Restoration of the roofs of Caminha’s main church.

FARIA, J. A.

WOODEN HANDWORK / WOODEN CARPENTRY:
EUROPEAN RESTORATION SITES
International Seminar - Lavrion, Greece

ENVIRONMENTAL, SOCIAL, FUNCTIONAL AND
LOADING CONDITIONS AS MAIN FACTORS FOR THE INVENTION
AND DEVELOPMENT OF CHARACTERISTIC TIMBER
STRUCTURAL SYSTEMS

National Technical University of Athens - School of Architecture
Lavrion Technological - Cultural Park, Lavrion Attica
Building “Pharmakion”

15th May 2002

Organisation: Supported by:

NTUA
Politecnico di Torino

European Commission
Directorate-General of Education and Culture
Greek Ministry of Culture
Municipality of Lavrio

SCIENTIFIC COMMITTEE
P. Touliatos (co-ordinator), C. Bertolini Cestari, E. Tsokanika, J. Amorim Faria,

ORGANISING COMMITTEE
P. Touliatos (co-ordinator), C. Bertolini Cestari,
E. Tsokanika, G. Tsekoura, T. Marzi.
WOODED HANDWORK / WOODEN CARPENTRY: EUROPÆAN RESTORATION SITES

Culture 2000

FINAL PROGRAM OF THE INTERNATIONAL SEMINAR: GREEK ACTION
Wednesday 15th May 2002 - LAVRIO - ATTICA

"Environmental, social, functional and loading conditions as main factors for the invention and development of characteristic timber structural systems"

NTUA-GREECE

9.00 – 9.30 Official opening of the Seminar

Session 1: 9.30 – 13.20 Chairman N. Kalogeras (NTUA)

9.30 – 10.00 K. Palyvou (Aristotle University of Thessaloniki)
"The timber technology in the Minoan world"

10.00 – 10.30 D. Kamarinou (Brl. Sch. of Archaeology), S. Bistios, Chr. Govotsos, E. Maragoudaki, K. Baika, (Researchers) E. Tsakanika (NTUA)
"The timber technology in the Mycenaeans world"

10.30 – 10.45 P. Koufopoulos, M. Myriantheos, C. Zambas, A. Galanou, G. Dogani
"The 6th century Timber Roof of St. Catherine Sinai: Identification, Research and Proposals for its Protection"

10.45 – 11.00 P. Koufopoulos, St. Mamaloukos, P. Panagiotopoulos
"Repairs to timber framed buildings and roofs on Mt. Athos and Ormylia in northern Greece"

11.00 – 11.30 L. Kizis (National Technical University of Athens)
"The Balkan traditional carpentry inspiring modern building design."

11.30 – 11.50 Coffee Break

Chairman P. Touliatos (NTUA)

11.50 – 12.20 José Amorim Faria (University of Porto),
"Rehabilitation of the roofs of Carminha’s main church"

12.20 – 12.50 Antonio Frattari, Marco Sontacchi (Università di Trento),
"The horse centre “Felix Baron Longo” at Egna (BZ) – Trentino Alto Adige - Italy"

12.50 – 13.20 Peter Norberg (University of Gävle),
"Documentation of historic wooden buildings using 3D laser scanning"

13.20 – 14.20 Lunch Break

Session 2: 14.20 – 18.45 Chairman Clara Bertolini Cestari (Politecnico di Torino)

14.20 – 14.50 Minna Chudoba, (Meri-Lappi Institute),
"On joints in wood construction"

14.50 – 15.20 Philippe Galliard (University of Bordeaux),
"Renaissance of French Timber Bridges"

15.20 – 15.50 Clara Bertolini Cestari, Olivia Pignatelli (Politecnico di Torino),
"Building by the sea. building by the land: wooden architecture of the Venice Arsenal."

15.50 – 16.10 Coffee Break

16.10 – 16.40 Irene Efessiou (NTUA)
"Timber reinforcements in historical masonry buildings in Chios Island."

