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Parametric Study Of Tall Pier Bridges

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Abstract — ***This study presents parametric study of prestressed concrete tall pier bridges. Here, parametric study is done various deck length 50m, 75m &100m. This analysis having all the load cases as per IRC codal provision. This analysis will be carried out for seismic concept in tall pier bridges. Study mainly focus on the evaluating moment for different load cases and varying deck length. Results of moment will increase with increase of deck length. Maximum moment for the each condition will be used for pier design.***

Keywords-Tall pier; Parametric study; Seismic effect; Prestressed deck; Moment

I. INTRODUCTION

The past two decades have seen unprecedented growth of the knowledge in the field of prestressed concrete bridges, development of new structural forms, and new methods of computer based analysis and design and development of high strength materials. The need of new rationalized methods for bridge structure in general, based on limit state approach , in line with international practices, has been felt for long time. Keeping view of this ,the task of the study for prestressed concrete bridges is to establish common procedure for design of bridges with consideration of earthquake effects in India based on limit state method.

Mountain bridge is generally consist of variable pier heights, so not only the geometry of the bridge will affect its earthquake response; the height and type of pier major factors affecting earthquake response. Under the force of earthquake, the combination of high pier and short pier made the force of bridge more complicated.

An earthquake is a sudden, violent shaking of the ground(earth crust). Earthquake is worst among natural disasters. It is very important to design the structure after understanding earthquake behavior. In the bridge construction ,no architect is required all the design and layout prepared by structure engineers.

There are many research work is carried out for tall pier bridges with seismic analysis but with prestressing and wind effect which loading condition give maximum effect on bridge is unknown. Ground motion itself is a complex random process. The irregular nature of the high pier bridge in mountainAreas make the seismic design of bridge to be difficult. To strengthen seismic concept design of the high pier bridges in mountain, it is preferred to select the form of pier to resist large bending moment, shear force and torque.

III. METHODOLOGY

Parametric study can be done for various parametric variation like span length, pier height, pier configuration, deck width etc. Here 2-lane road bridge analysis is carried out. For this study of bridge analysis parametric study is done for varying deck length 50m, 75m, 100m. Bridge deck is taken as prestressed box girder having single box. Total 9 models are generated for analysis of tall pier bridge. For deck length 50m pier height varies to 30m,45m, 60m then for 75m deck pier height varies to 30m, 45m, 60m and for 100m deck pier height varies to 30m, 45m, 60m. Tall Pier Bridge is considered in valley so pier height can be very. For higher intermediate span length prestressing of deck is necessary. If no. of lane is more than box girder boxes increases. Loading on bridge is taken as per IRC-06. Moving load is taken as live load in bridges. Various load cases is taken for analysis as per IRC codal provision. Earthquake load is considered in all 3 directions X, Y and Z.
Bridge model of bridge is shown below:

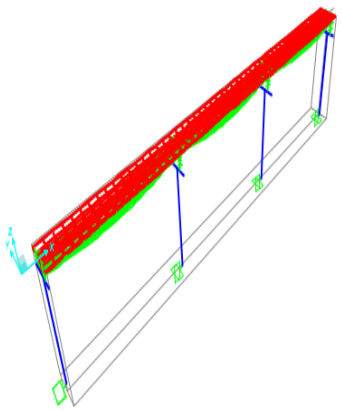

Fig.1 Bridge model pier height 30m

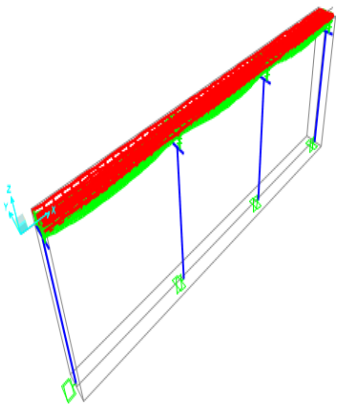

Fig.2 Bridge model pier height 45m

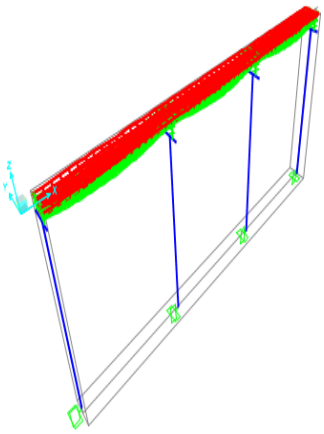

Fig.3 Bridge model pier height 60m

IV. RESULTS

After running analysis in CSI BRIDGE Software we got moment data for various deck length. Moments are required for design. Proper results can be generated after running analysis in CSI BRIDGE for various load cases. Maximum moment is for highest deck length 100m. Maximum results are shown below as graph:

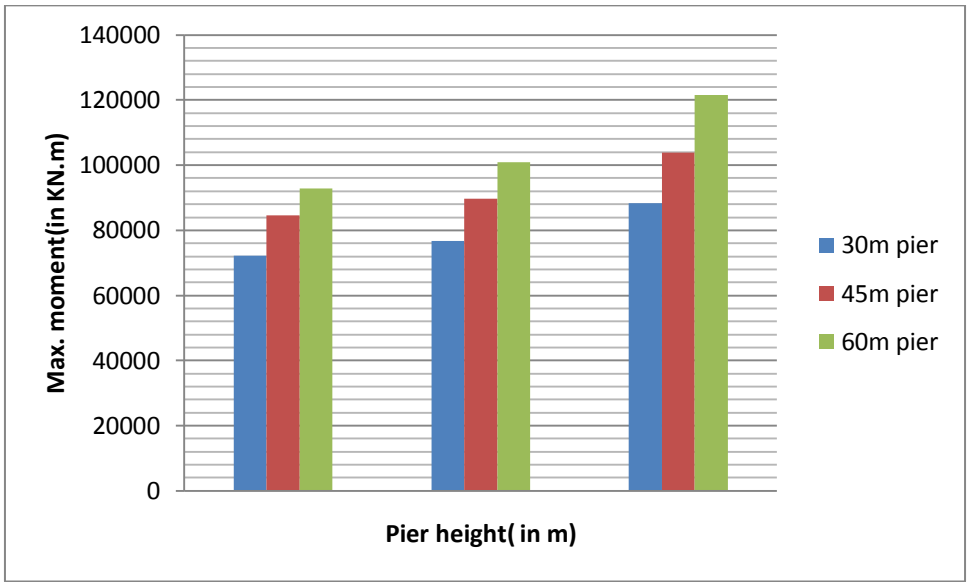

Fig.4 Max. Moments for bridge models

Bridge should be designed for max.moment value. Moments are increasing as per increase in pier height.

V. CONCLUSION

- Design of pier will be carried out for max.moment value.
- Moments for live load will decrease with increase of pier height but overall moment of load cases will increase.
- Pier cross section can be decided according to pier height and deck length.
- After 80m height single pier is not appropriate ,double piers are required.
- Rate of L/D ration will change in 50-70 m range.

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