



CASTLE REGAINED

A product belonging to the Mape-Antique range was used to reinforce and secure the north-west part of the ramparts of Caen Castle.

The settlement called Caen already appeared on the maps back in Roman times, but it was in the Middle Ages, under the reign of the Duke of Normandy, William the Conqueror, that the village really expanded and had a fortification wall built around it as well as a castle, two abbeys and a number of churches inside.

Much of Caen was razed to the ground during the 2nd World War due to how close it was to the areas where the American forces first landed in Normandy. Fortunately, most of the main city monuments were spared. Nowadays Caen has a population of over 100,000 people and has become the capital of both the Department of Calvados and the Lower Normandy region.

A few years ago the City Council launched an ambitious project to renovate the castle under the joint patronage of the French Government, European Union, Lower Normandy Regional Council and Calvados General Council, with a view to building a museum and a visitors centre inside.

Daniel Lefèvre, the head architect of the Historical Monuments Department, followed the renovation works and the securing of the north-west section of the walls involved in the





conservation project.

The renovation work began in March 2004 and was completed in 2006: eight million Euros were allocated for the initial work which involved over 230 metres of walls.

Working on the Castle

Before beginning the renovation work on Caen Castle, a survey was carried out on the materials out of which it was originally built and the state of its structures; the work was then divided into various operating phases.

The first phase involved reinforcing the basic structure to ensure the foundations were much firmer and more stable. The castle walls are actually built on a dry limestone conglomerate that had gradually become unstable down the years. 1400 m³ of cement-based mortar were injected to rectify the problem.

The second stage focused on finding and removing any stones, damaged by the passage of time, that had been used in the past to build the wall. The damaged material was replaced by new stones (approximately 220 m³).

The stone used for the repair work came from a quarry located in Cintheaux (France) and was chosen because it has the same properties as those used to build the castle ramparts in the 11th century.

Once the new stones had been set in place, the walls were reinforced by injecting MAPE-ANTIQUÉ I* hydraulic binder directly into the ramparts. Preliminary studies had shown that the city wall's structure featured a reinforced "core" composed of lime-bound stones and that small bubbles had formed in the conglomerate.


The injections of MAPE-ANTIQUÉ I* were designed to stabilise the overall wall structure and to form a link between the ramparts in order to recreate the original monolithic layout.

The day before injecting the binder, the inside of the wall had to be thoroughly soaked in water through the same holes where the

MAPE-ANTIQUÉ I* slurry was injected the following day.

The designers needed a product with compatible physical-mechanical properties to the original materials, good compressive and flexural strength, elasticity and an absence of chemical reactions. Other requirements were: good fluid consistency, high sulphate resistance, colour as close as possible to that of the stone, and quick, safe installation.

Lots of tests carried out in specialist laboratories proved that MAPE-ANTIQUÉ I* hydraulic binder, proposed by Mapei Technical Service Department, perfectly matched the building requirements of this job site.

MAPE-ANTIQUÉ I* is a pre-packed, sulphate-resistant binder used for obtaining injection slurries to consolidate stone cavity walls, refill cavities, cracks and internal porosities in old stone and brick structures. The product is composed of pozzolanic-reaction inorganic materials, special additives and ultra-fine fillers. MAPE-ANTIQUÉ I* belongs to the MAPE-ANTIQUÉ range, which includes plenty of products designed to meet all the requirements related to the repair of damp or damaged structures. 



Our thanks go to "Mapei and Vous", n. 15, published by Mapei France, from which this article was taken.

***Mapei Product:** the product referred to in this article belongs to the "Building Speciality Line". The technical data sheet is available on the "Mapei Global Infonet" CD/DVD or at the web site: www.mapei.com.

Mape-Antique I: cement-free, fillerized hydraulic binder for consolidating, by injection, stone, brick work and tuff structures.



TECHNICAL DATA

Caen Castle, France

Work: reinforcing and securing the castle ramparts

Years: 2004-2006

Client: Caen City Council

Project: architect Daniel Lefèvre, Paris

Works Management: Alain Marie and Vincent Gary, Lefèvre Sa

Contractor: Lefèvre Sa, Giberville (France)

Mapei Co-ordinators: Dominique Niveleau (Mapei France) and Pasquale Zaffaroni (Mapei SpA)