



## Effectiveness of Seismic Isolation of Highway Bridge on Design of Well Foundation

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### Abstract

During earthquake events, the respite and restoration works are completed conceivably when bridges are protected from failures. Nevertheless, as their structural redundancy is low, bridges are severely damaged and may lead to catastrophic failures during earthquakes. Just by increasing the tolerable stress level of bridge components is not effective. It is uneconomic, unless the spread of earthquake-induced forces and energy into the bridge structure is controlled. This can be achieved by decoupling the bridge superstructure from the substructure, by interposing seismic isolators at the level of bridge bearings. In India, river bridges located in seismically active regions have very large size of well foundations. As per the conventional design, the well diameter can be as large as 12 m, in some cases. Principally in case of long span bridges, such as those on river Brahmaputra in Assam, the cost of foundations becomes enormous. Seismic isolators, provided in place of conventional bridge bearings dissipate the kinetic energy, thereby reducing deformations of the piers and the deck. Lead rubber bearings (LRB), also known as New Zealand (NZ) bearings are the most common type of seismic isolators, installed in different structures, worldwide. In the present research work, a study is conducted to investigate the effect of NZ bearings on design of well foundations, considering a case study bridge [4], in which, time history analysis of the bridge considering Kobe (1995) earthquake excitation is carried out with and without installation of NZ isolators. Kobe earthquake is among the most damaging seismic events ever occurred universally. The response of the bridge with the LRB is compared with the uncontrolled response. The response parameters considered are pier shear force and pier base moment. Well foundations are designed for non-isolated and isolated bridge. The specific objective of the study is to evaluate effectiveness of seismic isolation on economizing the size of well foundation. It is revealed that there is a significant reduction in the well diameter and thickness of steining, which can decrease the cost of foundation. This will lead to saving in the overall cost of the project, in particular where the number of well foundations is large.

**Keywords:** Bridge structure, Seismic isolation, Lead rubber bearings, Well foundation, Seismic design