VIBRATION ANALYSIS OF DECK SLAB BRIDGE

Praveen Singh Bhil

Structural Engineering Division, Department of Civil Engineering, National Institute of Technology, MANIT-Bhopal, India-462051.

Abstract-Roads are the lifelines of contemporary transport and bridges are the foremost vital elements of transportation systems. They are prone to failure if their structural deficiencies are unidentified. an oversized range of bridges made round the world were styled throughout the amount once bridge codes had no unstable design provisions, or once these provisions were lean per this standards. Also, owing to aging and therefore the growth of transport hundreds in magnitude and volume, several existing bridges in India are experiencing deterioration. Because the construction of recent bridges involves immense time and cash, the repair and rehabilitation of previous and broken bridges are necessary, to preserve their load carrying capability and repair performance. within the gift study, A three-dimensional linear finite-element model of the cement concrete bridge, was developed and analyzed, (free, forced vibration) mistreatment ANYSIS package.

Key Words: *bridges, static, free, forced (modal, , harmonic, transient)vibration*

1.Introduction: Sudden or very extreme failure of bridges due to complete collapse of piers has been observed in every major seismic event. The earthquake occurs in Gujarat on 26 January 2001 have demonstrated that the strength alone would not be sufficient for the safety of bridges during the earthquake. Now the research is focused on finding out more rational and substantiated solutions for protection of bridges from severe earthquake attack. to reduce the seismic forces to or reducing inelastic deformations by seismic isolation. It reduces the fundamental frequency of structural vibration to a value lower than the predominant energy-containing frequencies of earthquake. The isolation device, which replaces conventional bridge bearings, decouples the bridge deck from bridge substructure during earthquakes thereby significantly reducing the deck acceleration and consequently the forces transmitted to piers

2.Literature Review:

D.p.Thambiratnam and G.H. brameld1995: This paper investigates the natural frequencies and associated mode shapes of bridge superstructure .it compares field observations with theoretical idealizations and finds that widely used idealization are accurate only in relation to certain types bridges, and that many bridges require more detailed analyses. It then develops a simplified method for accurately estimating the fundamental frequency of bridge modeled as a grillage, the paper also debates the significance of support stiffness ,and the dynamic modulus of elasticity of concrete, in estimating the natural frequencies of vibration.

Dr. Mohamad Najim Mahmood 2006: In the present work the Finite Prism method was used for the dynamic analysis of bridges under moving vehicles. In this method a combination is used of the finite element method representing the cross section of the prism and Fourier main aspect in the present work is the coupling of the

explicit solution technique of the equation of motion with the harmonic solution using the finite prism method for the problem of moving vehicle, , taking into thought the dynamic interaction between the series fittingly chosen to represent the behavior of prism within the longitudinal direction, that satisfies the merely supported boundary conditions at the ends. Explicit time integration scheme was used for solving the equation of motion for each of the bridge and vehicle. In the present work damping was neglected in the formulation of equation of motion of bridges. These render to avoid the solution of global system of equations, because each equation becomes uncoupled with other equations. One of the vehicle and bridge. Keywords used are Bridge, Dynamic Interaction, Finite Prism, Moving Forces, Moving Vehicles

Lupoi et al (2007): studied the applicability of the MPA proposed by Chopra et al (2001) for the assessment of a highway viaduct built in the sixties, with a total length equal to 420m, having 11 spans each of 33m and a continuous reinforced concrete deck pinned over the piers. Differences between the nodal displacements estimated by the MPA, and those by the nonlinear time-history analysis were found to be in the order of 15%, independently of the intensity level of the ground motion

Cardone et al (2007):used the adaptive pushover analysis, referred to as the "adaptive capacity spectrum" for two numbers of simply supported span viaducts in an Italian motorway network. A series of fragility curves, which describe the seismic vulnerability of the bridge under a probabilistic perspective was reported as the result.

Muljati and Warnitchai (2007): evaluated the inelastic seismic response of multi-span concrete bridges, using the modal pushover analysis (MPA). The performance of the study bridge using the MPA in a nonlinear range, showed a similar tendency with the MPA in a linear range. The MPA results provided an acceptable accuracy besides simplicity.

Shatarat et al (2008): evaluated the distinction within the international response of the bridge with 2 nonlinear static analysis strategies (displacement constant and capability spectrum method)). The effectiveness of varied nonlinear software system packages (GT-STRUDL version25, SAP2000 nonlinear version seven.0, ADINA 800-node version) was evaluated. Among the software's, SAP2000 provided higher results with the advantage of less complexness in modeling and analysis. The capability spectrum technique was accepted advantageous over the displacement constant technique, because it represent the graphical behavior of the structure.