16.40 – 17.10 Panos Touliatos (NTUA)
"Survey – Constructional analysis – Behaviour assessment of the industrial buildings in Lavrio"

17.10 – 17.40 Fragiskos Goulleimos (NTUA)
"The rehabilitation of an industrial building (Xyloorgo) in Lavrio"

17.40 – 18.10 Clara Bertolini Cestari, Tanja Marzi (Politecnico di “orino),
"The wood as resource, building in the wood": Prototype of a wooden building for Culture 2000

18.10 – 18.45 Round Table and conclusions:
Panos Touliatos, Clara Bertolini Cestari, N. Kalogeras
Maire Mattilnen, Panu Kailla, Hugues Wilquin, José Amorim Faria.
INVITED PARTICIPANTS

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Kauko Tulla
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INTERNATIONAL SEMINAR
ENVIRONMENTAL, SOCIAL, FUNCTIONAL AND LOADING CONDITIONS AS MAIN FACTORS FOR THE INVENTION AND DEVELOPMENT OF CHARACTERISTIC TIMBER STRUCTURAL SYSTEMS

National Technical University of Athens
School of Architecture

15th May 2002

Laviron Technological -Cultural Park (NTUA)
Laviron Attica
Building "Pharmakion"
**CULTURE 2000**

"Wooden Handwork / Wooden Carpentry: European Restoration sites" is a project realised in the framework of CULTURE 2000 European Program. Hence, a three-year, international and structured project aimed to share and valorise European coherent Cultural Heritage and to diffuse and promote know-how on good practices relevant to the conservation and the protection of that heritage.

**Approach and Methodologies**: Theoretical comparison of the acquired knowledge in the different countries: about the characteristics of the wood, the diagnosis, the time and the guidelines for the conservation; practical experiences through workshops in restoration and new building working-sites of timber structures; at least 3 important churches, being present under restoration will be a part of the programme. There, the theoretical experience will be put into practice and compared to the real operative complexity.

**Partners**: A highly qualified association of Italian Universities, Research Institutes, Companies and professionals from 9 European Countries subdivided into 3 geographical areas: Northern Europe (Finland, Sweden, Norway), Central Europe (Belgium, France, Luxembourg), Southern Europe (Greece, Portugal) - for a total of 24 Operating Units. The Department of Architectural and Building Sciences of the Politecnico di Torino is the General Coordinator of the Project.

**Objectives**: The European scientific community, National Boards, architect, engineers, technical assistants and SMEs involved in the protection of Cultural Heritage. List of the Project, the different partners will organise the theoretical activities through seminars, conferences and workshops. The practical activities will be located in the restoration working-sites exposed by the partners.

**Aims of the Project**

- To familiarize European professionals of various fields (architecture, history, art, culture, etc.) with the problems of restoration and the different solutions.
- To exchange experience on the restoration of wooden structures in the different countries.
- To study the different local characteristics and climatic conditions affecting the structure and the continue the work on the identification of traditional methods and techniques.

**Session 2**

**14.20 – 18.45**

Chairman: Clara Bertolini Castini (Politecnico di Trieste)

- 14.20 – 14.50: Mirna Chudoba (Mari-Lopi Institute), "On joints in wood construction"
- 14.50 – 15.00: Philippe Girard (University of Bordeaux), "Renaissance of French Timber Bridges"
- 15.20 – 15.50: Clara Bertolini Castini, Olvido Pignatelli (Politecnico di Torino), "Building by the sea: a study of the wooden architecture of the Venetian Lagoon"
- 15.50 – 16.30: Coffee break

16.10 – 16.40: Irene Bussiu (NTUA) "Timber reinforcement in historical masonry buildings in Chios Island"

16.40 – 17.10: Panos Touloukas (NTUA) "Survey – Constructural analysis – Behaviour assessment of the industrial buildings in Lavrion"

17.10 – 17.40: F. Frangiskos Goulielmis (NTUA) "The rehabilitation of an industrial building (Kallithea) in Lavrion"

17.40 – 18.10: Clara Bertolini Castini, Tania Morlino (Politecnico di Trieste), "The wood as resource, building in the wood (prototype of a wooden building for CULTURE 2000)"

18.10 – 18.45: Round Table and Conclusions: Panos Touloukas, Clara Bertolini Castini, N. Kalogeris, M. Matthias, P. Katsia, H. Wilquin, J. Amorim Peix

Several visits will be organised for the participants of the Seminar, with the following program:

- May 15th: Visit to the restored monastery at Hydra Island.
- May 16th: Visit to the historic structure and the original ancient churches in Lavrion (CULTURE 2000 site).
- May 17th: Visit to the ancient temple of Poseidon at Cape Sounion.
- May 18th: Visit to the Restoration site at the Byzantine Monastery of Agios Ioannis at Batisa.
FINAL PROGRAM OF THE INTERNATIONAL SEMINAR
ATHENS

Environmental, social, functional and loading conditions as main factors for the invention and development of characteristic timber structural systems
NTUA-GREECE

Tuesday 14th May 2002
Arrivals to Laurio – accomodation to a hotel in the city of Laurio

