Sustainable Urban Rehabilitation in Europe

Heritage Problems. Causes. Solutions

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Sustainable Urban Rehabilitation in Europe

3rd Semester

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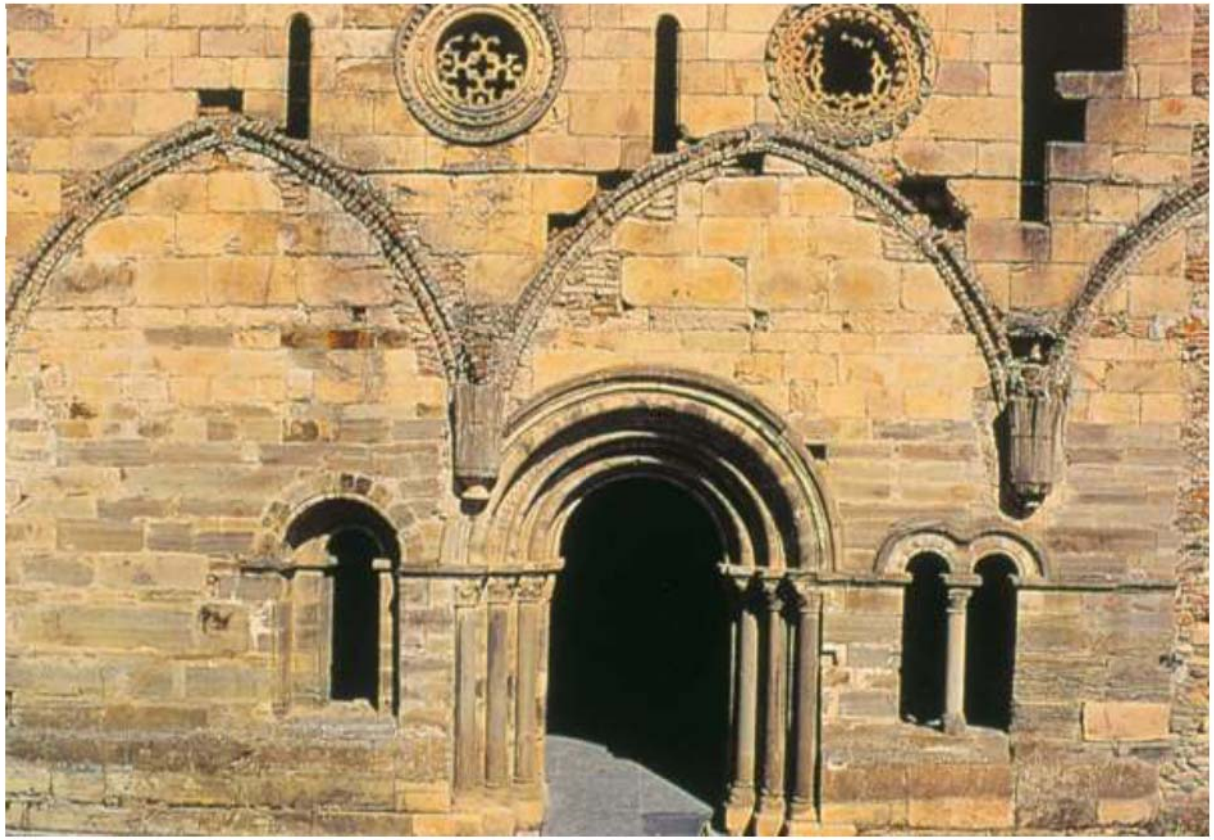
Camila Burgos Vargas

Heritage Problems. Causes. Solutions

3 ECTS

SH
Sustainable Heritage

EC
Elective Courses



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SURE
SUSTAINABLE URBAN REHABILITATION IN EUROPE

UNIVERSIDAD POLITÉCNICA DE MADRID

1. INTRODUCTION
2. **FOUNDATIONS: DAMAGES**
3. FOUNDATIONS: REPAIR SOLUTIONS
4. WALLS: CONSTRUCTIVE SYSTEM
5. WALLS II: PROBLEMS AND CAUSES
6. WALLS III: SOLUTIONS
7. VAULTS: CONSTRUCTIVE SYSTEM
8. VAULTS II: PROBLEMS AND CAUSES
9. VAULTS III: SOLUTIONS
10. FLOORS
11. WOOD
12. ROOFS: CONSTRUCTIVE SYSTEM, PROBLEMS AND CAUSES
13. ROOFS II: SOLUTIONS
14. OTHER TRADITIONAL STRUCTURES
15. SURFACE FINISHES, INTERIOR WOODWORK

