"STUDY OF BASE ISOLATED STRUCTURE"

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Abstract - *During past many years many of the building were collapsed due to one of the most destructive forces on earth which is earthquake. Therefore for analysis and design some realistic method is been adopted. Base isolation systems modern approach for earthquake resistant design. Under various expected seismic events it is an attempt which predict the performance of building. The design of base isolation in high seismic areas of world is widely used in not only building but also in residential buildings with high importance.*

***Key Words*: Base isolation, Earthquake, Seismic Events.**

1. INTRODUCTION

The use of base isolation system in recent years as a mean of aseismic design of structures has attracted considerable attention. Various designs for base isolators have certain features in common, as per extensive reviews on historical developments and recent literature on the subject was provided by Kelly (1982, 1986). But the most important of which are the horizontal flexibility and the energy dissipation capacity. The laminated rubber bearing (LRB) with and without a lead core is most extensively studied as a base isolation system. Most of the buildings are being built on laminated-rubber-bearing base-isolation systems all over the world.

1.1 BASE ISOLATION

In reducing the response of a structural system induced by strong ground motions. Base isolation is a quite sensible structural control strategic design It is clear that the effects of near-fault (NF) ground motions with large velocity pulses can bring the seismic isolation devices to critical working conditions.

1.2 LRB & FPS

On base-isolated buildings that consist of either lead-rubber (LRB) or friction-pendulum system (FPS) bearings to assess the effects of near-fault ground motions various Numerical simulations are performed to analyze the structure.

2. ANALYSIS TECHNIQUE

It is assumed that the structure behaves as an elastic shear beam. The equations of motion of a non-uniform shear-beam structure with various base isolation systems subject to a horizontal earthquake ground excitation were described at length by Su et al. (1989b). A summary of the governing equations for the special case of the SR-F base isolation system is provided in Appendix I. Using a fourth-order Runge- Kutta-Gill numerical scheme, a computer program for integrating the equations governing the modal amplitudes of the shear beam structure and the motion of the base raft for the SR-F base isolator, as well as the EDF and the R-FBI systems, was developed. Peak responses of the bases-isolated shearbeam structure subject to several earthquake excitations under different conditions are evaluated, and the results are discussed in the subsequent sections.

3. GROUND FREQUENCY CONTENT

To study the effect of the frequency content of earthquake ground motion, the sinusoidal excitation as given by Eq. 1 with variable *Tg* is used as the base excitation. For a structure with a fundamental natural period of 0.4 s, variations of peak responses with the natural period of the ground excitation *Tg* are shown that the deflection and acceleration response spectra for the fixed-base structure have primary resonance peaks at the natural period of the structure (*Tg* = 0.4 s) with secondary peaks at *Tg* = 0.14 s (corresponding to the second mode of structural vibration). It is also observed that base-isolated structures lead to much lower peak responses in comparison with the fixed-base one. The resonance peaks are essentially eliminated, and the peak deflection and acceleration responses do not vary significantly with *Tg.* In contrast, peak responses of the fixedbase structure are rather sensitive to the changes in the frequency content of the ground excitation. It shows that the peak base displacement of the base-isolated structure increases monotonically as *Tg* increases.

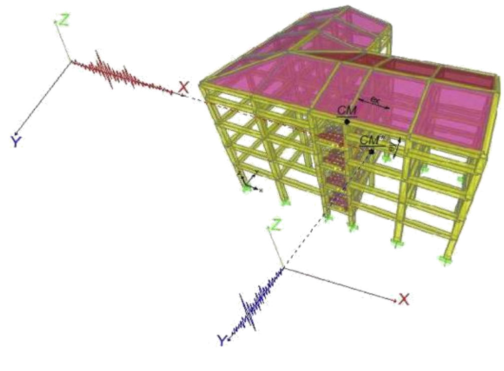

Fig.1 Seismic input for a position of the center of mass and one of the seven pairs of adopted accelerograms.

