

Publication	Day & Date	Edition
Estate World	July- August 2013	National

STRATEGY: LICENSING DEALS GET REAL ESTATE UPWARD

Postal Registration No. L-2/HR/FBD/287/12-14 | VOL. 2 NO.8 | 16th July to 15 August 2013 | ₹100

EstateWorld

INDIA'S REAL ESTATE MAGAZINE

www.estateworld.in

TRENDS
MY OFFICE IS NEXT DOOR

PRACTICE
THE PROMISE OF EDUCATION IN A DEVELOPER'S SOCIETY

PERSPECTIVE
LESSENING OF PRIVATE EQUITY FUNDS

INVESTMENT
TOP 10 LUXURY PROJECTS IN SOUTH MUMBAI

(UN) BROKERING REAL ESTATE

HOW FINLACE IS TRANSFORMING REALTY TRANSACTION FROM PEOPLE TO PROCESS

SATYENDRA TOMAR
Director, Finlace Consulting Pvt. Ltd.

PAWAN JASUJA
Director, Finlace Consulting Pvt. Ltd.

A PUBLICATION OF
FRANCHISE INDIA
Your growth is our business

15 PROMISING BROKERS IN DELHI NCR

finlace, NETAMBIT HOMEWISE, INVESTORS' CLUB, FAVISTA, neobriX, boji, PRUTHVEE, Sirohi, CA, PZ, WARG, PROPERTY CONSULTANT REAL ESTATE... SIMPLIFIED, intown, REINET India, CZ, A to Z

EW / TECHNOLOGY

TONING DOWN THE TREMORS

Earthquake resistant buildings are the need of the hour and we must employ each measure to make our buildings earthquake resistant.
By **Collin Furtado**

Natural disasters are very unpredictable and can cause extensive damage to lives and property. Earthquakes are one such natural disaster that can cause damages on a great magnitude and even level down large buildings to the ground. It cannot be predicted and hence, precautions must be taken to avoid such disasters. The best way to do this is to design a building using earthquake resistant technology. So are buildings in India earthquake proof? In reality, there is no such technology that can make buildings earthquake proof. Buildings can only be made earthquake resistant and that too depending upon which zone it falls in. If it falls in Zone IV you may design the building stronger- in real terms buildings are only stronger in terms of resistance from Earthquake.

Number of Earthquakes Worldwide 2007 - 2012

Magnitude	2007	2008	2009	2010	2011	2012
8.0 to 9.9	4	0	1	1	1	2
7.0 to 7.9	14	12	16	23	19	12
6.0 to 6.9	178	168	144	150	185	108
5.0 to 5.9	2074	1768	1896	2209	2276	1401
4.0 to 4.9	12078	12291	6805	10164	13315	9534
3.0 to 3.9	9889	11735	2905	4341	2791	2453
2.0 to 2.9	3597	3860	3014	4626	3643	3111
1.0 to 1.9	42	21	26	39	47	43
0.1 to 0.9	2	0	1	0	1	0
No Magnitude	1807	1922	17	24	11	3
Total	29685	31777	14825	21577	* 22289	* 16667
Estimated Deaths	712	88011	1790	320120	21953	768

Source: Survey National Earthquake Information Center

Measures to make a structure earthquake resistant

Earthquake resistant buildings are specifically designed structures to resist any damages that may be caused by an earthquake. To this, many architects and engineers have come up with ingenious designs incorporated into the building to absorb the shocks of the earthquake as much as possible. Prof. Charanjit S. Shah, Founding Principal Architect, Creative Group explains, "The building needs to be stronger in terms of the lateral movement. At the time of an earthquake, a building oscillates like a pendulum and needs to come back to its original position otherwise at the end of such a movement it ends up developing cracks. Therefore, the slenderness ratio as well as beam and column connections are sensitive aspects which need to be looked into. It is thus recommended that importance is given to proper and adequate reinforcement particularly the binding strips that need to be closer at supports in general terms." So what this means is that in order for a building to be resistant to earthquakes, it needs to be flexible

FREQUENCY OF EARTHQUAKES

Magnitude	Average Annually
8 and higher	1 ¹
7 - 7.9	15 ¹
6 - 6.9	134 ²
5 - 5.9	1319 ²
4 - 4.9	13,000 (estimated)
3 - 3.9	130,000 (estimated)
2 - 2.9	1,300,000 (estimated)



If a building's foundation sits on soft or filled-in soil, the whole building may fail in an earthquake regardless of the advanced engineering techniques employed. Our engineers first check the soil before doing anything further alteration to make the structure according to the strength. One solution involves tying the foundation to the building so the whole structure moves as a unit."