CURRICULAR CONTENTS

HERITAGE PROBLEMS. CAUSES. SOLUTIONS

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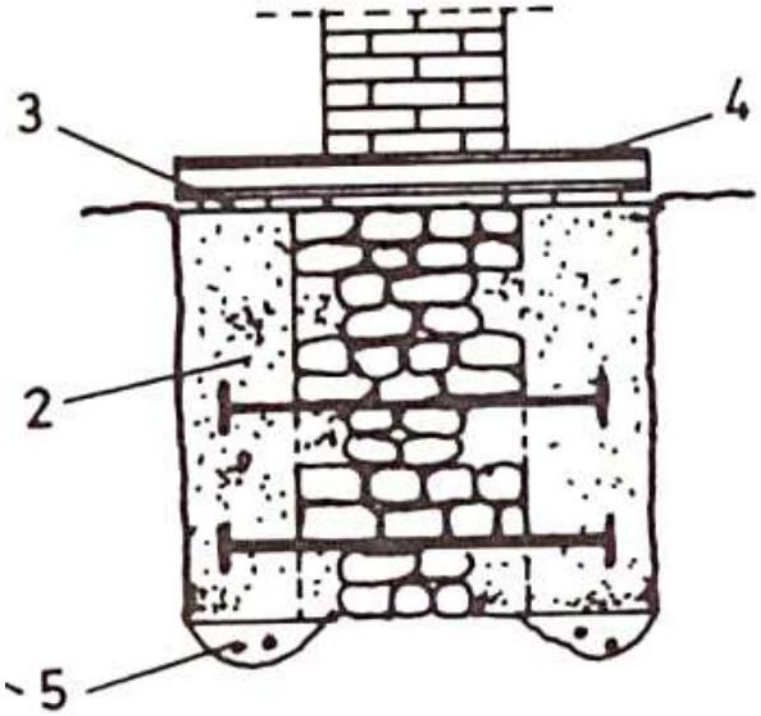
3 ECTS



02 FOUNDATIONS: DAMAGES

1. **DAMAGES AND BACKGROUND**
2. **ANALYSIS OF OBSERVED PATHOLOGY**
3. **VERIFICATION OF THE HYPOTHESES**
4. SELECTION OF REPAIR SOLUTIONS
5. EXECUTION OF THE WORKS

02 FOUNDATIONS

METHODOLOGICAL APPROACH

1. DAMAGES AND BACKGROUND

- ORIGINAL PROJECT
- HISTORICAL REFERENCES:
  - PHOTOGRAPHS, DOCUMENTS, TESTIMONIES
- EXISTENCE OF PREVIOUS BUILDINGS
- STRUCTURAL OR ARCHITECTURAL MODIFICATIONS
- DAMAGES: EARTHQUAKES, FLOODING...
- WATER TABLE
- MODIFICATIONS OF THE ENVIRONMENT:

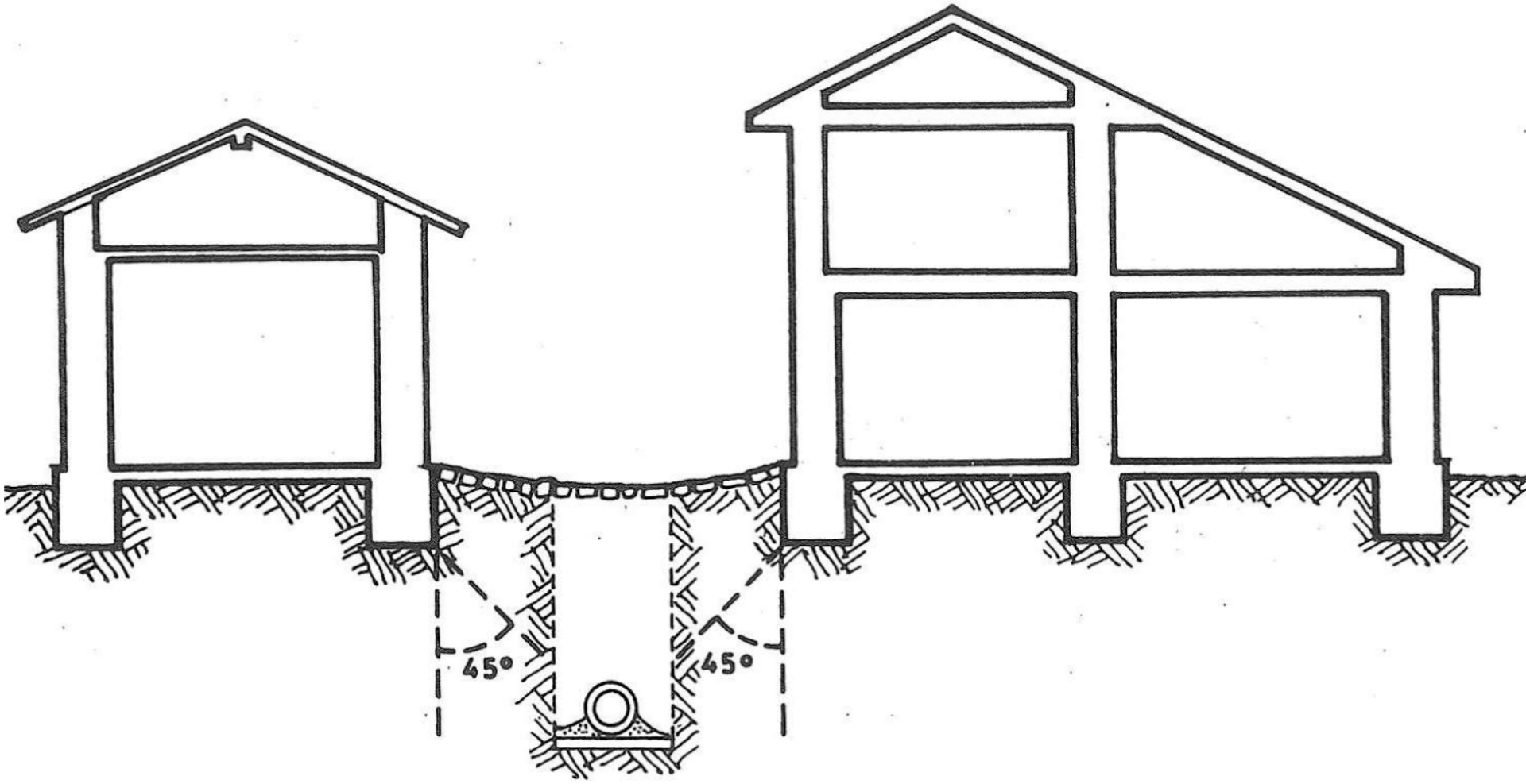
  EXCAVATIONS, PAVING, SANITATION, WELLS, CELLARS…

