STATIC AND DYNAMIC ANALYSIS OF SEISMIC PRESSURE ON THE RC BRIDGE: A REVIEW

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Abstract: **The site of the Hindon River having the sandy alluvium soil which is perfectly suitable for the bridge foundation. Bridges extends horizontally with its two ends restrained & that makes the dynamic characteristics of bridges different from buildings. For doing the seismic evaluation of the bridge at the time of earthquake open sees software is used. The open sees model is used to describe the various performances of the bridge. By comparing the various results obtained through the non-linear analysis (static and dynamic). The concrete developed by Chang and Mander is used for assessment. This new material is used in assessment enhance the existing bridge capacity against the bridge element damage during the seismic activity. From the various evaluation results it is worked out that the bridge structure under the designed seismic vibrations is safe and the results obtained from this pushover analysis is verified through the results obtained from the dynamic analysis.**

Keywords: **Hindu River, Alluvium Soil, Earthquake, Bridge Structure**

Introduction

The Bridge is considered the most important structure of engineering in modern times. The bridge that connects these two countries is separated by a body of water or a plot of land separated by any obstacles on the land. Hence, in severe circumstances, its structural integrity is also found in the Ghaziabad area where the Indus River Bridge is situated in the fourth earthquake zone and is strong enough for mild and high-intensity earthquakes. There have also been many earthquakes in the region's last ten years (5-6, 6-7) with different densities, and sometimes 7-8 earthquakes, which were not built according to various aspects of the design posing a threat.

The architecture of the superstructure in bridges depends on a number of charging requirements. During the chassis performance period , various types of loads may occur. This frequent presence of differing degrees of earthquakes contributed to the system being developed to enhance the 2002 seismic architecture framework (i.e. 1893, part 1). In fact, structural engineers do not have ideal guidance to define structural requirements for building bridges during earthquakes, however. Several research papers on building overrun analysis have been published but little work on reinforced concrete bridges has been done. The aim of this research is to use non-linear static analysis to conduct seismic assessments on established river bridges and to equate them with nonlinear dynamic analysis tests. The work was done with the assistance of Open Sees.The Hendon River Bridge is a continuous triangular bridge with a pre-tensioned square form beam and tightened steel cables. Its gross length is 114.9 m, and the height of bending is 8.05 m and 8.66 m respectively. The bridge model is required for non-linear bridge research. The columns during the earthquake are the most impactful component of reinforced concrete bridges

Activities on Planet. Column performance is therefore described in detail, and enough models are prepared during seismic activity. Research and model various aspects of different elements of the bridge (such as curved columns). (Including Map of the site). The results obtained were used for seismic analysis, static analysis, and dynamic analysis of construction.

Review of Literature

The stability of bridges during earthquakes involves the stability and performance of various elements, which are connected directly or indirectly to bridges on columns, columns, and foundations. Behavior exceeds the flexible threshold. But the non-linear analysis examines the behavior of the bridge beyond the flexible limit and determines the level of bridge performance during seismic activity. Good analysis is what gives better and suitable results inside and outside the limits of flexibility.

The main purpose of the nonlinear analysis is to analyze the different properties of materials and structures that exceed the elastic limit and before collapse. It depends on the advantage of using ductility and strength beyond the flexible limit, since the strength that exceeds the elastic limit is also considered, the construction cost can be reduced.

The ability of the structure to withstand loads during seismic activity and the deformation of the structure is reached to the last point of the deformation of the structure.

When the lateral load is applied to the bridge shaft, deformation may enter the shaft. This anti-seismic ability depends on the ductility and structural design of the structure, so that the structure has greater ductility. Given Caltrans' view, looking at the largest earthquake, regular extensions will not respond flexibly to the largest earthquake. Weaknesses in requirements and projected earthquake requests. In this way, the goal will be to use flexibility and post-global quality to meet established implementation standards with minimal capital investment. This logic is created for a situation in which the probability of a major earthquake at a particular location is usually low, and it is easy to absorb maintenance costs if a large earthquake occurs. Seismic activity puts more stress on the structure in the vertical direction. It causes greater pressure in the bridge structure in the lateral direction, which is properly dissipated by the structural elements of the bridge by making plastic hinges and dissipating the extra stress energy with the dampers. In general, the assumptions of the presentation should be that there is no computer program for static and dynamic non-linear studies. However, scientific models are often limited by the capabilities of computer projects used.

