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### **Abstract:**

*Several catastrophic earthquakes around the world have revealed the lacunae in proper detail of building systems in the recent past, and ultimately the poorly detailed systems have become victims of various kinds of distress. A survey is required during the post-disaster mitigation stage to examine the conditions of the distressed house. The creation of a general rule for retrofitting measures is very difficult because of the vast variety of building structures and, to a large degree, each structure must be treated as a reinforcing issue on its own merits. It is important to determine whether to demolish or restore a distressed structure to an efficient load carrying system. The degree of distress is always such that the building structure can be taken back to its normalcy with a minimum restoration measure, and in such a case, restoration or retrofitting is preferred.*

**Keywords:** *Retrofitting, Earthquakes, Old building, cost, Base isolation*

### **Introduction**

Generally, a part that was not there originally must be retrofitted to (any piece of machinery or structure) in order to correct a lack. In the sense of making buildings earthquake-resistant, earthquake engineers clarified that the word is used to reinforce buildings that were already built. Old buildings have not been designed, even though these cannot inherently render them dangerous, taking account of criteria of resistance to earthquakes. The Indian Standards Code of 2002 sets requirements for earthquake-resistant construction. The code is updated periodically; in 2009, it was last revised.

Some types of construction structures and a few unique components of these are known to have repeatedly collapsed in earthquakes and are prime candidates for reconstruction and reinforcement. The reasons are: Buildings with odd designs, such as those with sudden stiffness shifts, large gaps on the floor, very large floor heights; Liquefaction-prone buildings or structures on sites; Buildings with un-

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reinforced masonry walls that appear to split and collapse under extreme earth movements; Construction in the absence of ties between walls and floors or roofs; Buildings with non-ductile concrete frames, where beam-column joint shear failure and column failure are prevalent; Concrete constructions in which inadequate bar anchorage lengths are used and Flat-slab framed concrete houses, which can be seriously affected by large-scale floor drifts.

Un-reinforced masonry buildings are the largest class of buildings in need of seismic modernisation. The majority of non-residential buildings account for these structures and have these concerns in common. After a string of strong ground excitations, these buildings are usually marred with scars.

Building structure retrofitting means enhancing its earthquake efficiency by either increasing its strength and/or rigidity; increasing its ductility or reducing the input of seismic loads.

A medical checkup of a first-time patient resembles the beginning of a traditional renovation. In order to develop a diagnosis and to arrive at a prognosis, an examination of current conditions is intended to assess the state of the health of the house. Depending on the kind of structure, its apparent state and if the original design drawings are available, a structure can be examined in a number of ways. For an appropriate retrofit measure, a multilevel approach to the structural assessment of buildings is needed. The first stage consists of a preliminary assessment, which includes a review of existing building documents, an inspection of the site, preliminary structural analysis and the arrival of preliminary conclusions and recommendations.

A second phase, which includes a more detailed examination that deals with the same things in much more detail, may or may not be needed, depending on the results of this point. The requisite steps are:

- Reviewing existing building documents
- Field inquiries
- Sampling and exploratory demolition
- Materials research
- Analyzing existing framing operations
- To make an assessment
- The preparation of a condition assessment report

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Methods of substance testing requiring removal and degradation of a portion of the member in order to assess its properties are called destructive testing. Nondestructive testing does not alter the properties of the members or influence the structure's service.

### **Science of retrofitting**

According to the experts, In general, apart (to any machinery or system already in existence) that was not originally present must be added to the upgrade to correct a deficiency. Earthquake engineers illustrate that the term used to render buildings immune to earthquakes implies buildings that have already been designed. With earthquake resistance criteria in mind, old buildings may not be designed, but this does not necessarily make them unsafe.

In the 2002 Indian Standards Code, earthquake-resistant construction requirements are specified. The code, according to experts, has been regularly updated.

### **System of base isolation in retrofitting**

The base is strengthened to make a building earthquake-resistant in such a way that the load of the building during an earthquake is borne by the base alone, and there is not much shaking on the upper floors. Much as how a jack is used to lift a vehicle to adjust a tyre, the section of the base above the floor is cut and rested on bearings. The bearings are a mixture of roller bearings and elastomer bearings that, like shock absorbers, work to expand the car analogy.

Similarly, higher floors of a building retrofitted with base isolation may not experience any shaking in the event of an earthquake, just as one does not experience bumps in an expensive car on the road with strong shock absorbers.

### **Retrofitting a building**

When time goes by, retrofitting a building depends on the material used to create the building. Engineers think that after an earthquake, symmetrical structures are less unstable in the form of a square, circle or rectangle, and are easier to retrofit. Buildings erected on stilts are prone to collapse, so the laying of sheer walls or steel bars to secure the building would be necessary to retrofit them. Meanwhile, some experts argue that, depending on the number of rooms in the system, the time necessary for retrofitting can be roughly calculated. It should not take more than two days per room, ideally.



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### **Retrofit costs**

In order to make a building vulnerable to earthquakes, the cost of a building under construction is approximately 10 percent higher, according to experts and engineers. Retrofitting an existing structure, however, would cost between 15-20 percent of the structure's total cost.