02 FOUNDATIONS

METHODOLOGICAL APPROACH

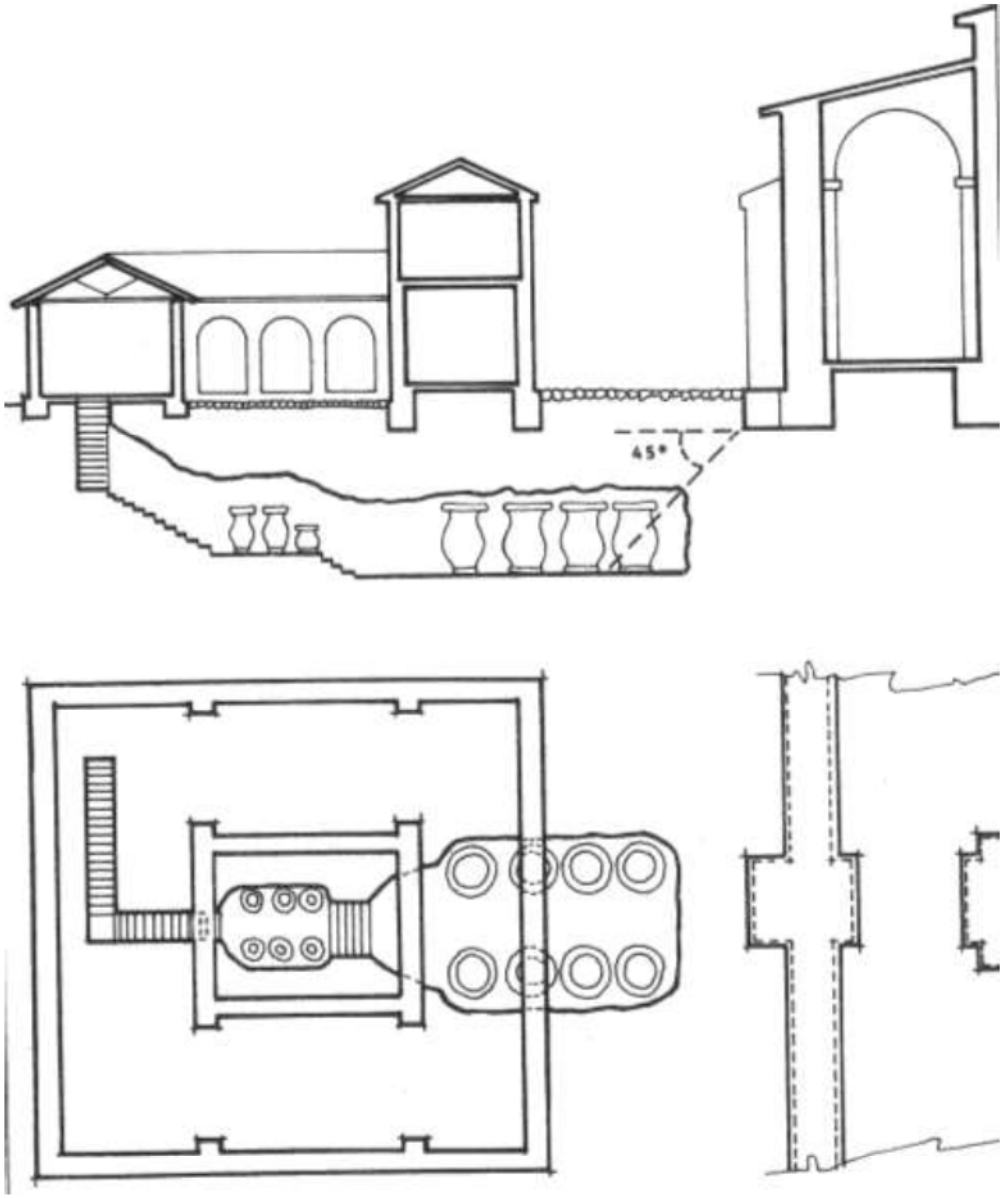
02 FOUNDATIONS

CAUSES



EXCAVATIONS, PAVING, SANITATION, WELLS, CELLARS…

MODIFICATIONS OF THE ENVIRONMENT



EXCAVATIONS, PAVING, SANITATION, WELLS, CELLARS…