Wednesday 15th May 2002
9.00 – 9.30 Official opening of the Seminar in Laurio (on site), using the just restored and reused historical industrial structures.
Poster session

Thursday 16th May 2002
Visit on site of at least 10 restored industrial structures.
Visit of the original ancient mines
Visit of the ancient temple of Poseidon at cape Sounion

Friday 17th May 2002
Departure by bus to the Byzantine monastery (10th century) of Osios Loukas.
Visit of the restoration sites at the monastery.
Accomodation in the monastery and/or at a village nearby

Saturday 18th May 2002
Departure by bus
Visit of the Byzantine monastery of Skripou or visit of the archeological site of Delphi
Visit of the modern large span timber and metal structure on the top of the mountain Parnassos
On route stop for a short visit of an aseismic modern timber structure
Departure to Athens

Sunday 19th May 2002
Departures
REHABILITATION OF THE ROOFS OF CAMINHA’S MAIN CHURCH

J. Amorim Faria, Civil Engineer, Ph.D., Assistant Professor
FEUP-DEC-SCC Portugal

(to be presented to the Seminar “Environmental, social, functional and loading conditions as main factors for the invention and development of characteristic timber structural systems”
Culture 2000 project – GREEK ACTION – Larnaca Attica 15th of May 2002)

Abstract

The rehabilitation process of Caminha’s main church, one of the Portuguese sites integrated on Culture 2000 project Wooden handwork/Wooden carpentry: European restoration sites is now going on. Included on the above mentioned works the planned intervention has previewed to solve some existing problems on the roofs of the church, namely the following: - new design for rain water conduction, because in this moment due to a inadequate conception the rain water in some places runs out on the interior walls and on the roof wood on the inside part of the outer lining which is damaging the building; - repairing of some wood elements of the roof structure.
It is the first opportunity to observe, photograph and study the wood structures of the roofs since the last big intervention that happened around 1935
REHABILITATION OF THE ROOFS
OF CAMINHA’S MAIN CHURCH

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1. GENERAL DESCRIPTION

Fig. 1 – Local plan
Fig. 2 – Plan
1. GENERAL DESCRIPTION (cont.)

Fig. 3 – General view (North-West)

Fig. 4 – General view (South-West)

Fig. 5 – View of the roofs (direction East)

Fig. 6 – East view – Rua Direita
1. GENERAL DESCRIPTION (cont.)

- Church built between 1488 and 1560

- Many XVIIIth Century Baroque Interventions

- 1930’s intervention in order to restore the building and give it the original image
2. THE INTERVENTION

- Global rehabilitation of roofs
  - Wood structures
  - New tiles
  - New details
  - Eventually new geometry
- Stabilisation of wall structures specially bell tower
- General analysis of foundations stability
- Rehabilitation of stained glass windows

2. THE INTERVENTION (cont.)

- New Architecture / Sacristy: Bathroom, water, …
- New floors on the bell tower
- New electrical system and lighting
- Ground floor water drainage
- Mortar joints treatment and granite walls rock treatment
- Definition of a future observation plan
2. THE INTERVENTION (cont.)

Fig. 9 – View of the actual situation of the works

3. WOOD STRUCTURES

<table>
<thead>
<tr>
<th>ROOFS</th>
<th>FLOORS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main Chapel</td>
<td>Bell Tower (2 levels – first</td>
</tr>
<tr>
<td>2 Lateral Chapels</td>
<td>third level is actually</td>
</tr>
<tr>
<td>Chapel of the Sailors (“Capela</td>
<td>concrete)</td>
</tr>
<tr>
<td>Mareantes”)</td>
<td>First Floor - Sacristy</td>
</tr>
<tr>
<td>Sacristy</td>
<td>STAIRS</td>
</tr>
<tr>
<td>Bell Tower</td>
<td>Sacristy – 1 stair</td>
</tr>
<tr>
<td>Main Aisle</td>
<td>Bell Tower – 5 stairs</td>
</tr>
<tr>
<td>2 Lateral Aisles</td>
<td></td>
</tr>
</tbody>
</table>
4. DECORATED ROOFS AND FLOORS

- Main Aisle – Arab Style XVI\textsuperscript{th} Century – Very Valuable (only 5 examples in Portugal)

- 2 Lateral Aisles – Mixed XVI\textsuperscript{th} – XX\textsuperscript{th} – To restore carefully

- Sacristy Ground Floor Ceiling

- Sacristy 1\textsuperscript{st} Floor Ceiling – Slightly Decorated

5. ACTUAL SITUATION

- Many biological degradation problems due to humidity
  - Termites in the Sacristy, Bell Tower and Sailors Chapel
  - Fungi and Beetles all over except main aisle