Vijay Kumar Jindal
CMD, SVP Group

enough to move to the vibrations or else it will snap into two. He further added that in case of load bearing structure, diagonal bonds play a very crucial role besides conventional off settings, corraling and use of multiple horizontal and vertical reinforcement.

According to developer Mukul Kumar, Executive Director, Alpha G: Corp Development Pvt. Ltd, earthquake resistance can be introduced in a building at three levels, through material grade and quantity, project management and the structure itself. The material grade pertains majorly to the quality of the aggregate, cement and steel used for structure. The project management aspect pertains to ensuring quality and providing for requisite time frames to introduce these elements. Within the structure, reinforcement of slabs, columns, beams and other structural elements is paramount. Here, even the structure designer ensures compliance with seismic design criterion of National Building Code and various Bureau of Indian Standards (BIS) codes, based on the seismic zone in which the proposed building falls. In case of high-rises, provision of

EW/ TECHNOLOGY

Timeline of Major Earthquakes

Date	Earthquake Location		Earthquake Effects				
		Mag.	Deaths	Injuries	Damage	Houses destroyed	Houses damaged
Year	Name		No.	No.	\$Mill	No.	No.
1950	India-China	8.6	1530		20	9534	
1984	India: Assam, Cachar District	5.6	20	100	2791	2453	
1986	India: Kashmir: Dharmasala, Lahore, Pakistan	5.3	6	30	3643	3111	
1991	India: Chamoli, Uttarkashi, New Delhi, Chandigarh	7	2000	1800	60	7500	7500
1993	India: Latur-Osmanabad, Killari	6.2	11000	30000	300	0	
1997	India: Southern: Jabalpur	5.8	56	1000	143	8546	8546
1997	India-Bangladesh: Chittagong, Bangladesh	6.1	23	200		1	1
1999	India: Chamoli, Rudraprayag, Tehri Garhwal	6.6	100	394	70	21100	21100
2001	India: Gujarat: Bhuj, Ahmedabad, Rajkot; Pakistan	7.7	20005	166836	2623	339000	339000
2002	India: Andaman Islands: Rongat, Diglipur, Ariel Bay	6.5	2			40	
2005	India: Jausari, Chamoli, Nandprayag	5.3	1	4		1	1
2008	India: Maharashtra	5	1	20			
2011	India: Sikkim	6.9	111	177	22.3	6000	6000

Source: NOAA (National Geophysical Data Centre)

expansion joints, between the tower's extended basement and construction joints is also extremely important to mitigate damage.

Costs of earthquake resistant buildings

In terms of cost of earthquake resistant structure there is a difference of opinion. Developers say that there is a significant increase in costs in incorporating earthquake resistant technology in buildings. "Creating earthquake resistant structures imply significantly higher steel and cement costs. The greater amount of time required in implementing such technologies also translates into higher costs", said Kumar. While architects on the other hand say



This is not true always as it depends on the seismic zone of the region and the method adopted to counter the earthquake - methods like base isolation may be expensive but inducing ductility in the structural members of the building is not very expensive."

Monnanda Appaiah
Managing Director, Wienerberger

that there is not much difference in costs and that it is matter of understanding and use of appropriate technology and materials. "The basic understanding of behaviour of structure and its movement during

an earthquake needs to be addressed and understood in its engineering practices. The basic simple practices need to be implemented to create earthquake resistant buildings," said Prof. Shah.

