Stabilisation of the gravity structure of the Romanesque Abbey of Payerne Switzerland

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Abstract

The gravity structure of the Romanesque Abbey of Payerne in Switzerland showed structural disorders indicating a delicate state of equilibrium. Consequently, the structure was stabilized by installing inclined tendons inside the walls of the side-naves that were anchored up to 10 m below the foundation in the ground. The implemented concept is original, invisible and allowed to avoid the horizontal steel bars (to take the horizontal thrust force of arches) that, in such cases, usually are installed, however significantly impair the perception of space in the church.

Keywords: heritage structure, Romanesque architecture, natural stone masonry, gravity structure, inclined post-tensioning tendon, strengthening intervention.

1 Introduction

The Abbey in the City of Payerne in Switzerland was a Cluniac monastery. The construction of the church building in Romanesque architecture dates back to the 11th Century. Today, the Payerne Abbey is considered the most important Romanesque church in Switzerland, thus a heritage structure of very high cultural value (Fig. 1 and 2).

The structure of a Romanesque church typically is characterized by series of three consecutive semi-circular arches transverse to the main axis, i.e., a main arch in the middle forming the central nave that is flanked by lower and smaller side-naves, separated from the main nave by an arcade (Fig. 3).

This gravity structure is built in natural stone masonry and has no structural elements capable of taking tensile forces.

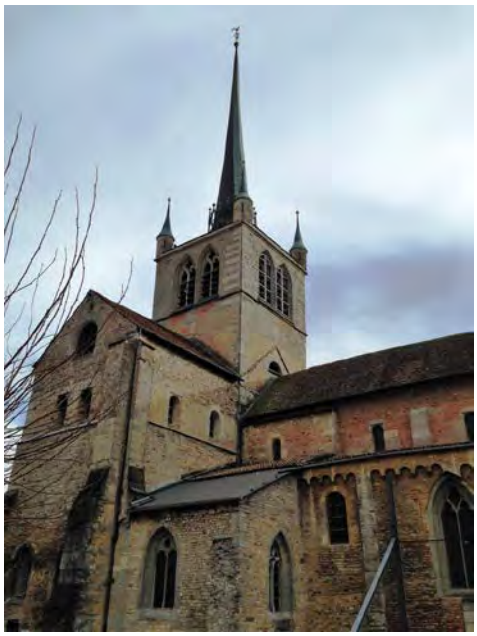

Figure 1. Payerne Abbey from the North showing the Gothic bell tower (photo taken on 09.01.2014)

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