Review on Earthquake Resistant Techniques

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Abstract — In World & mostly in India people lives in small houses with short income. And thus more prone to earthquake effects. The seismic waves that travel through the ground can demolish buildings, kill people, and cost billions of dollars in damage and restoration According to the National Earthquake Information Center, there are over 20,000 earthquake severy year on average, including 16 major disasters. The damage was caused by the collapse of buildings with people inside, as in previous earthquakes, prompting the development of earthquake resistant constructions.

Keywords: Earthquake Resistant Techniques

I. INTRODUCTION

The Indian subcontinent has suffered some of the greatest earthquakes in the world. The earthquakes of the late nineteenth and early twentieth centuries triggered a number of early advances in science and engineering related to earthquakes that are discussed here. The earthquake led to the further development of the National Information Centre of Earthquake Engineering and the establishment of a comprehensive 4-year National Programme on Earthquake Engineering Education that was carried out by the seven Indian Institutes of Technology and the Indian Institute of Science.is more effective process for confinement. Earthquake engineering is a highly context-specific discipline and there are many engineering problems where appropriate solutions need to be found locally. There is a need: to create a more professional environment for safe construction, include.

II. CONCLUDING REMARK OF LITERATURE

1) A Study on Earthquake Resistant Construction Techniques by Mohammad Adil Dar1, Prof (Dr) A.R. Dar, Asim Qureshi, Jayalakshmi Raju, American Journal of Engineering Research(AJER),2013 Apart from the modern techniques which are well documented in the codes of practice, there are some other old traditional earthquake resistant techniques which have proved to be effective for resisting earthquake loading and are also cost effective with easy constructability Disasters are unexpected events which have adversely affected humans since the dawn of our existence. Inresponse to such events, there have been attempts to mitigate devastating effects of these disasters.
2) Future trends in earthquake-resistant design of structures by Durgesh C. Rai, special section: Seismology, 2000 Earthquake-resistant design of structures has grown into a true multi-disciplinary field of engineering where in many exciting developments are possible in the near future. Most notable among these are: (a) a complete probabilistic analysis and design approach; (b) performance-based design codes; (c) multiple annual probability hazard maps for response spectral accelerations and peak ground accelerations with better characterization of site soils, topography, near-field effects;
3) International Aspects Of the History of Earthquake Engineering Part I by Robert Reitherman, Earthquake Engineering Research Institute (EERI), February 12, 2008 In the United States, serving as co-editor with William Holmes of the Earthquake Engineering Research Institute issue of Earthquake Spectra on the centennial of the 1906 earthquake in California (April 2006, vol. 22, Special Issue II, The 1906 San Francisco Earthquake: An Earthquake Engineering Retrospective 100 Years Later), and writing a historical paper in that issue, was valuable experience for writing the present work. Although that subject – an earthquake in the United States and its effects on the earthquake engineering field – is outside the scope reported on here, it helped give me a comparative basis for looking.
4) Numerical Analysis of Seismic Elastomeric Isolation Bearing in the Base-Isolated Buildings by M. Jabbareh Asl1, M. M. Rahman, A. Karbakhs, Open Journal of Earthquake Research, February 2014 Base isolation concept is currently accepted as a new strategy for earthquake resistance structures. According to different types of base isolation devices, laminated rubber bearing which is made by thin layers of steel shims bonded by rubber is one of the most popular devices to reduce the effects of earthquake in the buildings. Laminated rubber bearings should be protected against failure or instability because failure of isolation devices may cause serious damage on the structures. Hence, the prediction of the behaviour of the laminated rubber bearing with different properties is essential in the design of a seismic bearing.
5) Advanced Seismic Design of Buildings for the Resilient City by Akira Wada, Nobuyuki Mori, 11th World Conference on Seismic Isolation, 2019 Advances in seismic design technology today enable structural engineers to design buildings with avariety of seismic safety levels corresponding to different demands of the society. However, target of design is basically limited to secure life safety level within relatively short time span, i.e., serviceable life of each building. Aspects of constructing sustainable and resilient cities, which consists of buildings with long life, are not taken into account in general. Strong earthquakes occur at intervals that are longer than life of individual building or people. On the other hand, as life of cities is obviously much longer, the corresponding seismic action is stronger than the design action and may cause serious damage in buildings designed for their life only. Taking these into account, we have to design each building for earthquakes considering the life of cities in order to secure continuity of urban activities over disastrous earthquakes. However, there are problems to be solved in order to implement