Performance Point

- Defining seismic engineering logic based on performance is an overview of an auxiliary framework that prepares to manage a predetermined risk level at a predetermined size. Follow-up actions are usually taken to require unique cut points to be set at the level of implementation:
- Describe the different event probabilities of the tremor load;
- Characterization of different degrees of injury.
- Fixing Each Tremor With A Satisfactory Injury Degree

Types of Nonlinear Analysis

The primary explanation for non-linear modeling is to assess the capacity of the system to withstand seismic activity effectively. There are two nonlinear analytic types-

• Nonlinear static analysis or an application of change.
• Analysis of non-linear dynamics or the chronological history.

The brief details of the top review are given below. These analyzes are used for analysis of the bridges.

Nonlinear Static Analysis: Pushover

The use of the pressure analysis dates back to the 1970s, but in 15-20 years the frequent use of this analysis in RC buildings began. Determine the power of the system in relative analysis. As regards shear and basic displacement (max). In the analysis of pressure, increase the primary shear or lateral load strength and measure the displacement until the maximum displacement is achieved. The solid displacement and the solid displacement of the roof framework are calculated according to the requirements.

Target-shifting is considered seismic activity. Various stress variables (axial, shear) are measured in pressure analysis, and the structure's bearing potential is calculated according to tension and displacement specifications. Complete a sequence of structural studies and simulation, and describe the different areas of the plastic hinge.

The method of size spectrum is used to display the results of the relay analysis, because this method uses a graphical representation of the screen. Performance building during Earthquake activity.

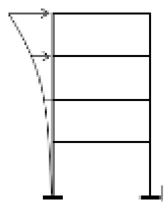

Fig According to the IS CODE (lateral loads act on the building)

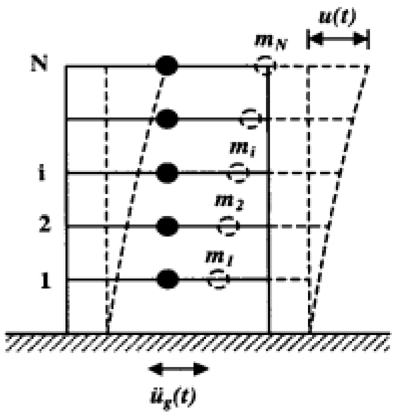

Fig Building model after the plastic hinges formed

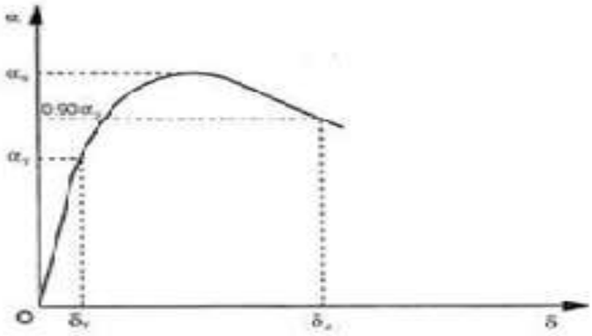

Fig Pushover Curve

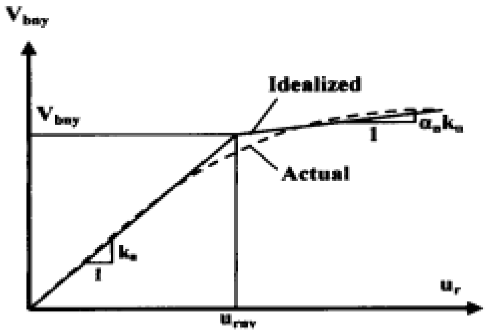

Fig Idealized pushover analysis curve

Capacity Spectrum Method(ATC 40)

The basic uncertainties in the method of the amplitude spectrum are identical to those in the past. In other words, the maximum inelastic deformation of the non-linear SDOF frame can be derived from the more extreme distortion with a proportional period and damping of the multifunctional linear SDOF frame. This method uses the assessment of flexibility to determine the success and damping time period. As part of the ADRS, this approach incorporates the inversion curve. This can be achieved by direct translation of attributes of frame components. In ADRS configuration the downward pressure curve is called the structure's "boundary radius." The response range speaks about seismic ground movement in the same ADRS.

A collection of essentials.

