Timber structures

Case studies

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Assessment of existing structures
Project number: CZ/08/LLP-LdV/TOI/134005
Structural reassessment

Inadequate reliability;

Structural modifications;

Changes in category of use and design working life;

Damage or deterioration (environmental, chemical or biological, attack);

Damages due to accidental loads (earthquake, impact or explosion), settlements or other unintentional events
Preliminary investigations

Acquisition of original information (design and structural conception of the building, reference structural codes, if any);

History of structural modifications (addition or demolition, and/or deep maintenance interventions);

actual damage and/or crack patterns;

actual material properties;

required performance level.
PRELIMINARY REMARKS
Effect of height of fibre splitting
CASE STUDY N. 1

STRENGTHENING OF A TIMBER ROOF
Cracked beam
Cracked beam

Damaged columns
Crack pattern in a beam
Strengthening of the beams

Threaded rods M12/400 glued with exopy resin
Strengthening of the connection

Threaded rods M12/400 glued with exopy resin

≠ 80x6

≠ t=8

300
Connection with the upper part of the shear walls

L50x100x4

Threaded rod M14/400

Barre Ø12 disposed a passo 40cm e allettate nel foro con malta di resina epossidica

L50x100x4

Steel mesh Ø8/200 welded to the L100x80 perimetral profile

Lightweight concrete $\delta=400$ Kg/m$^3$

Brick wall
Strengthening of the main beams
Strengthening of the secondary beams
Strengthening of the roof during the works
Strengthening of the roof during the works
Strengthening of the joints
Beams and joint after the strengthening
Details of the connections with intermediate brick walls
View of the roof during the work
Strengthening of brick wall
CASE STUDY N. 2

ANALYSIS AND REPAIR OF TIMBER BEAMS
Insufficient cross section – Uncorrect wood fibre pattern
Insufficient cross section – Uncorrect wood fibre pattern
Insufficient cross section – Uncorrect wood fibre pattern
Beam supported with a pack prop
Beams supported with pack props
Support and crack
Strengthening of timber beam preserving the exterior aspect

Threaded rods M8

≠140x15 (S235) glued with epoxy resin

Wooden cover

BB
Strengthening of timber beam preserving the exterior aspect

- Wooden plates glued with epoxy resin
- Threaded rods M8

≠140x15 (S235) glued to the wooden plates with epoxy resin
Crack pattern in a beam
Beam covered with wood plates
General view of the floor
Detail of the cover
A surprising arrangement of the cover
Detail of the supports
Typical crack pattern
Covered beams
Painted vault
CASE STUDY N. 3

SUBSTITUTION OF TIMBER BEAMS
CASE STUDY N. 3

SUBSTITUTION OF TIMBER BEAMS
Substitution of the floor
CASE STUDY N. 3

SUBSTITUTION OF TIMBER BEAMS FROM BELOW
Removal of the beam supporting the floor
Insertion of the new beam
Preparation of the support
Beam substitutions completed
Arch to be strengthened
Arch strengthening
CASE STUDY N. 4

STRENGTHENING AND REPAIR OF A WOODEN TRUSS ROOF SUSTAINING A PAINTED CEILING
The interior of the Church
Plan of the roof structure
Suspension of the ceiling
Connection of the truss tie - Jupiter dart
Connection of the truss tie - Jupiter dart
Repair of the strut
Repair of the truss and temporary chain
Repair of the Jupiter dart

Existing steel stirrups ≠ 200x4 glued to the wooden tie with epoxy resin.

Threaded bars M12 cl. 8.8/400

Threaded bars M8 cl. 8.8

Threaded bars M12 cl. 8.8

Threaded bars M8 cl. 8.8

Threaded bars M8 cl. 8.8

Threaded bars M12 cl. 8.8

Threaded bars M12 cl. 8.8

Threaded bars M12 cl. 8.8
Repair of the Jupiter dart
Repair of the strut-tie connection

- Threaded bars M14 cl. 8.8
- Threaded bars M8 cl. 8.8

Strut to be repaired
Tie to be repaired
Existing steel reinforcement

17° 60° 103°
Repair of the strut-monk connection
Repair of the strut-tie connection
Temporary suspension of the truss
Repair of a damaged head
Repair of a damaged head
Steel bracings
Thank you for your kind attention