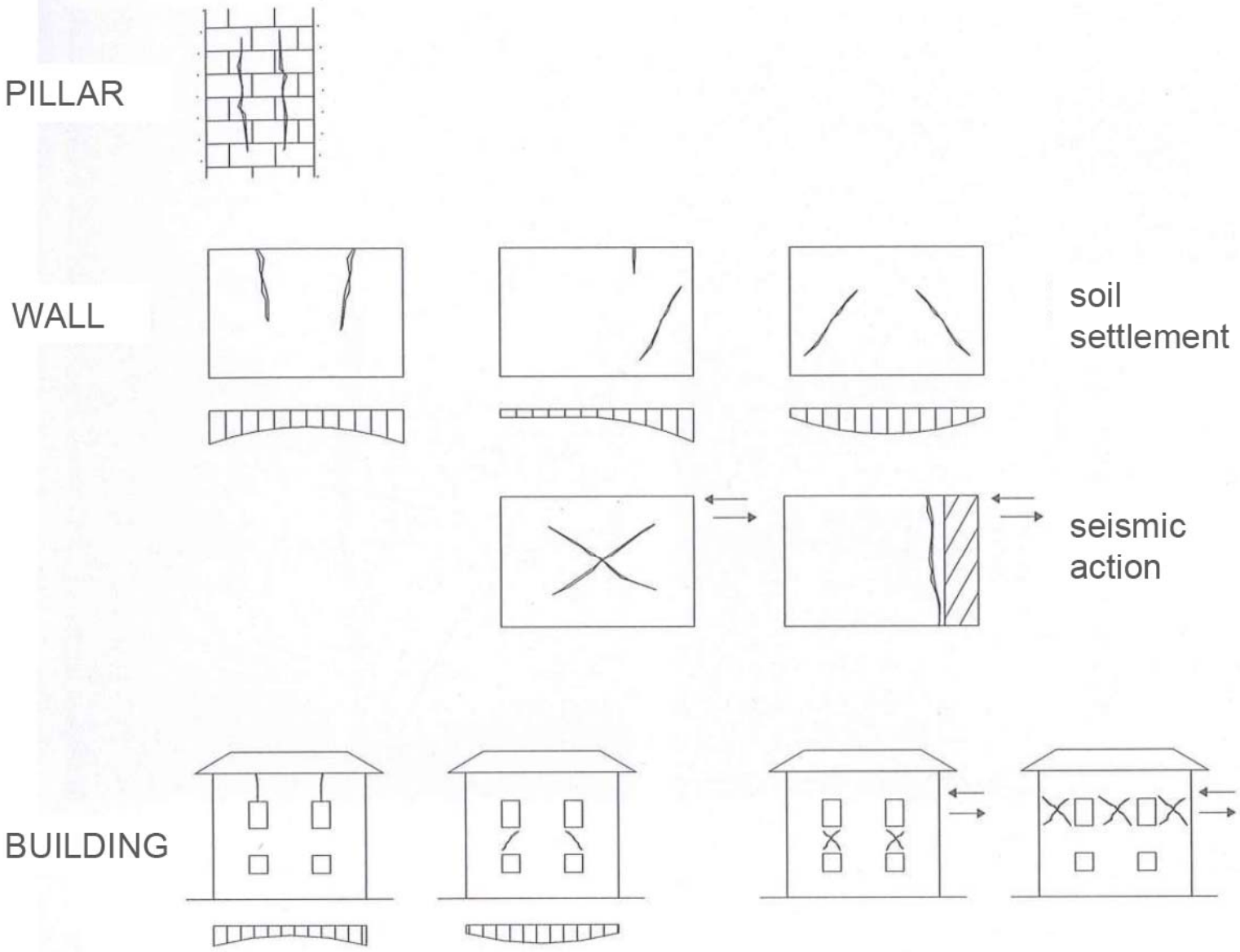
MODIFICATIONS OF THE ENVIRONMENT

2. ANALYSIS OF OBSERVED PATHOLOGY

- VERIFY THE ORIGIN OF DAMAGES
- TYPOLOGY OF FOUNDATION AND GROUND DAMAGES:
  - EDGE MOVEMENTS
  - INTERNAL MOVEMENTS
  - GENERALIZED MOVEMENTS
  - TWIST
  - COLLAPSE