To use the CSM to determine the center of the point of performance, the amplitude curve must be changed or the curve pushed to the specified range. With regard to the platform's medium displacement, the thrust curve cannot prevent the consequences of the base shear and roof displacement under such circumstances, and the acceleration-displacement reaction (ADRS) continuum structure cannot escape the broadest possible set.

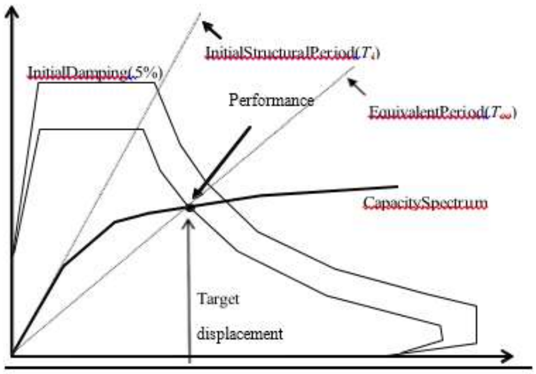

Fig capacity spectrum curve

Nonlinear Dynamic Analysis

The relation between the displacement and time is considered in this review. Because the bridge is a structure with some irregularities, this method is normally used during ground seismic activity to meet the performance and stability requirements of the structure. In nonlinear static analysis the dynamic impact of the building is ignored on seismic activity. In nonlinear dynamic research, archives of accelerometers are used to assess the reaction of the building to seismic activity, and data are derived from the study system.

The use of time-date analysis has several drawbacks:

(1) The calculation process is complex.

(2) Due (3) Detailed records of acceleration are appropriate in that analysis

Resources or approaches are used as entries to the account.

Using THA to analyze the structure can lead to more accurate results, as research is analyzed at different time periods on different structure behaviors during ground seismic activity.

In this analysis, different inputs are given to determine the different conditions that occur during seismic activity, and these inputs are increased to equal times during seismic activity to obtain the entire structural behaviour.

Progressive research addresses this issue by attaining a stable equilibrium at all periods. During the earthquake, the structural stability is determined according to the seismic requirements. According to ATC 40, according to earthquake criteria, the function of RC building design is divided into different types of earthquakes.

A 5 per cent damping request range has been developed according to Caltrans version 1.6 seismic design standards. When a seismic design passes through an ordinary bridge, the structure can collapse or become unusable.

Acceleration Time History (FEMA 273)

FEMA 273 offers instructions for the study of time-dates as follows:

• Identify at least 3 readings groups which are sufficient to read the history of seismic activity as an entry.

Determine bridge construction behavior during seismic activity by taking at least seven different-capacity readings.

Caltrans ARS Online received the necessary spectrum (v1.0.4). The data obtained should be updated to an appropriate standard according to FEMA 273 using spatial coordinates and shear wave velocity as input units, so that the average spectral value obtained is not less than 1.4 times the damping spectral value of 5 percent. 2 Design of seismic vibrations from T to 0.5 T, where t is the base-time.

Activity meets the requirement for versatility. The non-linear analysis, however, studies the bridge 's behavior beyond the flexible limit and determines the bridge performance levels during seismic activity. The listed assumptions do not involve computer programs for nonlinear, static, and dynamic studies. Scientific models, however, are often limited by the capabilities of the computer projects being used. The method of size spectrum is used to display the results of the relay analysis, because this method uses a graphical representation of the screen. Performance building during Earthquake activity.

Conclusion

This work includes an analysis of pressure on the bridge to the RC. The bridge is located in Ghaziabad, India, on a Hindu River. This bridge plays an significant part in connecting Delhi with Uttar Pradesh. This is an ordinary triple span bridge, built from prestressed concrete on site, which is a platform-supported crossbar. The Bridge's overall length is 114.9 m, the right pier is 8 m, while the left pier is 6.96 m.

The first mandatory research is to establish the seismic characteristics of the bridge construction and the average seismic vibration likelihood is around 5%. The spectrum is designed with 5 per cent damping flexibility according to Caltrans seismic design criteria. Accelerometer readings come from the library of NGA (Next Generation Attenuation), which roughly parallels the elastic range blocked by 5 per cent.

The latest research focuses primarily on the usage of pillar components for force-based beams. Their formulas quickly address condensed elements of plastics and dispersed elements of plastics. There is also talk about integrated iterations of non-linear materials.

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