# Effect of Seismic Isolation Bearings on the Potential Pounding between Adjacent Girders for Long-Length Girder Bridge Systems

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## Abstract

Research on seismic-isolated bridges concerning potential pounding between adjacent units remains limited to date, especially for long-length girder bridge systems consisting of several long-span girder bridges where the wave passage effect is of great significance. To investigate the effect of seismic isolation bearings on the potential pounding between adjacent girders considering the wave passage effect, a finite element model of a bridge system consisting of two box-girder bridges and one long-span hybrid truss-box girder bridge is developed. The results show that under uniform excitations the seismic isolation bearings can reduce the relative displacement at expansion joints and thus improve the performance against pounding. However, the wave passage effect can increase the deformation demands of the expansion joints and improve the probability of pounding even though seismic isolation bearings are used, especially for the low apparent wave velocities.

**Keywords:** long-length girder bridge systems; long-span girder bridges; seismic isolation bearings; expansion joints; pounding; wave passage effect.

## 1 Introduction

For the conventional long-span continuous girder bridges with bearings, the prestressed concrete structure is often used for the superstructure. To date, the longest one for this type of bridge is the Varrod girder bridge with a span of 260 m in Kristiansand, Norway, built in 1994 [1]. Nowadays, the span capacity of the long-span continuous girder bridges with bearings is further increased by using hybrid structures, e.g. truss-box girder hybrid bridge, arch-beam hybrid bridge. Considering the importance of long-span bridges in a traffic net, post-earthquake functionality, as well as require a high cost for repairing, seismic isolation design rather than ductility design will be employed. To mitigate the seismic inertial force from girders to the piers, various isolation bearings have been developed to elongate the structural natural periods and reduce the force [2, 3]. Friction pendulum bearing (FPB) is one of the most popular isolation bearings for long-span girder bridges, due to its isolation period independent of superstructure mass, as well as outstanding re-centering capacity and durability character [4].

For long-span bridges, the spatial variation in ground motions has a great effect on the seismic response of the bridge, especially the wave passage

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