

Three-dimensional lightweight grid load-bearing structures and their relationship with architecture

The project will investigate the potential of three-dimensional lightweight grid load-bearing structures and their relationship with architecture. Three-dimensional load-bearing structures have a spatial implication and as such are space-forming and space-generating. They also have a powerful aesthetical implication as they define the spatial form of a building. As such they have an influence on the overall architectural expression. Due to achieved shell action, structurally, three-dimensional structures typically offer a more efficient structural solution and the potential of material saving. Depending on the materials used there is a potential for demountability and re-use. The load-bearing capacity of these structures is dependent to a great degree on the geometrical definition as well as the possibility of optimizing the spatial configuration. It is therefore important to investigate the relationships between form, form variation, efficiency, as well as applicability and aesthetics.

Main Aim

The main aim of the project is to investigate the architectural potential of three-dimensional grid lightweight load-bearing structures. The following main aspects will be considered:

Architectural:

- What is the architectural potential for achieving a new architectural language
- Building types – permanent buildings, temporary structures, way of using the spaces
- Materiality and expression

Engineering/ technical

- Influence of the geometrical definition on the structural performance
- Structural and material optimization
- Materiality and structural performance
- Connections

Methodology

The project will apply a combination of qualitative and quantitative research methods. The research will be carried out by use of physical modeling, parametric studies, structural analysis software as well analysis of cases studies.

PhD supervision

Professor Olga Popovic Larsen will supervise the candidate. She has to date supervised 10 PhD candidates, all of whom have been successful in their research projects. The fields that she has been supervising cover Architectural Technology topics, Advanced structures in Architecture and fields that bridge Architecture and Structural Engineering.