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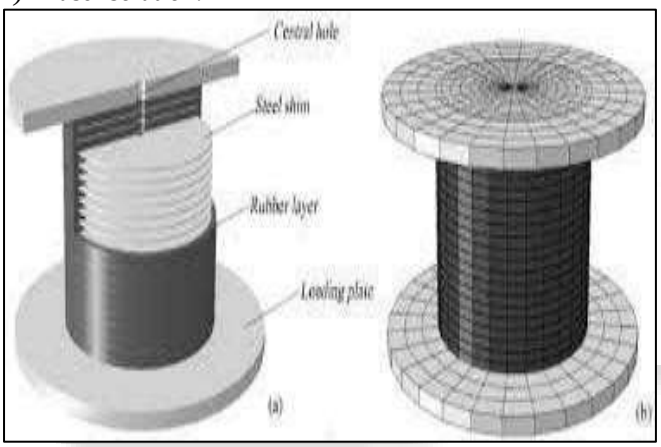
such seismic design. In this paper, factors in seismic engineering that hinder to realize long life city are identified and discussions on future steps of structural engineers to contribute in constructing sustainable and resilient society are indicated.

Advanced Earthquake Resistant Techniques by Pranjal Yadav, Advanced Earthquake Resistant Techniques, 2016 Earthquakes are serious problem as they affect life in hazardous manners. The Earthquake are mainly prevented by two methods namely Base Isolation Methods and Seismic Dampers. This report deals with Base Isolation and Seismic Dampers Methods in brief manner. Inertia is the reason for any building's displacement in the direction opposite to that of ground's motion. Base- isolated buildings undergo four times less acceleration as compared to fixed-base buildings. Reducing the vibrations in the structure is another way of resisting damage. This is where dampers come into play.

III. METHODOLOGY:

A. Earthquake Resistant Techniques:

1) Base Isolation:



Base Isolation is a very effective procedure which keeps a structure safe from earthquake. In this process structural elements are collected which should significantly isolate a superstructure from the substructure. It protects the integrity of different structure. Base isolation is potential equipment against earthquake. Technologies to control the vibration of structure are used in this process. Seismic sustainability and seismic execution of a structure can be raised significantly with the application of base isolation. But it is true that a building cann ot be made fully earthquake proof by the base isolation process.

a) Elastomeric Base Isolation Systems:

The developments in rubber technology made the base isolation a practical reality. In the implemented projects of base isolation worldwide, it is observed that elastomeric based systems are the most common. Typically, these systems consist of big rubber block, which can be natural or synthetic (in case of neoprene) that are generally characterized by high vertical stiffness compared to the horizontal stiffness and damping capacity.

b) Laminated Rubber Bearing

The laminated rubber bearings (LRB) represent the most commonly used elastomeric isolation system. The basic components of LRB are steel and rubber plates, built through vulcanization process in alternate layers (Simo and Kelly, 1984), The dominant feature of LRB is parallel action of linear spring and damping. A schematic For paper and pulp production, it is normally stored wet in order to assist in removal of the short pith fibers, which impede the papermaking process, as well as to remove any remaining sugar. diagram for the mechanism Generally, the LRB is characterized with high damping capacity, horizontal flexibility and high vertical stiffness. The relatively low shear stiffness in the horizontal plane is provided by the rubber, and the high vertical stiffness is provided by steel results in a previous research papers. of the bearing. The system operates by decoupling the structure from the horizontal components of the earthquake ground motion by interposing a layer of low horizontal stiffness between the structure, and its foundation. The isolation effects in this type of system are produced not by absorbing the earthquake energy, however by deflecting through the dynamics of the system. Usually, there is a large difference in the damping of the structure, and the isolation device, which makes the system non-classically damped. The high- damping rubber bearings (HDRB) also exhibit similar properties, and falls in the same category of elastomeric systems (Kikuchi and Aiken, 1997; Koo et al., 1999; Tsopelas et al., 1991). The ideal force-deformation behavior of these isolation systems is generally represented by non- linear characteristics, the HDRB may exhibit hardening at higher strains values.

