

REDUCTION OF SEISMIC EFFECTS ON BRIDGES BY USING SEISMIC ISOLATORS

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Seismic effects on a planned highway bridge in active seismic zone near Žilina (Slovakia) were analysed. Seismic analysis has proved that due to strong earthquake an inelastic structural response is likely. Due to great seismic design forces, increase of foundation dimensions was necessary. An alternative solution has been proposed using seismic isolators and dampers that reduce the seismic design forces in piers. As a result, the change of the dimensions was not necessary. These two alternatives and estimated costs were compared.

Key words: concrete bridge, seismic analysis, seismic isolator, lock-up devices

1. Description of the structure

The analysed structure is a motorway concrete bridge to be constructed in an active seismic zone near Žilina in Slovakia. The superstructure is a monolithic 6-span beam horizontally arc-shaped (Fig. 1, 2) with a total length 228 m ($30 + 4 \times 42 + 30$ m). Pier heights are from 4.95 m to 9.82 m and their cross section is rectangular. Materials: superstructure – C35/45, piers – C30/37, spread footings – C25/30, reinforcement steel 10505 (R). Average unit weight of the structure is from 25 000 kg/m in the middle of span to 32 100 kg/m over piers including supplementary constructions.

Subsoil consisting of gravel was classified as ground-type B according to [1,2]. Design ground acceleration for Žilina is $a_g = 1.1 \text{ ms}^{-2}$ and the seismic design spectrum is taken from the code [2] (Fig. 11).

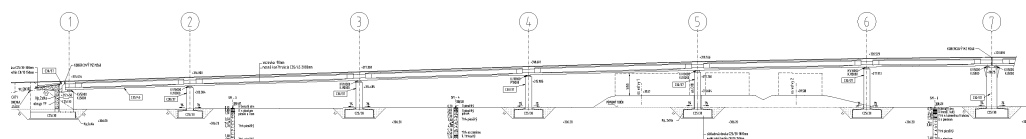


Fig. 1: Scheme of the bridge

2. Alternative I – usual bearings and seismic stops

In the first alternative usual bearings were used. There was a fixed bearing at the support Nr. 4 and unidirectional and omnidirectional expansion bearings at the other supports (Fig. 3). The seismic stops were supposed to be the secondary safety guarantee against sliding of the superstructure from piers.

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