REPORT FROM TEMTIS TEACHING SEMINAR

20.6.2008, PRAGUE, Czech Republic

Preamble

The fourth seminar and the second teaching seminar organized in the framework of the TEMTIS project took place in Prague on 20.6.2008. It was organized by the Czech Technical University in Prague, Faculty of Civil Engineering.
The speakers at the seminar were representatives of project partner institutions who were responsible for preparation of some of the chapters in Handbook 1 and some of the case studies. The seminar was organized for full-time students and Ph.D. students of Civil engineering at CTU in Prague specializing in timber structures.
The aim of the seminar was to demonstrate the products to a selected local audience and to test the materials prepared within the project.

Program of the seminar

The Teaching seminar
Date: June, 20.2008
Meeting place: Czech Technical University in Prague, Faculty of Civil Engineering, Thákurova 7, Prague 6, meeting room B161

9:00 Opening of the seminar

9:15 – 10:15 Presentations of chapters from Handbook 1 and case studies
9:15 – 9:35 Antonín Lokaj – Chapter 9 – Ultimate Limit State – Structural Members
Antonín Lokaj – Case study no. 9 – Sports Hall Český Těšín
9:35 – 9:55 Manfred Augustin – Chapter 6 – Wood Based Panels
9:55 – 10:15 Petr Kuklík – Chapter 17 – Fire Resistance of Timber Structures
Petr Kuklík – Case study no. 4 – Pedestrian Bridge Rádlo
Case study no. 11 – Flisa Road Bridge

10:15 – 10:45 Coffee break

10:45 – 12:05 Presentations of chapters from Handbook 1 and case studies
10:45 – 11:05 Anders Søvsø Hansen – Chapter 14 – Bracing of Timber Buildings
Anders Søvsø Hansen – Case study no. 6 – Production Building
11:05 – 11:25 Kolbein Bell – Chapter 5 – Glued Laminated Timber

Kolbein Bell – Chapter 15 – Timber Bridges
11:25 – 11:45 Andrzej Marynowicz – Chapter 16 – Durability of Timber Structures
Andrzej Marynowicz – Case study no. 12 – Wooden Church
11:45 – 12:05 Matjaž Tajnik – Chapter 11 – Planar Timber Structures

12:05 – 12:20 Discussion

12:20 Closure of the seminar

12:30 – 13:30 Lunch in the university restaurant

Abstracts

Abstracts of the speakers' presentations concerning Handbook 1 follow.

1. **Chapter no. 9** — Ultimate Limit State – Structural Members by Antonín Lokaj
The aim of this chapter is to explain the assessment of timber members that are exposed to basic stresses (tension, compression, shear, bending, and torsion) and their combinations.

2. **Chapter no. 6** – Wood Based Panels by Manfred Augustin
Wood and timber have been utilized since the dawn of time in its natural, bar-like, shape as round wooden logs or as a sawn product, typically with a rectangular cross-section. For many purposes wood products are needed as enclosing or sheeting material, for load-carrying elements in shear-walls or as heat-and noise insulating material. Naturally, this can be done with, e.g., boards or other sawn products, however, this is mostly uneconomical. There are, furthermore, other disadvantages with bar-like wooden members like the distinctive anisotropic behaviour when subjected to loads and moisture changes (shrinkage/swelling).

This chapter will give an introduction into so-called "Engineered Wood Products (EWP)", describe an order system for them and give insight into the main representatives that comprise them. Further, this chapter is dedicated in particular to giving information about the product "Cross Laminated Timber (CLT)", which will probably, in the near future, become the most important product for massive timber constructions for residential and multi-storey buildings.

3. **Chapter no. 17** – Fire Resistance of Timber Structures by Petr Kuklík
There is no simple way of expressing the behaviour of a material with respect to fire. There are two distinct phases to a fire, the developing phase and the fully developed phase and material performance has to be categorised in respect of those two conditions. The developing phase incorporates a number of separate phenomena, the combustibility of the material, the ease of ignition, the speed of the spread of fire/flame across its surface and the rate at which heat is released.
The fully developed phase represents the post flash over conditions where all combustible materials become involved in the fire. The desirable properties are the ability to continue to carry load to contain the fire within the zone of origin without the

escape of flames or hot gases and without conducting excessive heat to the unexposed face that may lead indirectly to fire being transmitted to adjacent areas. The ability to resist the fully developed fire is known universally as the fire resistance, but in general terms this can only relate to an element of construction rather than to a material. The performance of even a simple element such as a column or a beam is dependent upon such factors as the end conditions and the magnitude and distribution of any loading.

4. **Chapter no. 14** – Bracing of Timber Buildings by Anders Søvsø Hansen
Structural systems must be designed to transfer external loads caused by wind, accidental and seismic loads, braking forces from cranes, etc., to the foundations
The systems may also be able to balance internal forces caused by deviations of the main structural elements from their intended positions. Examples are fixing of members out of plumb or fixing of elements in compression.
There are reports from many countries, where severe problems with mistakes in the bracing of buildings have been observed. It is important that the designer has an overview of and can account for the transfer of forces from the points where the loads are applied and down to the foundation.
This chapter will concentrate on systems for simple buildings. In the literature like Timber Construction Manual [1], more detailed descriptions are given of different ways to brace timber buildings.
In practice, the principal check of the bracing in buildings with rectangular plans are often divided in 1) transverse loads and 2) longitudinal loads, but it is important to know that there are forces in both directions at the same time.

