SEISMIC ANALYSIS OF FOOT OVER BRIDGE FOR DIFFERENT SOIL CONDITIONS

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***ABSTRACT* – Due to fast construction of a large number of feet over bridges, many existing bridges located in seismic zones are deficient to withstand earthquakes. In order fulfil the requirement of this increased traffic in the limited land the length of bridge becomes medium to large. During an earthquake, failure of structure starts at points of weakness. Generally, weakness is due to geometry, mass discontinuity and stiffness of structure. In earlier days, embankment design and construction were not given adequate attention. Embankments were constructed and left for compaction by natural process. Due to loads imposed by heavier axle loads, very high degree of sub-grade support has become necessary in present scenario which requires fast and heavy compaction by suitable compacting equipment.**

In this project work seismic analysis of foot over bridge for different soil conditions are carried out. This paper highlights the effect of different soil conditions in different earthquake zones with Response Spectrum analysis using Staad-Pro.

***KEYWORDS* - Different Spans of Bridge, Seismic Analysis, and Different Soil Conditions.**

INTRODUCTION -

Soil is one of the most abundant materials available throughout the world. This fact along with the demand for local construction material led to this investigation on the suitability of soil for use as a building material.

Structural analysis is a process to analyze a structural system to predict its responses and behaviors by using physical laws and mathematical equations. The main objective of structural analysis is to determine internal forces, stresses and deformations of structures under various load effects. There has been much progress in foot over bridge design in recent years with increasing use of advanced analytical design methods, use of new materials and new bridge concepts.

Truss Element

A truss element is a two-force member that is subjected to axial loads either tension or compression. The only degree of freedom for a truss (bar) element is axial displacement at each node. The cross sectional dimensions and material properties of each element are usually assumed constant along its length. The element may interconnect in a two-dimensional (2-D) or three-dimensional (3-D) configuration. Truss elements are typically used in analysis of truss structures

. Figure 1: Foot Over Bridge.

OBJECTIVES –

- To analyze the foot over bridge with different soil conditions during seismic forces for safety of structure.
- Modeling and analyzing the effects of seismic forces for different spans of foot over bridges.
- To analyze foot over bridge by using STAAD PRO software.
- To check the effects of different soil conditions in different earthquake zones for foot over bridge.

LITERATURE REVIEW –

George C. Lee, Yasuo Kitane and Ian G. Buckle (2002)[1] have focuses on assembling currently available information on observed performance of isolated foot over bridges and identifying where further research may be necessary to improve the state of bridges. Results from numerous computer simulations and shake table experiments have shown the advantages of seismically isolated bridges compared to non-isolated bridges.

Ama.Ijeet Saini and M. Saiid Saiidi (1997)[2] studied the seismic risk to structural systems, and design structures to achieve goals of life safety, reduce economic loss, and minimize recovery downtime in the aftermath of a seismic event

Andre R. Barbosa, H. Benjamin Mason, and Kyle Romney (1994)[3] studied an understanding of the effects of duration on the seismic response of a soil-foundation-bridge system. The displacements, shear forces, and bending moments were not as sensitive to duration, because peak values were being examined

Dimitris C. Rizos1 and Edward H. Stehmeyer (1993)[4] presents simplified, yet accurate, soil foundation models suitable for dynamic and seismic analysis of structures accounting for Soil Structure interaction effects. The model parameters are extracted from impulse response functions (B-IRF) of the soil foundation system to B-Spline impulse excitations. The B-IRF are obtained using a direct time domain 3-D B Spline BEM methodology for electrodynamics. These models are suitable for direct time domain analysis and they accommodate nonlinear structural behaviour. The ease of use, accuracy and versatility of the proposed models is demonstrated. A series of studies address the effectiveness of seismic isolation devices when SSI effects are accounted for During the experimental study on two models of set-back frames by Wood (1992)[5], noticed that the response of set-back structures did not differ much from that of the regular structures.

Ron Dennis (1996)[5] studied the factors that need to be considered in the planning of the design and installation of the footbridge.

Installation of a footbridge is usually a considerable undertaking, particularly for communities, and it is essential to make sure that it is really needed and is a top priority and commitment for the communities involved. If it is decided that a footbridge is the best option, the first step is to carry out a site survey to decide on the alignment of the footbridge and determine its specifications in terms of span (length between supports) and the traffic to be carried. The manual starts from this planning process and works through the process of selecting the most appropriate design of footbridge to meet the specifications.

Hadi Moghadasi Faridani1, Leili Moghadasi (2012)[6] in this research, a modal comparison especially in the case of resonance probability is represented between the footbridge with and without soil effect with respect to some natural modes and frequencies of the footbridge which are prone to be synchronized by pedestrian load frequencies

Jaw-Nan (Joe) Wang1 Islam (2001)[7] This paper describes the analytical models used to account for the soil- foundation-structure interaction effects Due to the difficult soil conditions (very soft) and the expected ground motion intensity at the project site as well as the nature of the foundations, it was determined to model the superstructure and the foundation as a complete system, where every essential elements of the foundation such as all the drilled shafts, footing cap, piers, and the non-linear soil springs are included in the bridge model.

METHODOLOGY –

If the structure not properly designed and constructed with required quality they may cause large destruction of structures due to earthquakes. Response spectrum analysis is a useful technique for seismic analysis of structure when the structure shows linear response.

- Extensive literature survey by referring books, technical papers carried out to understand basic concept of topic.
- Selection of an appropriate model of foot over bridge.
- Computation of loads and selection of preliminary cross-sections of various structural members.
- Geometrical modeling and structural analysis of foot over bridge for various loading conditions as per IS Codal provisions.
- Interpretation of results.

In the present work it is proposed to carry out seismic analysis of foot over bridge using Response spectrum analysis method considering different soil condition with the help of STAAD PRO software.

CONCLUSION –

Many of the studies have shown seismic analysis of the foot over bridges with different soil conditions. Whenever a structure having different length, it is necessary to analyse the bridge in various earthquake zones.

The lateral displacement of the building is reduced as the percentage of irregularity increase. As the percentage of vertical irregularity increases, the story drift reduces and go on within permissible limit as clause no. 7.11.1 of IS 1893-2002 (Part I). It was found that mass irregular building frames experience larger base shear
than similar regular building frames.

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