Seismic Isolation of the existing viaduct B28 in Switzerland

Constantinos Thomopoulos

B+S AG, Bern

Contact: costas.thomopoulos@gmail.com

Abstract

Inadequate earthquake resistance of existing bridges has been identified over the last years as a global engineering challenge, both for countries of high and of moderate seismicity, such as Switzerland. In this article the project of the seismic isolation of the Wysseflue-viaduct B28 at the Swiss national route A8 is presented as a case study of the suitability of this method for the protection of life and invested value of bridges with typical for Switzerland seismic deficiencies. Seismic isolation with low damping elastomeric bearings has been chosen as the technically most suitable and cost-efficient retrofit strategy, as retrofit costs do not exceed 3% of the estimated value of the structure.

Keywords: seismic isolation; existing bridges; viaduct B28; elastomeric bearings; Switzerland

1 Assessment of the existing bridge

1.1 Bridge description

The Wysseflue-viaduct B28 was built in 1985 and is part of the national route A8 Interlaken-Brienz. It consists of two continuous pre-cast girders supporting a 14.30m-wide concrete roadway over 9 spans of about 31m each. The total height of the cross-section is 2.45 m and the total length of the bridge is 277m. At the piers and abutments each girder is supported by a pot bearing. In the longitudinal direction all bearings are sliding on a PTFE surface. A shear key at the east abutment is the single fixed point of the bridge for the transmission of longitudinal horizontal forces. In the transverse direction at each support axis one bearing is sliding and the other is fixed. The 8 piers of the bridge have a rectangular cross section 4m by 0.95 m and heights, which vary from 4.15 m to 12.75 m. The geometry of the bridge is shown in Figures 1 and 2.

1.2 Procedure according to FEDRO

The Federal Office for Routes in Switzerland has set up a two-level procedure for the assessment of existing bridges. In the first level the bridge is qualitatively assessed through a checklist, which detects probable vulnerable geometrical and structural configurations. In the second level the bridge is analytically assessed. More information can be found in [1]. Decision on the necessity for retrofit measures is made on the basis of resulting compliance factor $\alpha_{eff}=R_d/E_d$. In case of values $\alpha_{eff}\leq 0.40$ retrofit measures have to taken regardless of their cost. For compliance factors $0.40<\alpha_{eff}<0.70$ the proportionality of the retrofit measures has to be investigated through calculation of the cost of retrofit as a percentage of the estimated value of the structure. For values over 0.70 no measures have to be taken.

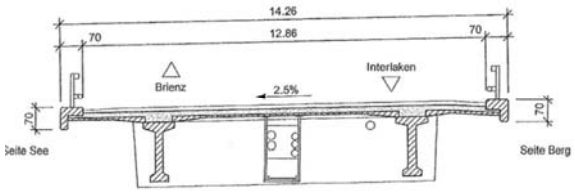

Figure 1: Cross section of the bridge

1.3 Seismic action

The seismic action is defined through the design response spectrum according to the SIA 261:2014. [3].The bridge B28 is situated at the south coast of

https://doi.org/10.2749/222137815818359212