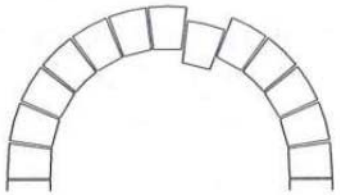
02 FOUNDATIONS

PROBLEMS

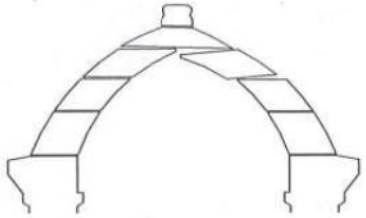


DAMAGES AND DEFORMATIONS IN A MASONRY STRUCTURE

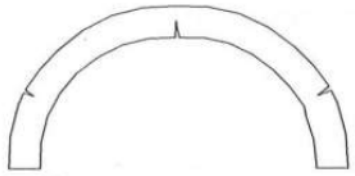
ARCHES



ashlars with radial joints

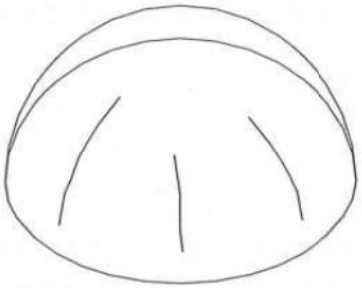


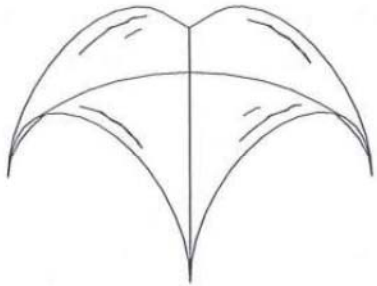
ashlars with horizontal joints



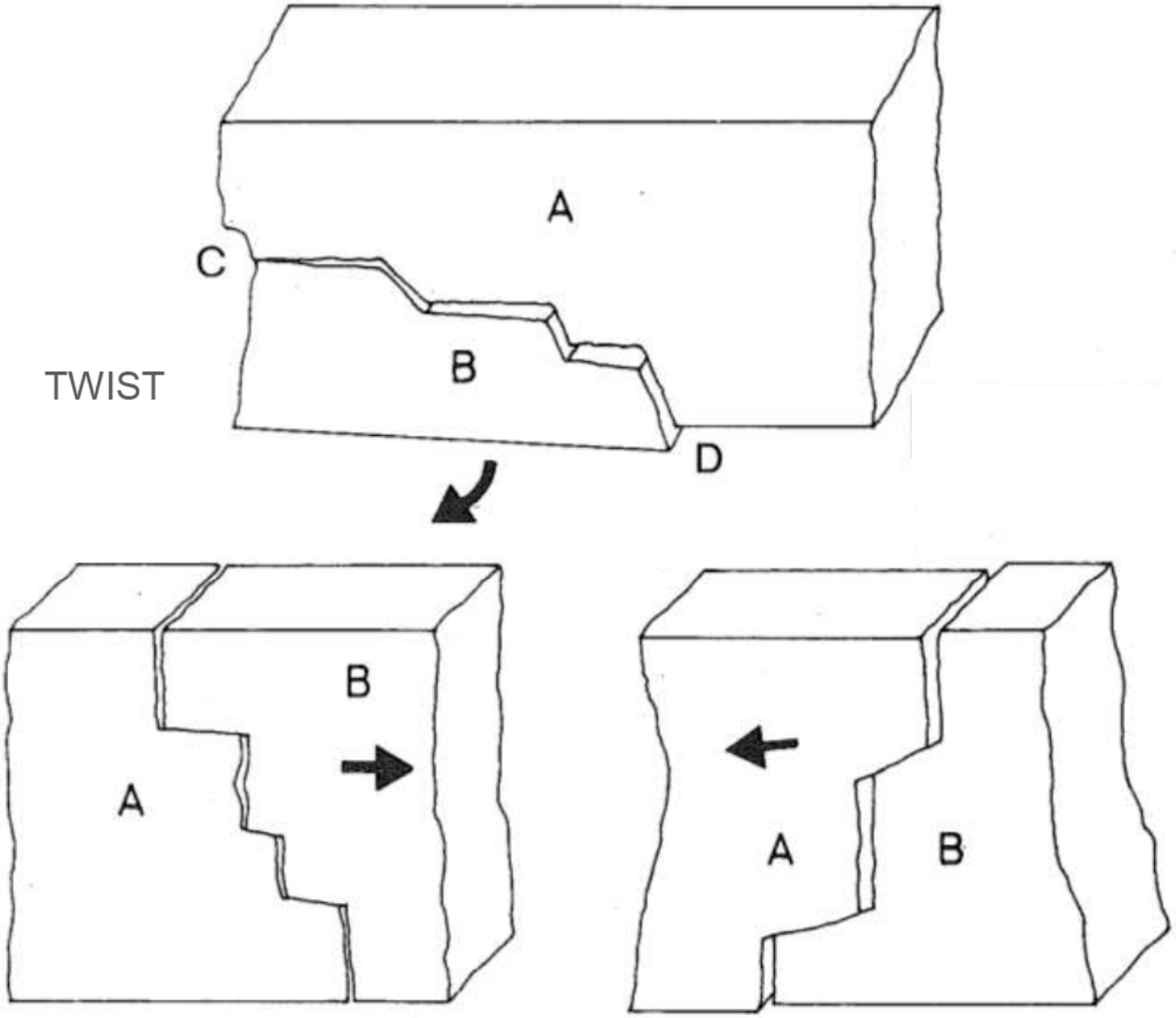
stone and mortar

DOMES AND VAULTS





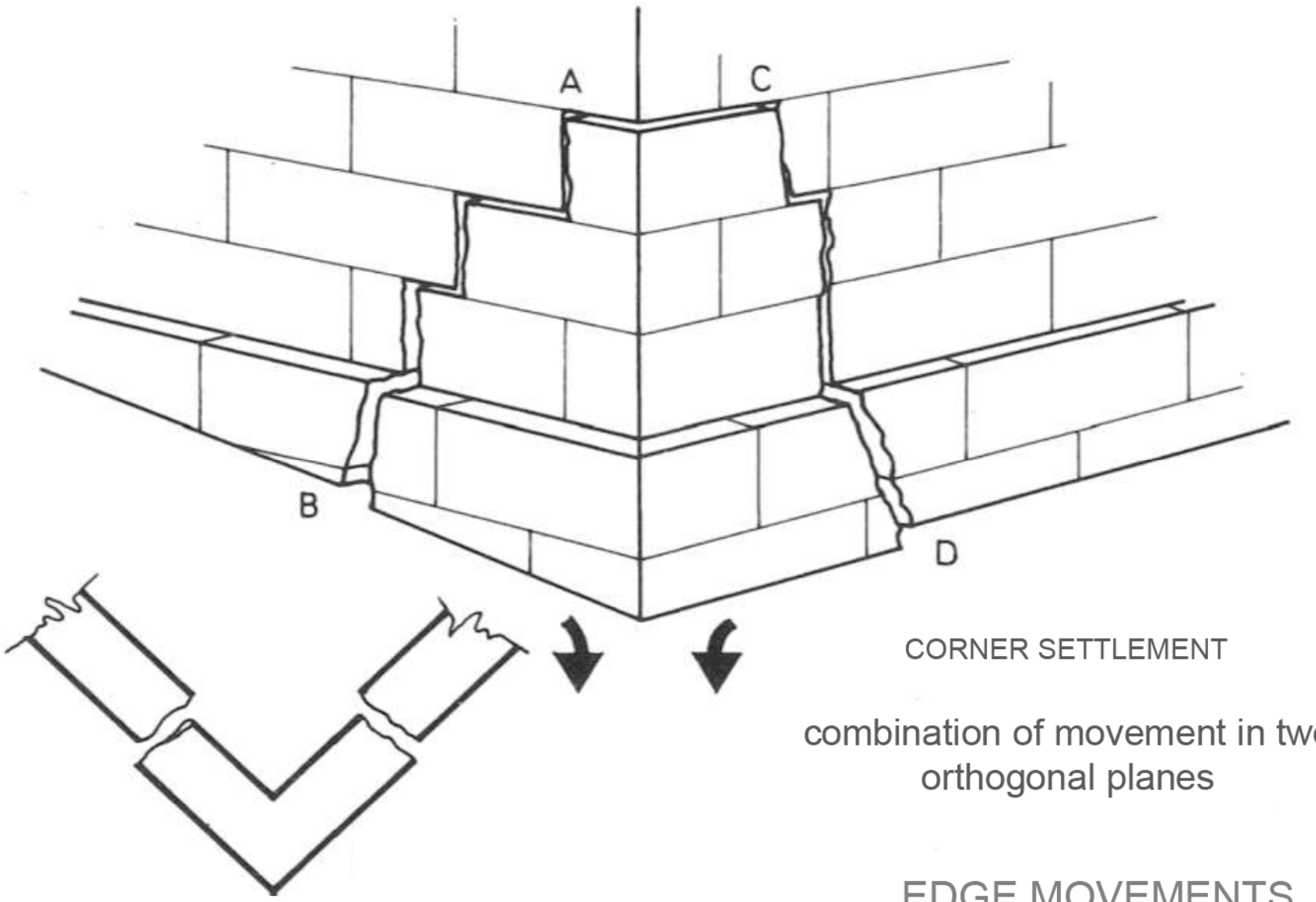
DAMAGES AND DEFORMATIONS IN A MASONRY STRUCTURE



SHEAR AND STEPS CRACKS

EDGE MOVEMENTS

FOUNDATION AND GROUND DAMAGES

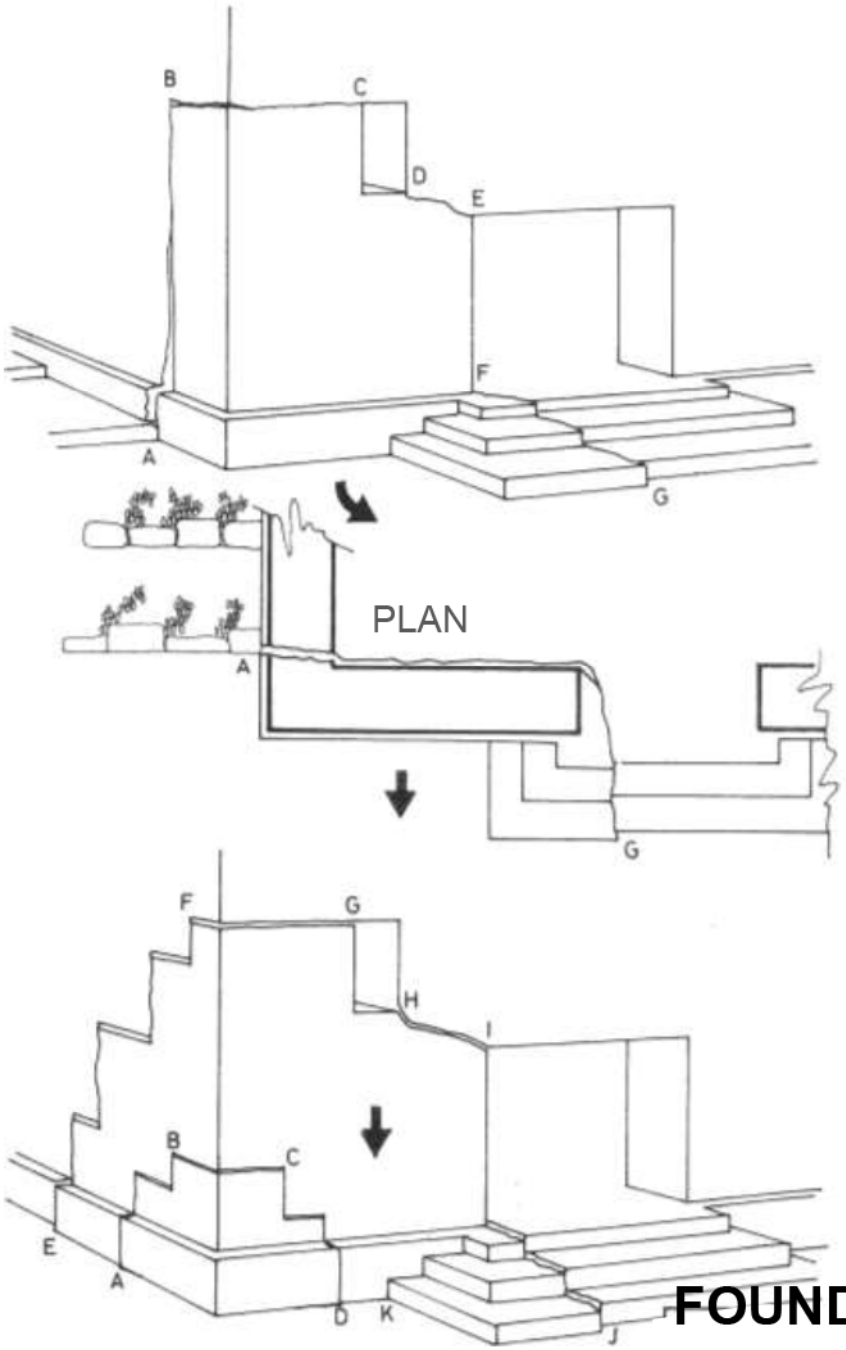


CORNER SETTLEMENT

combination of movement in two orthogonal planes

EDGE MOVEMENTS

FOUNDATION AND GROUND DAMAGES



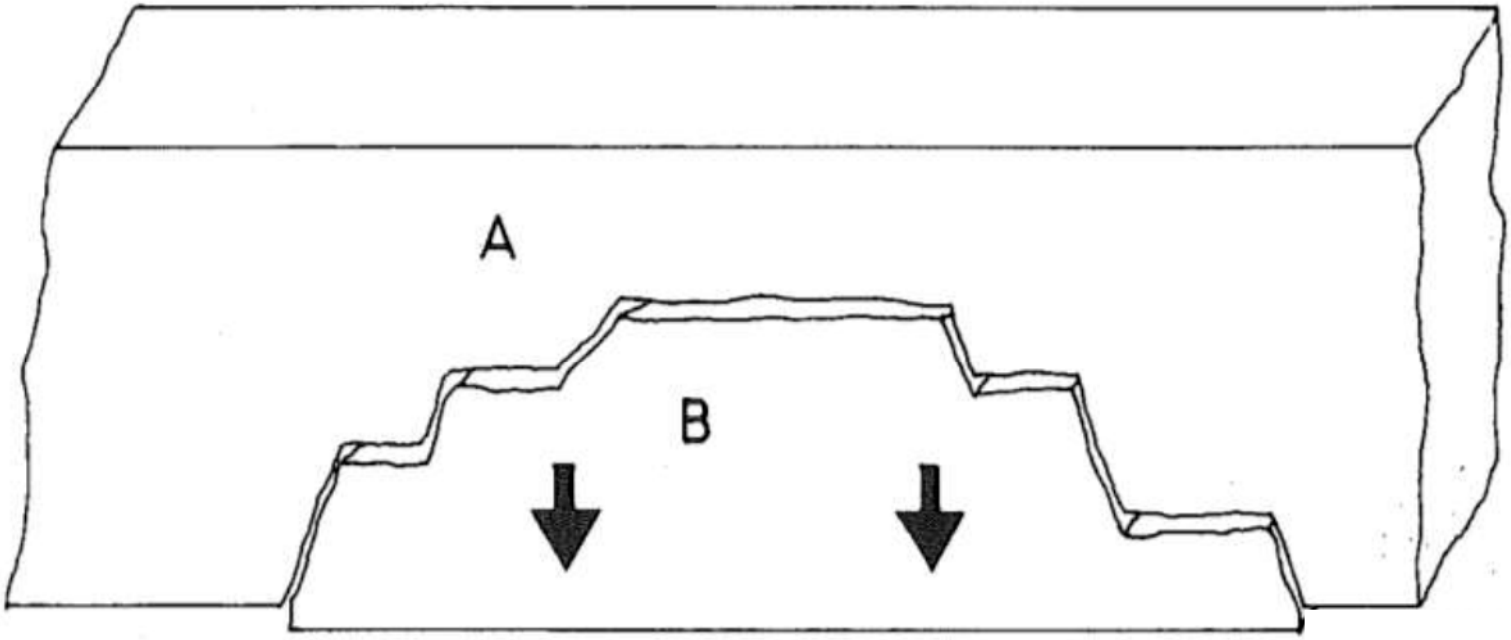