Fu and AlAyed (2008): geared toward learning the relevancy of a nonlinear static procedure, by implementing the displacement constant methodology (DCM) in bridges. The accuracy and reliableness of the strategy was checked exploitation the nonlinear time-history analysis. a 3 span continuous bridge was analyzed for 2 levels of seismic intensities (design level and most thought-about earthquake). The nonlinear static analysis gave conservative results in comparison to the nonlinear time history analysis at the look Level, whereas it provided a lot of conservative results at the most thought-about earthquake level.

ElGawady et al (2009): investigated the unstable performance of a ferroconcrete bridge with pre -stressed hollow core piles, exploitation the nonlinear static and dynamic analyses. a 3 dimensional spine model of the bridge was developed exploitation SAP2000, together with modeling of the bridge bearings, enlargement joints, and soil-structural interaction. owing to the upper mode effects, the results obtained from the nonlinear static analysis were found to be un-comparable with those from the nonlinear dynamic analysis.

Rahai et al (2010): evaluated the unstable performance of 2 models of prestressed concrete bridges using the capability spectrum technique (CSM) and displacement constant technique (DCM). The displacement controlled pushover analysis was accustomed realize the capability of the structure. The DCM (which is suggested for buildings) results were found to be acceptable, and at an equivalent time additional conservative than the CSM results.

Shatarat and Assaf (2009): determined the seismic vulnerability of a multi-span-simply-supported pre-stressed bridge, so as to develop the desired retrofit live. The seismic vulnerability of the bridge was evaluated exploitation 2 seismic analysis ways, given within the federal route administration (FHWA) seismic retrofitting manual for route bridges, namely, methodology C and methodology D2.

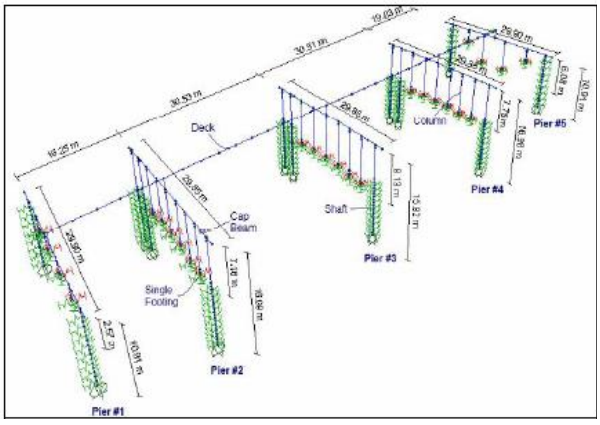

Figure:1 Spine model (Shatarat and Assaf 2009)

Dr. Mohamad Najim Mahmood 2006, : within the gift work the Finite Prism methodology was used for the dynamic analysis of bridges beneath moving vehicles. during this methodology a mixture is employed of the finite part methodology representing the cross section of the prism and Fourier main facet within the gift work is that the coupling of the express answer technique of the equation of motion with the harmonic answer victimization the finite prism methodology for the matter of moving vehicle, taking into thought the dynamic interaction between the series befittingly chosen to represent the behavior of prism within the longitudinal direction, that satisfies the merely supported boundary conditions at the ends. express time integration theme was used for finding the equation of motion for every of the bridge and vehicle. within the gift work damping was neglected within the formulation of equation of motion of bridges. These render to avoid the answer of worldwide system of equations, as a result of every equation becomes unconnected with alternative equations. one in every of the vehicle and bridge. Keywords: Bridge, Dynamic Interaction, Finite Prism, Moving Forces, Moving Vehicles

Moni and Alam (2010): thought of many retrofitting provisions on 3 column concrete bridge bent in North American nation that was designed before 1965 with inadequate unstable description. because the bridge bent designed just for gravity load didn't meet the unstable standards, many retrofitting techniques like steel jacketing, CFRP jacketing and steel bracing were thought of to boost the unstable performance. The nonlinear pushover analysis was conducted for the first and retrofitted frames. a man-made ground motion record was wont to appraise the dynamic response of those structures. The unstable demand/capacity quantitative relation, drift quantitative relation, plasticity has been calculable. the simplest retrofitting technique has been projected for such multi-column bridge bents designed just for gravity load

3. Reserch methodology :

- Numerical study by finite element method (using ANSYIS software)
- Using ANSYIS software analyzed the static, free and forced vibration.
- Comparing results with code.

4. Conclusion:

From the analysis of the bridge, the following are the conclusions and recommendations. From the bridge modal, analysis ,it was found that bridge modal used in this research that is harmonic transient are it gives best and positive result and it also Validation of results with standard values [IS Code]

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