for connecting buttress*
5. *Buttress footing*

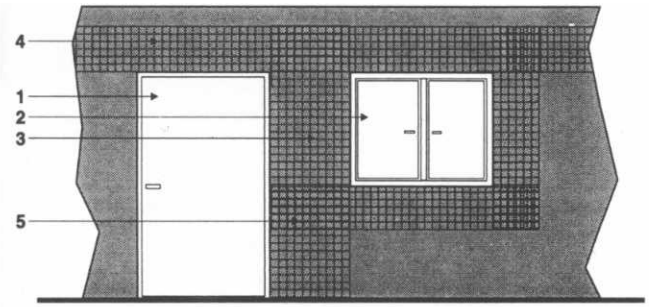


Fig. 4 : Reinforcing around opening

1. *Door*
2. *Window*
3. *Mesh of ferro-cement*
4. *Seismic Belt*
5. *Overlap of Mesh*

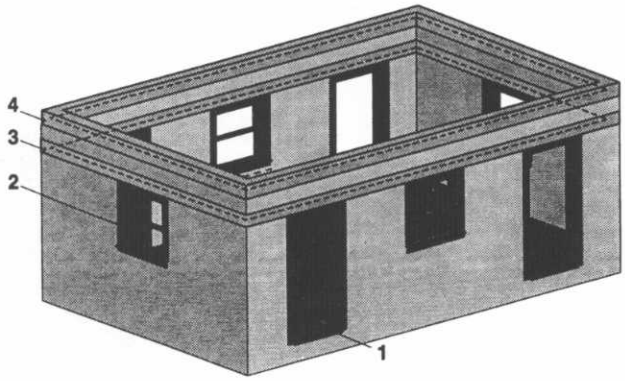


Fig. 5 : Arrangement of Seismic Belt

1. *Door*
2. *Window*
3. *Lintel Belt*
4. *Roof Belt (only for stone patti floors, not required for RC slab roofs and floors)*

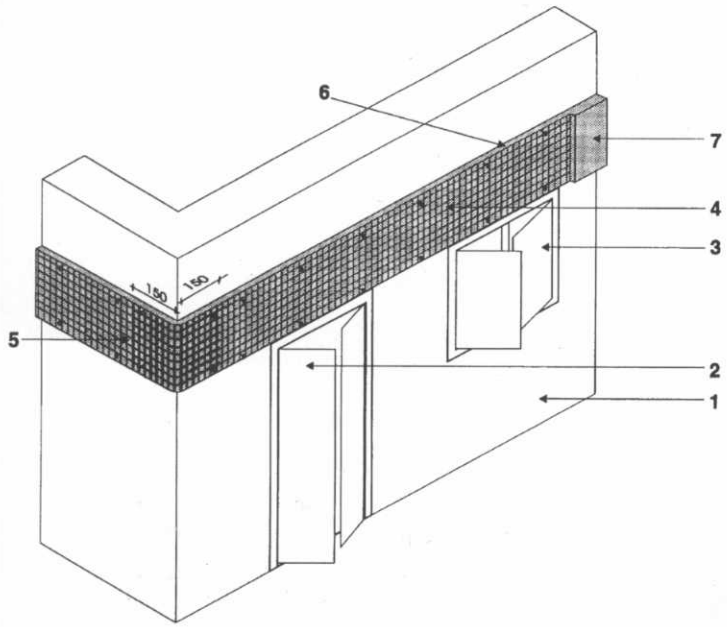
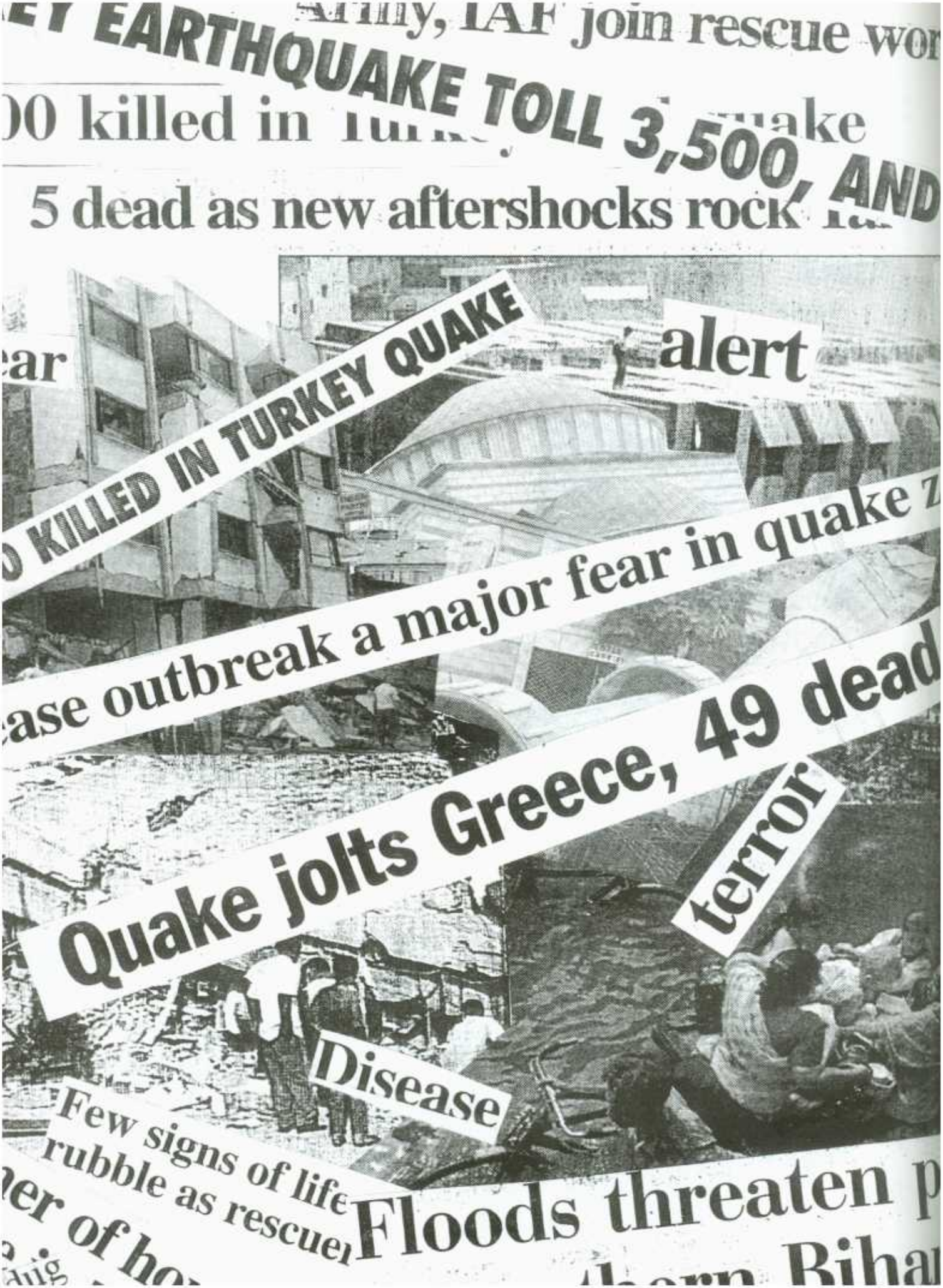


Fig. 6 : Fixing of Seismic Belt

1. *Wall*
2. *Door*
3. *Window*
4. *Mesh in Seismic Belt*
5. *Overlap in Mesh*
6. *First coat of plaster*
7. *External plaster, second coat*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