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## BUILT EXPRESSIONS

Editor-in-Chief: Ajit Sabnis
ajit@builtexpressions.com

Executive Director: Dennis J.
dennis@builtexpressions.com

Technical Editor: Dr. Jagadhar
Consultant Editor: Dr. R. Jagadhar
Editors: eynisha@builtexpressions.com

EDITORIAL TEAM
Pavitra Tch. Bhal Setu Dass Ravi Ram Renuka Venkata Ratan Chatterjee Swetha R Pratik A Kavita Sharma Prema I

PHOTOGRAPHY
Jagannath N V
photos@builtexpressions.com

MARKETING AND SALES
Bhavan N Rangla P

ADMIN STAFF
Evan Hills A B Vivek

Published By:
Jagtis Sabnis
MURUGI MEDIA (PVT) LTD
12, 2nd Floor, Lalashan Road, Shanth Nagar, Bangalore - 560071
Ph: 91-80-22226999, Telefax: 91-80-22226909
Email: info@builtexpressions.com
info@builtexpressions.com

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Build Change uses and promotes a homeowner-driven model – a model that creates permanent change in construction practices. This model has begun to receive notice and even sought out by several large disaster relief organizations. When homeowners drive the process and make their own decisions about design and materials, the cost of building the house can be as much as three-to-four times less than a donor-built house.

‘BUILD CHANGE’ - BUILDS A BETTER FUTURE IN SEISMIC ZONES

According to the US Geological Survey estimation, several million earthquakes occur in the world each year. Many go undetected because they hit isolated areas or have very small magnitudes. The National Earthquake Information Center (NEIC) now locates about 50 earthquakes each day, or about 20,000 a year. A majority of the casualties are from the seismic-prone areas of Japan, Indonesia, New Zealand, Mexico, and parts of US & China.

In many ways, Japan is still reeling from the devastating earthquake, which killed about 16,000 people and left 4,647 missing, 18,927 displaced and at least 23,005 buildings, 2,128 roads, 26 bridges destroyed or damaged by the earthquake and tsunami, leaving many homes devastated.

Other countries in the Asia-Pacific zone and parts of Europe fall under high-risk, seismic-alert zones. As per the National Disaster Management Authority of India, an earthquake is a major issue of concern as over 58.6 percent of land in India is highly vulnerable to earthquakes and 38 cities fall under moderate to high-risk seismic zones.

After each major disaster, nations are pushed into a lot of soul searching as they can be worn down by economic growth and political crisis, leading to the need of international help. The road to recovery can be long, as tons of debris has to be removed and a new beginning has to be initiated to rebuild the area. In what international officials may term as a long-drawn-out humanitarian crisis, many may remain in increasingly dangerous tent camps, thousands of inhabitants may reside in dangerously damaged buildings and countless others may be evicted from camps and yards.

To avoid these ghastly incidents, civil and structural engineers should try to implement economically viable construction practice considering all structural components, which can be clearly understood with the concept of earthquake-resistant houses. These structures should be more durable in nature.

From the past analysis of seismic incidence, engineers and architects agree with the fact that meticulous planning at the foundation stage of a building can reduce the number of casualties considerably and sometimes even to very few instead of thousands. But on the other hand, they are apprehensive about budget allocation to build such houses as the support from the government is minimal and also, there is lack of political will to implement changes.

Build Change Develops a Sustainable, Homeowner-Driven Model

To overcome these challenges and demonstrate that there are low-cost, sustainable solutions to building earthquake-resistant houses, Build Change, an international non-profit social enterprise has been working on this issue since 2004. Build Change’s mission is to greatly reduce deaths, injuries and economic losses caused by housing collapses due to earthquakes in developing countries. It does this by designing earthquake-resistant houses and training and creating awareness among local builders, homeowners, engineers and government officials to build them. The Build Change team facilitates these training programs, which stimulate local demand for safe and affordable building using local materials.