However, no price is too expensive when it comes to the safety of the home buyers. With this idea in mind we wanted to see if developers are incorporating such measures into their buildings to make them earthquake resistant. A majority of developers follow the National Building Code which has strict norms for developers to incorporate earthquake resistant technology. Kumar added, "We diligently follow the guidelines laid down by the National Building Code with respect to earthquake resistance

Occurrence of Earthquakes Worldwide

Earthquakes per year

Magnitude	Average since 1900	Average last 10 years
5-5.9	1,319	1,549
6-6.9	134	145
7-7.9	15	13
8-8.9	1	1.3

Source: USGS statistics

structures. We fully account for external conditions such as seismic zone, soil status while designing buildings and strict quality control during construction”.

Retrofitting earthquake resistant technology

Most buildings that are coming up today are all earthquake resistant buildings as they follow the National Building Code guidelines, but what about older buildings that do not have such technology? Can earthquake resistant technology be retrofitted into it to protect them against an earthquake? Well it can be done; however, the retrofitted structure will offer limited resistance to stronger earthquakes.

According to Mr. Shrinivas Rao, CEO-Asia Pacific, Vestian Global, “Certainly, a building can be retrofitted post construction through a series of techniques such as, external post-tensioning, base isolators, supplementary dampers, tuned mass dampers, slosh tank, active control system, adhoc addition of structural support or reinforcement, connections between buildings and their expansive additions, exterior reinforcement of building, exterior concrete columns, infill shear trusses and massive exterior structure. Of course all this will depend on the area to be retrofit and the suitability of the technique.”

Though retrofitting buildings with earthquake resistant technology is possible it is a bit too expensive. The earthquake resistance treatment starts from the plinth beam onwards. In a load bearing structure building, the envelop of the building can be



Cost wise, the building construction including the seismic resistance provisions in the first instance, workout the cheapest in terms of the safety of the building and that of the occupants. Retrofitting of an existing inadequate building may involve as much as 2 to 3 times the initial extra expenditure required on seismic resisting features. Repair and seismic strengthening cost of a damaged building may even be 4 to 8 times as expensive. It is therefore very much safer as well as cost-effective to construct earthquake resistant buildings at the initial stage itself according to the relevant seismic codes.”

Ravi Mittal
CEO, RMS Group



Mumbai houses several skyscrapers and also falls in Seismic zone III, entailing a risk of being struck by earthquakes of high magnitude. Skyscrapers are universally standardised to be constructed using the float-on-systems technology that employs ball bearings, springs or padded cylinders. These act as shock absorbers and further allow the building to be decoupled from the tremors or aftershocks and essentially followed by developers in India as well.”

Shrinivas Rao
CEO-Asia Pacific, Vestian Global

incased and interwoven with vertical offsetting pillars and cobbled corners with roc beam bracing and can be developed as architectural elements that can then make the building earthquake resistant.

In RCC framed structural buildings, it is possible to minimise slenderness ratio in columns and strengthen the column caps joining beams either with addition roc works or braced with steel fabrication work. Retrofitted exercise is quite technical and needs engineering expertise and proper execution and supervision.



In today's scenario, the cost of building additional safety over that prescribed by the codes is not significant compared to the selling price of property. These measures can be easily adopted authentically. Developers should try to educate the buyers about these measures by first introducing them to small technical matters related to earthquake. This will go a long way in building the trust between the seller and the buyer.”

Vikas Kasliwal
Vice Chairman and CEO, Shree Ram Urban Infrastructure Ltd.

Are metros ready for major earthquakes?

With building structures reaching to new heights every day especially in metros such as Delhi-NCR, Mumbai and Bangalore, the question arises whether they are ready enough to bear the brunt of an earthquake on big scale. According to Prof. Shah they are ready, as today, next generation technology is available to all developers to create earthquake resistant sky scrapers. There are many overlapping precautions and treatments in such high structures that need to be set in the right order.

Though new developments are by and large earthquake proof, the older sections of the cities are more prone to damage from earthquakes. For one, none of these old buildings are earthquake resistant and secondly, they are usually in weak and dilapidated conditions due to their age. Redevelopment needs to be done in these sections to avoid disasters.

As earthquake resistant technology today can be the difference between life and death, no person wants to take the risk of living in an unsafe environment especially with different types of natural disasters hitting different parts of the world every year. Developers have to take this into far more serious consideration than following simple norm. ©EW