The nature of the earthquake induced forces is reckless and lasts for a short duration. It is uncertain in terms of its occurrence and nature. However, advancement made in various areas of science has provided some degree of predictability in terms of a probabilistic measure, which helps in forecasting the occurrence and intensity of an earthquake adequately for a particular region.

Forecasting an earthquake isn’t enough. We have to ensure that our structures are safe to withstand what’s coming. The design philosophy and methods have been continuously researched, proposed and implemented for improving the seismic design of structures.

Usually the earthquake resistant design is based on the concept of ductility. This is because; ductility helps to dissipate energy while undergoing large deformation. This approach emphasizes more on life safety but not much importance is given to protecting non-structural contents. Sometimes, the large deformation causes non-structural damages that may sometime cost as much as building the structure itself.

The Indian Code follows seismic coefficient method to determine lateral design forces to build the structure. But, the performance of intended ductile structures during major earthquake has been proved unsatisfactory. That is why, necessity of finding a method that is devoid of shortcomings of ductility approach is necessary.

The alternative and emerging approach for earthquake-resistant design is Base Isolation. It was first formally used by Frank Lloyd Wright in 1921 to design Imperial Hotel in Tokyo, it performed extremely well in devastating 1923 Tokyo Earthquake.

Base Isolation is a passive control system which decouples the structure from the damaging effects of ground motion during an event of earthquake. Most of the base isolation systems that have been developed only provide partial isolation. Base Isolation reduces the force transmitted by providing flexibility and energy dissipation mechanism. Its strategy for protecting structure from earthquake revolves around a few basic elements of understanding. They are, period-shifting of structure, mode of vibrations, damping and cutting of load transmission path and minimum rigidity.

In base isolation by increasing flexibility the displacement response may be undesirable. Therefore energy dissipater/damping is a must. Base Isolation is most suitable for midrise 10-15 stories and also is an excellent substitute for fixed base design in places of frequent earthquakes. New Zealand, USA and Japan are the leading countries who have rapidly adopted this technology and put great deal of energy and funds.

Thus far no base isolated buildings have been subjected to the designed earthquake motion to ascertain its ultimate capacity.

There are many types of Isolation System. One of the most common systems is the Elastomeric Base Isolation System. The development of rubber technology has made base isolation a practical reality. Typically this system consists of a big rubber block (natural or synthetic) having a high vertical stiffness compared to its horizontal stiffness and damping capacity. The vertical stiffness is close to rigid and it also helps to prevent undesirable bouncing motion that is induced if vertical flexibility is provided. Some of the few popular systems are Laminated Rubber Bearing and New Zealand Bearing.

If page permits write briefly about these.

The other Isolation system is Sliding Base Isolation System. This system along with restoring forces offers advantage over Elastomeric Isolation System because it is capable of take a wide range of frequency input from the seismic excitation. Some examples are, Pure Friction System, Friction Pendulum System, and Resilient- Friction Base etc.

It has been reported that several types of these isolation system are being used in protecting structures such as liquid storage tanks and bridges. For bridges, bearing are now produced which have high vertical stiffness and low horizontal stiffness enabling concepts of period shifting and additional means of damping.

While modelling and analyzing the Base Isolated Structures we have to adhere to some assumptions. For example, in a Base Isolated Building some of the assumptions followed are;

Superstructure is considered to remain within the elastic state during the period of seismic excitation, floor is rigid in its plane, mass is lumped at each floor level, column are inextensible and weightless which provides lateral stiffness and governs time period of the superstructure.

Even though the Base Isolation has been implemented since 1980, a formalized and simple procedure for its implementation hasn’t been very well developed. Formalization through codes itself have been at the rudimentary level.

With simplified code procedures, construction techniques and financial incentive earthquake protection can be a reality and base isolation will gain popularity.