Build Change uses and promotes a homeowner-driven model – a model that creates permanent change in construction practice. This model, largely inspired by the reconstruction approach used by the Indian government following the 2001 Kargil, Gujarat earthquake, has begun to receive notice and even sought out by several large disaster relief organizations. When homeowners drive the process and make their own decisions about design and materials, the cost of building the house can be as much as three-to-four times less than a donor-built house.

Dr. Elizabeth Hauser Strand, founder and the CEO of Build Change, created an innovative, sustainable, highly replicable model around the theory of change, which led to the formation of the non-profit social enterprise Build Change. In early 2005, it started its work in Ache, Indonesia, after a powerful earthquake and tsunami, and began testing its theory of change. The organization found that its theory of change worked and since then, it has refined and transferred this model to West Sumatra - Indonesia; Sichuan - China; and Port-au-Prince - Haiti, during post-disaster situations.

For her innovative and sustainable approach to post-disaster reconstruction, Dr. Hauser Strand has received many awards including most recently the 2011 Lemaire-MIT Award for Sustainability for designing disaster-resistant building in China, Haiti and Indonesia and the 2012 US Social Entrepreneur of the year by the Schwab Foundation. She has also been instrumental in shaping policy around post-disaster reconstruction. For instance, she was a panelist at the 2010 Clinton Global Initiative Annual Meeting and a participant at the 2012 World Economic Forum. She has also delivered lectures on sustainable, disaster-resistant construction worldwide and served on the 2002-2005 US National Research Council Committee to develop a long-term research agenda for earthquake engineering. Dr. Hauser Strand holds an MS and Ph.D. in civil engineering from the University of California, Berkeley and an M.S. in environmental science from the University of Colorado.

Talking about her inspiration to initiate Build Change Dr. Hauser Strand says, "In 2002, I went to Gujarat - India, on a Fulbright fellowship to study and assist with post-reconstruction efforts after a devastating earthquake that killed more than 20,000 people. I learnt that after a major earthquake in a developing country, foreign relief agencies typically build houses on masses that are not always culturally appropriate or sustainable in the local construction sector. Often, the homeowner is only minimally involved in the decision-making and construction process. The opportunity to build local capacity is often missed, and in many cases, the houses built after the funding and technical assistance cease are not earthquake-resistant.”

After observing these efforts, Dr. Hauser Strand developed a theory of change. She feels that earthquake-resistant construction in developing countries will become common only if the right technology is locally available, widely known and culturally accepted. In addition, the cost of the technology must be competitive with existing, but not necessarily safe, building methods.

Build Change’s model is sustainable because the organization applies the following principles and strategies.

- Local Solutions - Build Change
If built incorrectly, these buildings can be deadly in earthquakes.

While building techniques and materials used vary by location, to ensure successful implementation and sustainability, Build Change has identified the following three critical factors, or "The Three Cs," for durable, culturally acceptable and affordable reconstruction:

**Configuration**
Applying careful thought to a home's design plan and layout can improve its resistance to earthquakes at little or no extra cost. For example, ensuring that structural walls are symmetrical and that there are approximately the same number of load-bearing walls in each direction per home will help improve its durability during natural disaster.

**Connections**
Unreinforced or unconfined masonry walls fail in earthquakes. Making strong 'connections' between all components of the home (e.g., all walls, the foundation and the confining elements) is necessary for structural integrity. Connecting the roof to the walls especially is essential for safety in both earthquakes and hurricanes.

**Construction Quality**
Using quality materials and workmanship is the first line of defense for an earthquake-resistant home. Simple, inexpensive techniques, like soaking bricks in water prior to building a masonry wall, make all the difference in the resilience of a house. Using locally available resources and labor also help make this the most affordable and culturally acceptable reconstruction process.

Build Change is a founding member of the Confined Masonry Network; the first meeting was held at IIT-Kanpur in January 2008.

**Build Change is Creating Change in Post-Disaster Reconstruction**

When asked about the benefits and changes society can foresee with the arrival of this concept, Dr. Hauser Strand proudly asserts, "We have already begun to see a shift in the way disaster relief agencies think about post-disaster reconstruction services. For years, relief agencies have been using a donor-driven model after major disasters in developing countries — a model that does not include, or minimally includes, the homeowner. This approach does not create sustainable change in construction practices as houses built after the funding and technical assistance cease most often are not earthquake-resistant."