FOOTING SETTLES AND LEANS

combination of movement in two orthogonal planes with shear and steps cracks

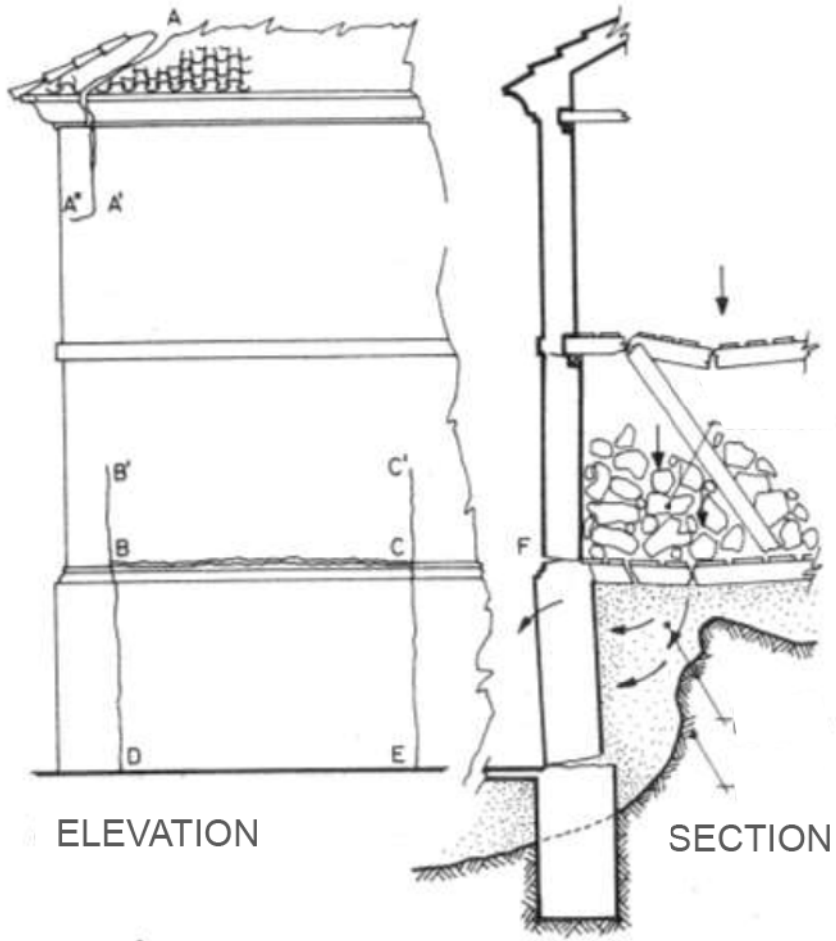
EDGE MOVEMENTS

FOUNDATION AND GROUND DAMAGES

caused by weight and small
differential settlement below load

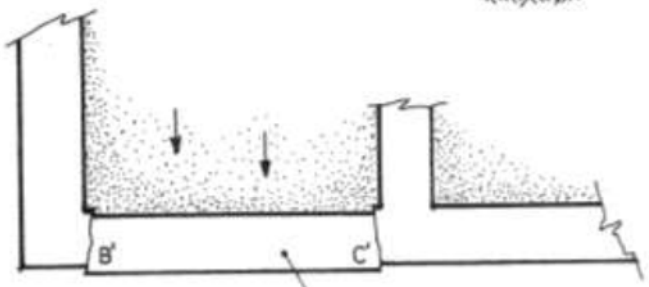


DIFFERENTIAL SETTLEMENT



ELEVATION

SECTION



PLAN

DISPLACEMENT

wall is uniformly pushed
and displaced with
vertical shear cracks

INTERNAL MOVEMENTS

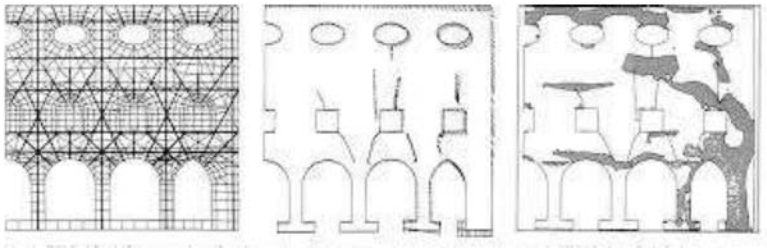
FOUNDATION AND GROUND DAMAGES

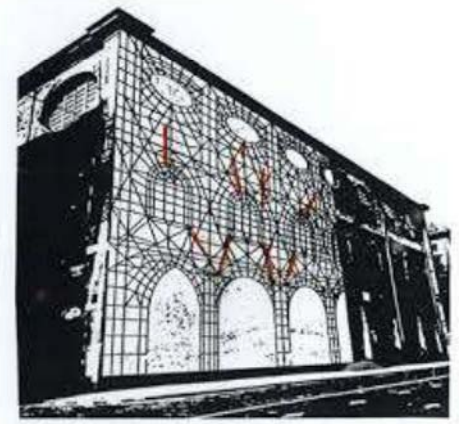
3. VERIFICATION OF THE HYPOTHESES

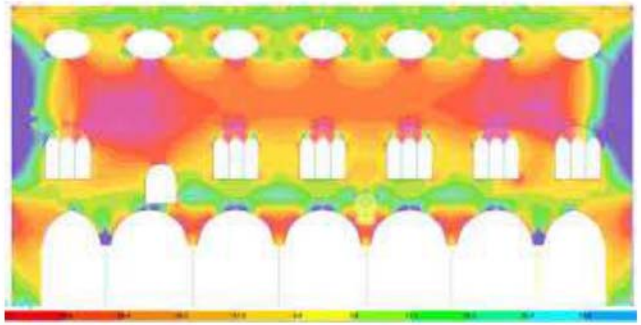
- STRUCTURAL ANALYSIS
- RECOGNITIONS AND PROSPECTIONS
- GEOTECHNICAL INTERPRETATION

02 FOUNDATIONS

METHODOLOGICAL APPROACH







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Numerical model and consolidation interventions of Palazzo della Ragione in Milan

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Abstract

Palazzo della Ragione, erected in 1233, represents one of the most ancient and relevant historic building of Milan. During the last century, the Palace suffered significant modifications, including the realization of an underground tunnel immediately near the foundations. Numerical analysis conducted with a FEM model were developed on the basis of some experimental tests. In particular, the diagnostic campaign performed in 1979, in which flat jacks and dynamic tests were applied, allowed to obtain useful information on the mechanical characterization of the masonry. In addition, the execution of some dynamic identification tests in 2017 returned the own frequencies of the building 40 years later. Before to work on the structural project, the autor verified the consistency between the structural response of the numerical model and the one of the real building, obtained by dynamic tests. Some consolidation interventions were realized on the wooden trusses of the cover, in order to restore either local and global safety situation, with respect to vertical and horizontal load.

Peer-review under responsibility of the CINPAR 2018 organizers

Keywords: Dynamic tests, Finite Element Model, Seismic strengthening

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http://jurina.it/wp-content/uploads/2013/11/1-s2.0-S2452321618301549-main.pdf



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