

Engineering of a contemporary version of the stone arches of the “Pont des Trous” in Tournai

Yves Duchêne, Vincent de Ville de Goyet, Frédéric Gens

Greisch Office, Liège, Belgium

Contact: yduchene@greisch.com

Abstract

As part of the works on the Seine-Scheldt link, the Scheldt is to be expanded to CEMT class Va at the Tournai crossing. The main works comprise the widening of the Scheldt river and the central arch of the historic bridge called “Pont des Trous” – “Bridge of the Holes”. The choice of replacing the bridge has gone to a triple arch in stone masonry with a main span of 20 m for a height of 15 m and a thickness of 40 cm, closer from a sculpture. Due to its very small thickness and corresponding self-weight, accurate estimation, with wind tunnel tests by University of Liège, of the wind effects is of utmost importance for the verification of masonry and especially the joints openings. Nonlinear finite element calculations considering cracking and opening of joints, using Finelg software, show that the joints should be glued to ensure the stability. Finally, by political decision, this triple arch project was abandoned and replaced by a more conventional structure.

Keywords: bridge, historical, renovation, masonry, wind tunnel test, glued joints.

1 Introduction

1.1 History of the “Pont des Trous”

The “Pont des Trous” (Figure 1) is a vestige of the second ramparts of Tournai, erected at the turn of the 13th and 14th centuries on both banks of the Scheldt. This enclosure is the witness of a golden age of the episcopal city; the late Middle Ages.



Figure 1. Original structure in 1914

The rarity of the “Pont des Trous” is based on its typology, that of being a water gate. A part of the fortification spans the river and controls the access to the Scheldt downstream from the city, by means of harrows blocking the river in case of danger. Contrary to popular belief, the “Pont des Trous” is not a bridge since its upper gallery, originally covered, initially served as a technical room for controlling the harrows and as a point of observation and defense on the River.



Figure 2. Current structure