She adds, "If even a few relief agencies adopted the more sustainable, homeowner-centric approach, it could be the tipping point to charging post-earthquake reconstruction programs globally. This shift would create permanent change in construction practices in developing countries — to ones that are safe, earthquake-resistant and widely accepted by local communities — greatly reducing deaths, injuries and economic losses caused by housing collapses due to earthquakes."

The organization has spread its wings to Indonesia, Haiti and China. The organization claims that the response in all of these countries has been extremely positive from all parties involved in the reconstruction process.

**West Sumatra, Indonesia**

- After training education supervisors in West Sumatra, the chief of the Provincial Education Bureau declared that the Education Bureau was in the process of incorporating Build Change's earthquake-resistant design and construction (ERDC) training into the schools' curricula. Additionally, a reconnaissance study after the September 2007 earthquake in West Sumatra found that none of the 650 houses built in Build Change's minimum earthquake-resistant standards following the area's September 2007 earthquake had suffered any damage (although other structures in the area had collapsed). After that 2009 earthquake, a number of homeowners started rebuilding using the techniques Build Change had previously introduced.

**Sichuan, China**

- After providing hands-on training to the Chinese township government and deriving simple, easy-to-use building standards, the township government asked Build Change to assist with inspections — a significant step toward building reinforcement in rural China. The national government also asked Build Change to expand the training throughout Sichuan and other regions in China.

**Port-au-Prince, Haiti**

- The Haitian Ministry of Public Works (MTPC) is partnering with Build Change to develop a Haiti-wide retrofit guidelines. Once these guidelines are published and officials are trained, they will be used and enforced throughout the country even after reconstruction efforts are complete — impacting tens of thousands more buildings and lives.

Build Change has designed ERDC training programs for engineers, builders, homeowners, technical students, vocational school teachers and education supervisors to introduce them to the basics of ERDC principles and techniques. The training includes a combination of classroom seminars, practical exercises.
and demonstrations on how to read a drawing, estimate quantities, choose good quality materials and design and build safe houses.

She also believes that the training course provides an excellent introduction to EKRC, but it is most effective when builders also have onsite supervision and mentoring during construction to ensure proper application of the techniques they learned. Build Change thus provides construction site supervision, inspecting each stage of the construction process against a checklist that verifies that construction meets the minimum standards for earthquake safety.

**Build Change’s Low-Cost Approach Minimizes Environmental Impacts**

Dr. Hauser Strand strongly feels that building an earthquake-resistant house can have a positive effect on the environment because the lifespan of the building is longer, thereby reducing consumption of resources. She elucidates, “Earthquake-resistant buildings will not collapse in an earthquake and will not need to be rebuilt. Also, many homeowners Build Change works with in Indonesia, choose to build their houses from locally grown or reused timber, which has a lesser environmental imprint and can be more earthquake-resistant than homes made of bricks and concrete.”

Recalling her visit to India, Dr. Hauser Strand says, “From 2002 to 2004, I visited the areas affected by the 1993 Maharashtra / Kerala earthquake, the 1999 Kumbhi earthquake, and the 2001 Bhuj / Gujarat earthquake. At that time, the Indian sector was leading the world in the most sustainable, safe and satisfactory approach to post-earthquake housing reconstruction, as evidenced in the Bhuj reconstruction. The Indian government was using a homeowner-driven approach, which was a significant source of inspiration for Build Change’s work.”

Suggesting few guidelines for India where many parts are categorized under seismic zones, Dr. Hauser explains, “For high-rise and other buildings built through the formal sector, following the Indian building codes is essential. Everyone has a role to play in building safely – planners, engineers, architects, owners, government officials, contractors, builders and building materials producers. There are some excellent resources and training courses offered by the NICCE, Kanpur. The Earthquake Tip Sheets produced by the National Information Centre of Earthquake Engineering (NICEE) IIT-Kanpur are very informative and user-friendly. They have received global recognition and have been translated into multiple languages, including French, to support our work in Haiti. For buildings built in the informal sector, referring to the tip sheets and other resources available in India, such as the simple guidelines produced to support the reconstruction following the 2001 earthquake near Bhuj, is the best way to promote safe construction. Hands-on builder training is necessary for change to take place.”