4. EARTHQUAKE EXCITATION

In this section, five earthquake accelerograms—the El Centra 1940, the Pacoima Dam 1971, the Taft 1952, the Olympia 1965, and the Mexico City 1985—are used as ground excitations. These earthquake accelerograms have a variety of peak ground accelerations ranging from 0.17g to 1.17g and cover various forms of frequency content.

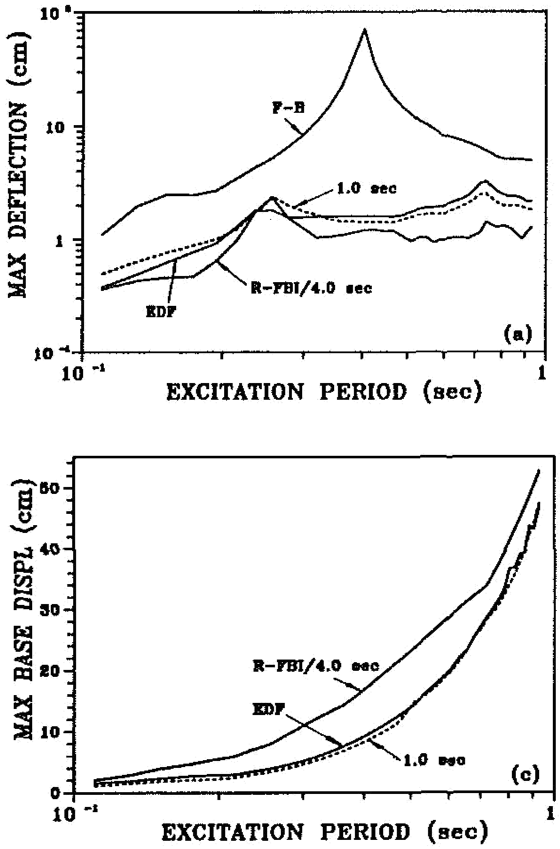

Fig.2 Variations of Peak Responses with Natural Period of Excitation.

5. LITERATURE REVIEWS

2.1 Cancellara D and Angelis F

Investigated the seismic response of lead rubber bearing (LRBs) in comparison with an innovative seismic isolator namely as high damping hybrid seismic isolator (HDHSI) in a multi-storey reinforced concrerte (RC) building. For the resistance of RC building the performance of study seismic base isolation and controlation of passive structures. The combination series of traditional lead rubber bearing (LRB) and a friction slider (FS) assembles the novel high damping hybrid seismic isolator (HDHSI). For realizing the base isolation system elastomeric materials and steel Teflon bearings is being used. Also to analyaze of the hysterectic cycle of the isolator is being reported for the nonlinear behavior of composite device. For analyzing the different seismic events the time history of base shear and the time history of base displacement are illustrated. Related to various seismic events like EI Centro earthquake and Erzincan earthquake the seismic records is being analyzied which would give some results which are as follows:-

•Based on the investigation of innovative seismic base isolator, the combination of traditionally lead rubber bearing (LRB) and a friction slider (FS) the high damping hybrid seismic isolator (HDHSI) is being obtained which is being characterized by a high friction coefficient.

•In the analysis of various extreme seismic events which would be considered as seismic inputs. After adopting different amplification factors of the seismic record of EI Centro earthquake and the record of Erzican earthquake which is characterized by high energetic content at low frequencies, the Erzican earthquake represent a seismic event for base isolated structure is particularly dangerous.

•For the mathematical behavior of different has been analyzed by the mathematical modeling of presented HDHSI base isolation system. The determination of time history of base shear and the time history of base displacement gives the advantage and benefits of proposed HDHSI and traditionally LRB shows appropriate for seismic protection of structure under the action of extreme seismic events.

•As comparison with traditional LRB system which is not being equipped by sliding mechanism, the innovative HDHSI system shows proper efficiency in counteracting the events of extreme seismic which would be characterized by high intensity.

