

# Student Reports

## Objectives

These reports are intended to give students an opportunity to explore some aspect of wood structures in more detail than is possible in the context of the lecture series. They are intentionally arranged to give sufficient latitude for the student to choose topics or areas of wood technology which will be of more particular interest to themselves. Through the class presentations, the other students are also given an opportunity to gain insight into different topics of interest in wood structures.

## Options

Three options are suggested as types of studies that would be appropriate for the reports. These three are:

1. Case studies
2. Physical testing
3. Computer analysis

Other options are possible with approval from the instructor. Each group should gain approval from the instructor for a particular topic to avoid duplication.

## Requirements

The studies may be performed in groups of 2 or 3 or individually. The expected product of the studies will depend on the size of the group.

1. One member            class presentation
2. Two members        presentation + (model or poster)
3. Three members      presentation + model + poster

Presentation visuals (e.g. Powerpoint or model) are due with presentation. Posters are due at the end of the term.

## Student Evaluation

Each student will also be required to fill out an evaluation for each presentation attended. Criteria for the evaluation will be:

1. Quality of work
2. Quality of presentation
3. Quality of additional visuals (e.g. models)
4. Relevance to topic (with regards to course)
5. Value to the class

# Case Study

## Option 1

### Description

This option allows a detailed inspection of either an existing wood structure, material system or architect/engineer. Structure is to be studied on the level of complete systems as well as individual details. Subjects are to be chosen for their interest in terms of both structure and aesthetic, but with relevance to wood material.

### Goals

- To become familiar with different wood structural systems
- To explore significant examples of wood applied in architecture
- To document the exploration and present it to the class

### Procedure

- Form a group of 2 to 3 members
- Choose a subject for the case study. Suggestions are attached.
- Get your choice approved (to avoid duplicates)
- Research the subject.
- Prepare a short 10 to 15 minute presentation, which explains the structural significance of the subject. This would most likely be a short power-point presentation.
- The presentation can also include a physical model that illustrates either the system or some detail.
- Prepare a poster that summarizes the presentation – ca. three 11x17 sheets.

Both presentation and poster should have well illustrated graphic studies of form and structure that explain the architectural and structural concepts, and tectonic features of the building or project.

Graphic studies should include a general understanding of the layout of the building, computer modeling, physical models, and other diagrams that explain the structure. The model can depict an important detail, structural concept, or entire system.

Considerations might include: structural system, construction details, finishes, transportation, erection, connections, weather proofing, location, economy, etc. and how these factors affect the choice of wood as a material and the structural system used.

## Case Study Suggestions List

### Materials

LVL application  
Living structures  
CLT (KLH)  
Concrete Composite

SIP  
Bamboo  
Rustic Logs

Glulam  
Plywood  
Fiber Composite

### Systems

Half-Timber Frame  
Lever beams  
Light frame  
Grid Shells  
Box-beams

Post-Frame  
Timber Bridges  
Stress Skin  
Geodesic  
Reciprocal Structure

Tensegrity  
Truss work  
Tree (branching) structure  
Lamella

### Architects/Engineers

Frei Otto  
Ernst Giselbrecht  
Blue sky architecture  
Fielden Clegg Architects  
Klaus Linkwitz  
Thompson and Rose  
Shimizu Arch. & Eng.  
Simon Velez

Alvar Aalto  
Fielden Clegg  
Claus Mattheck  
Jahan Nyren  
Patkau Architects  
Nikken Sekkei  
Kajima Design (Izumo)  
Andrea Frangi

Shigeru Ban  
Hotson Bakker  
E. Fay Jones  
Jourda and Parraudin  
Renzo Piano Building Workshop  
Takao Doi (Silk Road Expo '88)  
Green & Green  
Peter Zumthor

### Projects

SunnyHills, Japan  
Kizhi Pogost Church  
Horyu Temple, Japan  
ATLAS-I, New Mexico

Tamedia Office Building  
Tillamook Air Museum  
Metropol Parasol, Seville  
Solemar Bad Dürkheim

Superior Dome in Marquette  
Community Church of Knarvik  
Wood Innovation Center, Canada  
Great Eastern Temple, Japan

#### Grid Shells:

Savill Gardens

Weald & Downland

Mannheim Multihall

#### High Rise Wood Systems:

Forté, Australia

Murray Grove, London

Treet, Norway

# STAAD-Pro Analysis

## Option 2

### Description

This option involves the analysis of a more complex wood structural system. Systems which are beyond the scope of hand analysis can be better understood through computer analysis coupled with graphic post-processing that makes force flow and deflection modes more visible.

### Goals

- To become familiar with different wood structural systems
- To gain further expertise in FEA
- To better understand the behavior of wood structural system
- To document the exploration and present it to the class

### Procedure

- Form a group of 2 to 3 members
- Choose a subject for the analysis study. Suggestions are attached.
- Get your choice approved (to avoid duplicates)
- Model the system in STAAD under various loads.
- Prepare a short 10 to 15 minute presentation, which explains the structural significance of the subject. This would most likely be a short power-point presentation.
- The presentation could also include a physical model that illustrates either the system or some detail.
- Prepare a poster that summarizes the presentation. One to three 11x17 sheets.

Both presentation and poster should have well illustrated graphic studies of form and structure that explain the structural concepts and analysis details.

Graphic studies should include still and animated images from the post-processing results. The model should illustrate the system or detail being analyzed.

### Example Topics

half-timber frame	post-frame	Glulam frame
pole-frame (space truss)	bridges	panel structure
grid shells	lamella	tree (branching) structure
box-beams	strut & cable	lever beam
folded plate	surface shell	other CLT

# Physical Testing

## Option 3

### Description

This option involves the physical testing of some smaller component or detail. Full size elements or details are developed and tested for stiffness and strength.

### Goals

- To become familiar with the behavior of wood elements under load
- To gain expertise in physical testing
- To better understand the behavior of wood structural system
- To document the exploration and present it to the class

### Procedure

- Form a group of 2 to 3 members
- Choose a subject for the test. Suggestions are attached.
- Get your choice approved (to avoid duplicates)
- Construct or procure a test sample of the element you wish to test.
- Develop a test plan, and test the piece.
- Record load and strain data. Make a video of the test.
- Prepare a short 10 to 15 minute presentation, which explains the structural significance of the subject. This would most likely be a short power-point presentation.
- The presentation should also include the physical piece that was tested.
- Prepare a poster that summarizes the presentation. Use 1 to 3 11x17 sheets.

Both presentation and poster should have well illustrated graphic studies of test that explain the structural concepts and results. Graphic studies should include still and video (in presentation) images from the test.

### Example Topics

#### Material

Glulam  
SIP

LVL  
Stress Skin

species tests in Fc, Ft, E  
I-Joists

#### Details

gang nail  
split ring shear  
flexure joint

mortise and tendon  
bolt bearing  
shear panel

nailing  
tension joints

#### System (model form or partial elements)

truss  
box beam

shell  
composite

plates  
nail laminated plates or columns