She continues to say, “At the moment, Build Change does not have plans to work in India, however, we look forward to continuing to learn from the successes in the Indian sector.”

When asked about how affordable the earthquake-resistant building for developing and under-developed countries. Dr. Hauser says, “Build Change looks for low- or no-cost improvements to existing ways of building houses. During the process, we make sure we identify materials that are available locally and building techniques that are culturally accepted and easy to adopt with limited training and education. By introducing incremental changes to existing practices, especially in areas where the most common defects occur, change in construction practices is more likely to be adopted and sustained over time.”

Citing an example, she explains, “A no-cost improvement that increases wall strength substantially in Indonesia includes filling bricks with water to increase the bond between bricks and mortar, and walls in China with lots of openings can be strengthened by placing lintel beams over the openings and not tearing them next to corners.”

She adds, “In Indonesia, new houses built through homeowner-driven technical assistance programs generally cost anywhere from US$3,000 to US$12,000 less than similar structures built in donor- or contractor-driven environments. In Haiti, retrofit can cost anywhere from US$1,500 to US$4,500, with a per square meter cost ranging from US$40 to US$100.”

**Build Change Scales and Increases Impact by Leveraging Partnerships**

A critical component of Build Change’s sustainable model is leveraging partnerships in the field. Partnerships are a key avenue to scale impacts, create long-term change and generate revenue. Accordingly, Build Change partners with:

- **Local, state and national governments** to develop building code standards, simple enforcement systems, and homeowner financing.
- **Large relief agencies** – CARE, Catholic Relief Services, Mercy Corps, Caritas, CRB International, Oxfam, Save the Children, and the Red Cross – to train their staff to reach more homeowners and builders with earthquake-safe housing solutions and provide financing.
- **Vocational schools and education bureaus** to incorporate ERDC as a part of the school curriculum and build a pipeline of builders trained in ERDC.
- **Private sector** (local building materials producers and suppliers) to distribute information on safe reconstruction and provide quality products.
- **Financial institutions** to facilitate homeowners’ access to financing so they can build back safely.
- **The best engineers and architects** in the world to ensure the highest-quality designs and design thinking are applied to reconstruction, while maintaining the criteria for local sustainability and acceptance.

Build Change partners with local governments and the authorities to help enforce the reconstruction model as a new building standard, reducing community reliance on change and leading to further implementation. In addition, Build Change partners with local governments to develop simple, practical design guidelines and enforcement systems for building and inspecting safe houses, and create a streamlined, simple inspection and monitoring system for enforcing those standards. For example, Build Change signed a Memorandum of Agreement with Haiti’s Ministry of Public Works, (MTTPC) to provide technical assistance and training services to the Government of Haiti. In addition, the organization has also been working with the MTTPC to develop a Haiti-wide retrofit guideline, which will be published by the MTTPC soon, to help ensure this solution can scale to meet the much greater need in Haiti. In Indonesia, the education bureau in West Sumatra is partnering with Build Change to incorporate ERDC into the school district’s curriculum. In China, Build Change worked with the government officials to develop inspection guidelines and expand training throughout Sichuan.

In order to create awareness around the world, Dr. Hauser Strand speaks regularly at global conferences on such topics as sustainable disaster-resistant construction and social entrepreneurship. She also participates on various panels to inform the discussion about how a homeowner-driven model in post-disaster reconstruction efforts can bring about permanent change in construction practices.

Dr. Hauser Strand concludes, “Earthquakes don’t kill people, poorly built buildings do. This is a man-made problem with a man-made solution. It is possible to build simple, safe, sustainable earthquake-resistant buildings, including homes for low-income homeowners.”

Pavithra TS