PREPARATORY TASKS – WORKSHOP 2

ELABORATION OF TIMBER-SPECIFIC TOPICS (FACT SHEETS)

Task formulation:

The preparation for the second intensive course in Cracow includes the elaboration of 18 timber-specific topics regarding timber technologies, structural systems and building physics. Two students from different nationalities and disciplines (architecture, civil engineering and building site management) work together on one question and answer it in max. two pages (inclusive glossary, text, tables, and graphics). These students are considered "experts" on the topic during the workshop in Cracow and support the groups by solving topic related problems in the elaboration of the main assignment.

The analysis of the timber-specific topics should be submitted before the beginning of the intensive course. The students will receive the answers to all questions at least one week before the course, so they will have time to prepare theoretically for the workshop.

Components of the analysis (topics):

1. **Vertical load transfer - spans and systems for timber construction**

Planning aspects in relation to structural grid, primary/secondary structure and load transfer across floors, influence on degree of prefabrication. Differences in different constructions and explanation of advantages/disadvantages about load-bearing behaviour.

2. **Horizontal load transfer - bracing in timber construction**

Planning aspects regarding bracing concepts, load transfer within the storey (roof/ceiling and wall) and across the storeys (internal, external and partition walls) into the building ground. Differences in different constructions and explanation of advantages/disadvantages about load-bearing behaviour.

3. **Sound insulation vs. load transfer**

Principle solutions for the node connection of wall and ceiling components, considering influencing factors on the part of architecture and statics, special features of timber construction / differences to solid construction.

4. **Cantilevers**

From e.g., balconies / loggias to living space. Overview of structural systems, cross-references about waterproofing and thermal separation, and problems with cantilevered building components (e.g., staggered storey).

5. **Roof systems**

Options for roof systems: pitched (steep) roof / flat pitched roof / flat roof. Cross-references about building physics (warm roof vs. cold roof/ventilated constructions).

6. **Ceiling systems**

Possibilities of ceiling systems (e.g., bar-shaped, or flat components, mixed forms) and bracing of the same. Differences in single span/multi span beam systems. Consideration

of the vibration issue of wood ceilings, also in relation to wet/dry screed.

7. Wall systems

Possibilities of wall systems (e.g., bar-shaped, or flat components, mixed forms) and bracing of the same. Economic size for prefabricated elements / modules. Limits for standard systems and possibilities for special constructions (e.g., room height, span, etc.) if not built with standard elements.

8. Airborne sound insulation of partition walls in timber construction

Basic component systematics, solid timber construction / timber frame construction, facing shells / multi-shell constructions.

9. Impact sound insulation of partition ceilings in timber construction

Basic component systematics, bar-shaped or flat components, mixed forms

10. Decoupling possibilities in timber construction

Separation joints and their formation, decoupling materials, types of decoupled bearing (point, line, etc.) and their effect on the quality of decoupling. How to achieve the best decoupling / how hard must a bearing be (compressive strength vs. elasticity), dimensioning of decoupling materials. Design options for decoupling fasteners in timber construction.

11. Constructive solutions for the reduction of indirect (flank) transmission

Structural measures to avoid indirect (flank) transmission, influence of the measures on architecture and structural design. Description of flank paths; qualitative evaluation in comparison with the quality of separating components.

12. Summer suitability in timber construction

Elaboration of the decisive parameters about summer suitability (storage mass, solar inputs, ...) and their influence on the characteristic thermal development of the room air temperature in timber construction. Thermal balance of a room on a summer day

13. Moisture protection and air tightness in timber construction

Moisture transport by diffusion and convection. Basic concepts of components (superstructure) systems for fault-tolerant constructions regarding tightness, moisture protection and thermal insulation in solid wood construction and timber frame construction. Use of vapor barriers in wood construction.

14. Constructive moisture protection in timber construction

Overview of the decisive areas (plinth, facade, wet rooms, connection points, etc.) and the decisive parameters about constructive moisture protection.

15. Timber building system – systematization.

Variant study of construction systems - products, details + advantages/disadvantages, technical consequences.

16. Hybrid structures

Systems that combines different materials and structural solutions. The choice may be made for architectural, structural, environmental or economic reasons, or because of local construction practices or code requirements (the use of steel and concrete with engineered timber)

17. Prefabrication

The prefabrication of wood-based composite materials - large structural elements and components. Levels of prefabrication, advantages and disadvantages of prefabrication, the transportation issues, types of prefabricated elements (linear, planar, boxes).

18. Facades

Types of facades (loadbearing, self supporting, non loadbearing), cladding materials, proper order of layers, kinds of membranes and insulations

Type of assessment: group work (2 students per topic, international teams)

Number of hours: 20h

Learning Outcome: Through the elaboration of the topics the participants should acquire the necessary knowledge needed for the assignments during the second intensive course in Cracow (focus: construction systems and building physics).

Applied during: O4 intensive course in Cracow, Poland (Mai 2022, Host University: CUT)