2.2 Cancellara D and Angelis F

Investigated the behavior of multistoried RC building and analyzing the two base isolation namely High Damper Rubber Bearing(HDRB) with friction slider (FS) and the lead rubber bearing (LRB) with friction slider which would be designed by European codes EC2 and EC8 and adopted by a plan which is strongly irregular. The three-dimensional base isolated structure is being performed by analyzing the dynamic nonlinear analysis. For the evaluation of seismic response of structure a record accelerograms for bi-directional ground motion compatible with elastic response spectrum have been used. The results obtained are as follows:-

•In comparison with HDRB isolators, the LRB isolator shows greater dissipative capacity, from 15% to 30%.

•Due to higher contribution of vibration modes the LRB isolator determine greater values of inter-storey drift than the HDRB isolator.

•In comparison with HDRB the LRB isolator is the robustness and stability of hysteretic cycle.

2.3 By Lin Su et al.

This study applies a modified design for a base isolation system for the desirable features of the Electricite de France (EDF) base isolator and the resilient-friction base-isolation (R-FBI) system. For a non uniform shear beam structure, Seismic performance of this isolator, which is referred to as the sliding resilient-friction (SR-F) base-isolation system is been used. For the evaluation of different earthquake displacement and acceleration response spectra of the base-isolated structure is taken into an account. The SR-F system effectively reduces the peak acceleration responses without generating large base displacements. Based on the presented results, the following conclusion may be drawn

•The amount of base displacement generated by the SR-F base isolator is, usually, manageable.

•Without generating excessively large base displacements the SR-F system is highly effective in reduction of peak acceleration and deflection responses of the structure.

•Peak deflection and acceleration responses of a structure with the SR-F base isolation system do not vary significantly with severe variations in the intensity of ground acceleration.

•The SR-F system, which combines the features of the EDF and the R-FBI systems, could become a reliable base isolator for a variety of structures with different seismic protection demands

•The SR-F system is insensitive to long-period contents of the ground acceleration when its natural frequency is away from the excitation frequency.

2.5 D cardone. and G .gesualdi

Investigated the design of seismically isolated structure for a fundamental requirement of current standard and guideline specification to restore the capability of any isolation system. This paper involve thousands of non-linear response history anaylsis of SDOF system for the restoring capability spherical sliding isolation system, often referred to as friction pendulum system (FPSs). The visco-plastic modal of Constantinou et al. describe the behavior of base isolation system. From the parameters governing the dynamic response of FPS the regression analysis have been performed to derive the dependency of the residual displacement. The investigation of seismic ground motion of the influence of near fault earthquake is been carried out.

2.6. Petros komodromos. et al.

Investigated the concererened work of multi-storey retrofit at various level along their height by installing isolation device. To introduce in a building the effective design of retrofit solution of this type require the appropriate the number of isolation levels. With a specially designed developed optimizing procedure, which can automatically and effectively explore the huge set of potential retrofit solution formed by all possible combination of isolation number, location and properties. To identify feasible location configuration for all test cases examined the demonstration of numerical result obtained the validilty and effectiveness of the optimization procedure. In identifying such isolator, the optimizer does not use up the available budget for introducing seismic isolator. By applying the optimization approach of this work, we can avoid whenever necessary the activation of base isolation and automatically identify alternative non-conventional way for effective motion control of structure.

3. CONCLUSIONS

• From the above literature we conclude that it is the most innovative and standard way to investigate non linear behavior of the building. As compared to HDRB+FS and the LRB+FS base isolation system, the LRB+FS isolator show a greater dissipative capacity from 15-30%.

This solution is also characterized by lower economic costs with respect to other alternative solutions in which different types of elastomeric isolators are adopted, respectively only LRB isolators or FPS, with different characteristic properties for reaching the objective of decoupling the vibration modes of structures with irregularities in plan.

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