c) Sliding Base Isolation Systems:

Systems with restoring force offers advantages over elastomeric isolation systems. The sliding system is effective in the sense that it is capable of taking care of wide range of frequency input from the seismic excitation. The frictional force is proportional to the mass of the structure and hence the center of mass and the center of resistance of the sliding support coincide, thus diminishing the torsional effects produced by asymmetric building.

d) Pure Friction System:

The simplest sliding isolation system, used popularly for bridges in particular, is the pure friction (P- F) system based on the mechanism of sl ding friction (Westermo and Udwadia1983). The use of layer of sand or roller in the foundation of the building is the example of P-F base isolator. Under normal conditions of ambient vibrations, and small magnitude earthquakes, the system acts like a fixed base system due to the static frictional force. For large earthquake, the static value of frictional force is overcome, and sliding occurs with reduced dynamic resistance thereby reducing the accelerations. It is to be noted that the frictional coefficient μ is independent of the sliding velocity. The limiting frictional force in the bearing is given by,

$$F_s \mu Mg = (8.10)$$

Depending upon the magnitude of the frictional force, F_x the system will be in stick or slip conditions. If F_x

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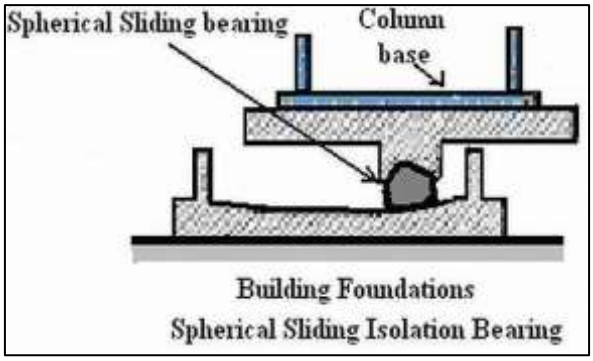
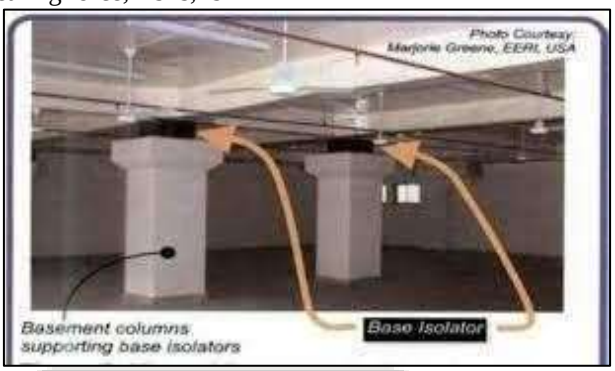


< *F*s, then it will be in non-sliding (stick) phase, and the bearing force, *F*b is, b x F=F



IV. EXPECTED / POSSIBLE OUTCOME

- The small magnitude earthquake intensity which always shakes the multi stored building for shorter period, where the major structural components are sufficient to impart the response.
- The larger magnitude peak earthquake excitation always needs proper positioning of friction dampers with combination of tuned or viscous dampers.
- The friction pendulum system (FPS) criteria always govern for some time absorbing more earthquake energy compared to other superstructures techniques like different types of dampers.
- The Elastomeric bearing having mutual compactness of steel and rubber medium vulcanized each other with certain thickness needs regular observation for maintenance for sliding mechanism.
- The work in the field of earthquake resistant techniques is very important to have safe structures.
- Techniques for earthquake resistance is not strengthen the building, but can reduce the earthquake forces generated during sewer earthquake
- The scale of damage may caused by earthquakes mainly depends on the use of different appropriate earthquake resistant technique like use of isolation plates and different type of dampers are metallic yield dampers, friction dampers, viscous fluid dampers and visco elastic dampers.

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