5. **Chapter no. 5** – Glued Laminated Timber by Kolbein Bell
Structural glued-laminated timber or glulam is one of the oldest engineered wood products and is still very competitive in modern construction. Glulam is made up of wood boards which are glued together, so that they form a beam cross-section of the shape desired.
Glued constructions have been used for centuries, but the breakthrough of glulam occurred at the beginning of the 20th century by a German called Otto Hetzer. In 1906 he obtained the patent on his invention of curved, glued wood components, made up of several laminates, which are assembled under pressure and joined insolvable. Therewith, Hetzer had developed a unique technique, whereby the natural dimensions of wood could be overcome and durable constructions built.
Up to the beginning of the sixties, production was rather small, but since then it has increased continually, mainly due to the improvements in manufacturing techniques and adhesives, which have led and still lead to a better exploitation of this natural material.

6. **Chapter no. 15** - Timber Bridges by Kolbein Bell
The last two decades have seen a growing interest in timber bridges in many European countries. There are several reasons for this. The growing interest in environmental questions and sustainability has definitely paved the road for more frequent use of structural timber, but also a new and innovative use of timber, such as the stress laminated timber deck and better connections, have played an important role. The fact that reinforced concrete did not turn out to be an everlasting

material - many countries have experienced serious problems with concrete bridges built in the 1960's and 70's - is another factor. Last but not least, the enthusiasm of individuals should also be acknowledged.
We start this brief account with a short historical review before we review the most common types and sizes of timber bridges. Then we move on to the main structural systems, for both the support structure and the bridge deck. Connections and details are very important for the success of timber bridges, perhaps more than for other types of timber structures. In general, dynamic excitation is not considered a serious problem for most timber bridges, but some aspects need to be addressed. We also include some notes on erection and economy of timber bridges. The most crucial challenge for a timber bridge is perhaps the question of longevity, which brings in protection and durability as major concerns.
We round off the account with some comments on the Nordic Timber Bridge Project which has proved to be of vital importance for the revival of timber bridges in the north of Europe.

7. **Chapter no. 16** - Durability of Timber Structures by Andrzej Marynowicz
We can define the durability of timber as its resistance to physical, chemical and biological destructive conditions. The measure of durability is the time period during which it keeps its usability properties in normal exploitation conditions. Durability is different for various kinds of timber, but in general does not depend on its density but on the presence of some components that are damaging, such as fungi and insects. This is the main reason why sapwood timber is always vulnerable to biological decomposition, while heartwood timber is much more durable.

8. **Chapter no. 11** - Planar Timber Structures by Matjaž Tajnik
This chapter concentrates on timber (wood) most common structures like trusses, frames and arches. Timber trusses have some specialties in the construction technology and design procedures in comparison to that of frames and arches. For this reason, the Chapter is divided into three main sections:
- timber trusses,
- timber frames and arches, and
- design criteria for these structures.

The presented case studies are currently available at the private part of the project website. After evaluation they will be made available for all interested at the public part of the project website together with remaining case studies and Instruction handbook.

Text of the questionnaire

The questionnaire consists of 7 questions, where 5 questions are closed questions with answers Yes or No and 2 questions are open questions.
1) Did you like the presentations?
2) Do you think the presentations were presented professionally?
3) Which presentation impressed you the most?
4) Do you think the presentations are suitable for teaching?

5) Were you satisfied with the overall course of the seminar?
6) Would you take part in similar seminars in the future?
7) What topics for future seminars would attract you the most?

Evaluation of the questionnaires

At the seminar there were altogether 41 participants, of which: 23 were students, 17 TEMTIS project partners and speakers. There was also a foreign guest from Barcelona. 14 students filled in the questionnaire and passed them to P5 for evaluation. Representatives of TEMTIS partners' institutions did not fill the questionnaire.

The results are as follows:

1) Enjoyed presentations – All answered YES. No comments.
2) Professional presentations – All answered YES. There was a comment – It is possible to see that the lecturers are experienced!
3) The most impressive presentations - Timber bridges, Fire resistance, Glued laminated structures.
4) Presentations suitable for teaching – All answered YES. There was a comment – The presentations can be used for developing the knowledge in timber engineering.
5) Satisfaction with the seminar – All answered YES. No comments.
6) All students would like to take part in similar seminar in the future.
7) Proposed topics for future seminars - Residential houses. Post and beam structures. Superstructures. Special joints.

Summarizing evaluation of the seminar

The teaching seminar in Prague was the second teaching seminar in the TEMTIS project. The seminar was the place for test teaching using materials elaborated within the project. The seminar has positive evaluation – both from the view of students and lecturers (project partners).
The presentations were well prepared and clearly presented to the audience.
The indicator of a minimum number of participants (20) was fulfilled, the satisfaction (50%) as well.
The photo documentation of the seminar is available at the private part of the project website and will be included in the CD for Final report.

The report was compiled by Marcela Zahnasova (P1).