Learning from Failure

Long-term Behaviour of Heavy Masonry Structures

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Editor:

L. Binda
Politecnico di Milano, Italy

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Politecnico di Milano, Italy

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Ashurst Lodge, Ashurst, Southampton, SO40 7AA, UK
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Contents

Preface

On March 17 1989, the Civic Tower of Pavia collapsed without any apparent warning signs – killing four people. Subsequently, L. Binda, together with four colleagues from DIS, Politecnico of Milan, was nominated a member of a Committee that had the aim of helping the Prosecutor of the Procura della Repubblica in Milan find the causes of the collapse. After an experimental and analytical investigation lasting nine months, the collapse cause was found. Progressive damage dating back many years, due mainly to the heavy dead load put on top of the existing medieval tower with the addition of a massive bell-tower in granite, was to blame.

This type of long-term behaviour of masonry structures was not as well researched as it was for concrete and steel structures and for rocks. Experimental research aimed at showing the reliability of this interpretation was carried out, and is still continuing, that is more than sixteen years of research since 1989. After careful interpretation of the experimental results, also based on experiences from rock mechanics and concrete, the modelling of the phenomenon for massive structures, such as creep behaviour of masonry, was implemented by collaboration with E. Papa and A. Taliercio from the same department.

Other case histories were collected such as the collapse of the Sancta Maria Magdalena bell-tower in 1992 in Dusseldorf, the damage to the bell-tower of the Monza Cathedral, Italy, and to the Torrazzo in Cremona, Italy. Later on, in 1996 the collapse of the Noto Cathedral, Italy, showed that similar progressive damage can take place in pillars of churches and cathedrals.

Collaborations on the topic first started with the University of Padua (C. Modena) and later on with the University of Minho, Portugal (P. Lourenco). Then the University of Calgary, Canada (N. Shrive) and the University of Barcelona (P. Roca) were involved.

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The Editor
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