- 1930’s intervention: concrete bracings very bad for wood (no ventilation)
6. PHOTOS OF ACTUAL SITUATION (Detail)

Fig. 10 – Sacristy Roof

Fig. 11 – Sacristy Roof – Concrete Bracing

Fig. 12 – Sacristy Roof - Detail

Fig. 13 – Sacristy Roof - From Below
6. PHOTOS OF ACTUAL SITUATION (Detail)

Fig. 14 – Sacristy Roof -
Slightly decorated sheeting

Fig. 15 – Lateral Aisle – Wood structure (general view)

Fig. 16 – Lateral Aisle – Wood structure – Detail (rotten wood board)

Fig. 17 – Lateral Aisle – Wood structure
6. PHOTOS OF ACTUAL SITUATION (Detail)

Fig. 18 – Lateral Aisle – Seen from bellow

Fig. 19 – Lateral Aisle

Fig. 20 – Sacristy ground floor ceiling

Fig. 21 – Sacristy granite ground floor coverings – termites "highways"
6. PHOTOS OF ACTUAL SITUATION (Detail)

Fig. 22 – Sacristy first floor

Fig. 23 – Main Aisle

Fig. 24 – Main Aisle – Hole on summit

Fig. 25 – Main Aisle – Actual situation near main wall of the Church
6. PHOTOS OF ACTUAL SITUATION (Detail)

Fig. 26 – Sailors Chapel - Detail

Fig. 27 – Sailors Chapel - Detail

7. QUESTIONS – PHILOSOPHY OF INTERVENTION

- Level of intervention – cost – what is the best solution?
- Rehabilitation: How many years before next intervention?
- What is the correct solution for the Architectural Patrimony:
  - Original design?
  - How to deal with Baroque Interventions (XVIII\textsuperscript{th} / XIX\textsuperscript{th} Century)?
  - Lighting?
  - Modernity (bathrooms, electricity, computers, air conditioning)?
8. MAIN GENERAL PROBLEMS TO SOLVE ON CAMINHA'S MAIN CHURCH (that affect wood structures)

◆ Roof covering detail
◆ Structural stabilisation of the Bell Tower (Steel?, Wood?, Rain water entering on the upper level – Architecture)
◆ Rain Water – New solution (Technical – Architecture – Detailing = ?)
◆ Roof Ventilation
◆ Humidity on the ground floor
◆ Interior lighting (Natural – Artificial)

9. PROPOSAL OF INTERVENTION

◆ 6 Roofs – 4 Chapels, Sacristy and Bell Tower
  ◆ New roof covering detail – more efficient
    – Architect
  ◆ If possible (additional cost for alternative solution), demolish concrete bracings
  ◆ Restore wood parts with the same design, eventually change slope for efficiency purposes (standards)
9. PROPOSAL OF INTERVENTION (cont.)

- Lateral Aisles – 2 roofs
  - Remove all roof covering parts (done)
  - Remove locally wood beams where there are problems with supports; problems with nails – control type of nails – better if easy to remove – use screws?
  - Define preservation treatment / Decoration (Colour? Uniformity old-new?)
  - New solution that guarantees wood ventilation and rain water infiltrations control
  - Substitution of wood structural parts only when absolutely necessary (decoration is affected)

9. PROPOSAL OF INTERVENTION (cont.)

- Main Aisle
  - Remove all roof covering parts in order to permit preservation treatment and inspection of wood structure
  - Ventilation
  - New roof covering detail (ventilation, rain water tightness)
  - Analyse steel bracings (corrosion, existing treatment, connections with granite arches)
  - Analyse other steel parts
9. PROPOSAL OF INTERVENTION (cont.)

- Bell Tower Floors and Stairs/Granite Walls
  - More difficult problem still to solve
  - Last floor solution = ?
  - Bracing/Stabilisation of foundations and walls may interfere with the future solution to choose for rehabilitation (what type of floors – stairs ?)
  - Intention of improving tourist visits conditions is also interfering with the decision – not taken in this moment

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10. CONCLUSION

- In Architectural patrimony, rehabilitation final decisions can only be taken during construction phase
- This situation leads sometimes to money problems with contractors
- The budget must include good definition of observation, protection and safety scaffolding
- Wood structures rehabilitation must follow the rule: preserve always all valuable existing decoration, control demolitions, decisions (treatment/substitution) for at least a new life of 50 years, if possible 100 years