

A new partnership between engineers and architects

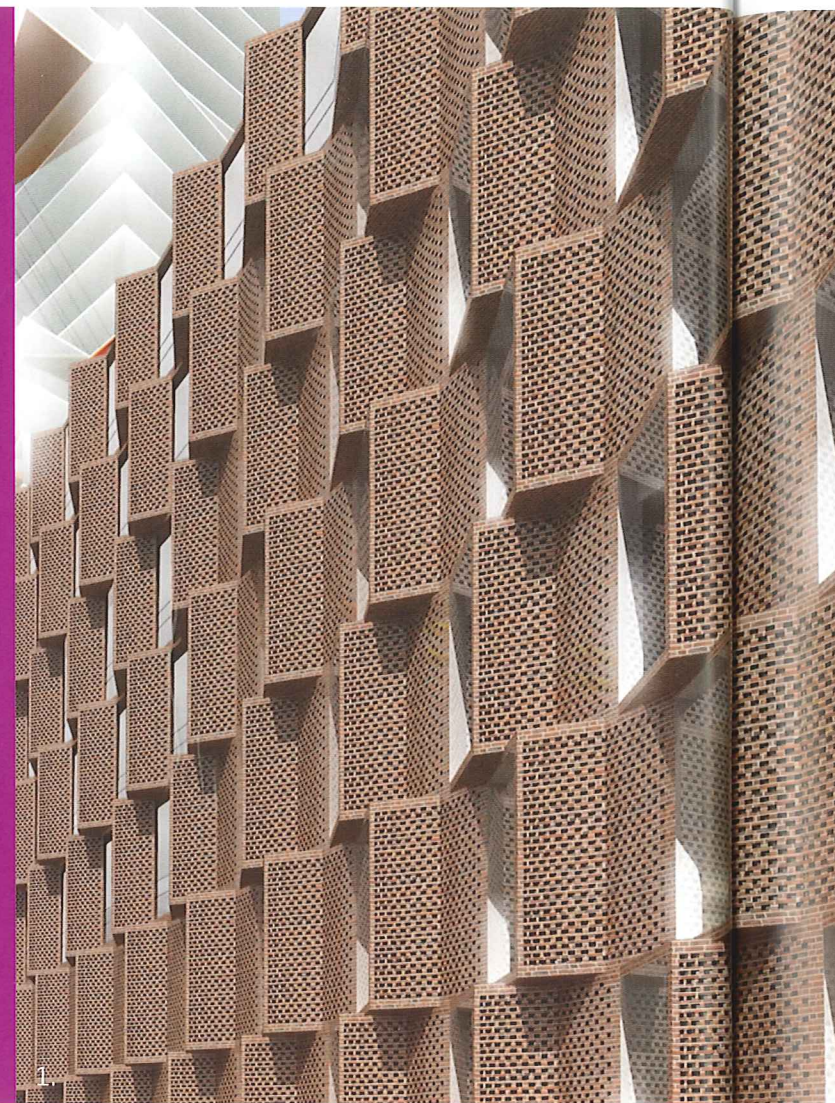
A collaboration between DTU Civil Engineering and Henning Larsen Architects aims at investigating the possibilities and effects of implementing technical knowledge in the early sketching process in order to design energy efficient, functional and aesthetically beautiful buildings and cities.



PhD student Jakob Strømmand-Andersen
Section for Building Physics and Services
jasta@byg.dtu.dk

PhD student Martin Vraa Nielsen
Section for Building Physics and Service
mavni@byg.dtu.dk

PhD student Michael Jørgensen
Section for Building Physics and Services
mijo@byg.dtu.dk

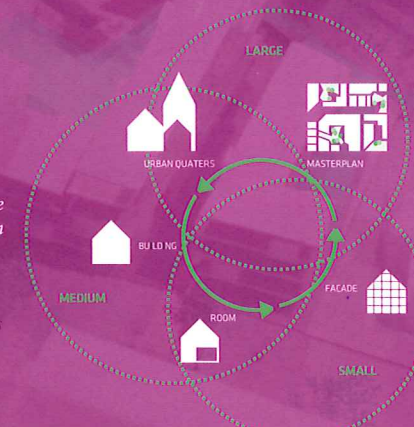


1. The proposal for the extension of FIH-bank headquarters shows a façade that has been designed with respect to minimizing direct sunlight impacts on the thermal and visual environment in the building, without limiting the view of the surroundings. This results in optimal daylight conditions plus good indoor thermal environment and since no external screening is needed, a reduction in maintenance costs.

2. In proposal for the new school in Ørestaden the façade is optimized with respect to strict demands for both functionality, energy and indoor environment. The division of windows with regards to view and especially daylight, minimizes the over-all glass area which in combination with a number of other initiatives, results in a building that meets the demands for class 1 in terms of both low-energy-building and indoor environment.

3. The proposal for the new urban area Västra Dockan in Malmö operates with a holistic and technical scientific vision for the urban spaces and buildings. This results in unique possibilities for the outdoor comfort level and energy reductions, because the effects from, for example; shade from surrounding buildings can be taken into account, as the impact of wind and daylight conditions from the varying urban landscape designs is considered.

Integrated design works across scales. The understanding that the façade, the building and the masterplan are closely tied provides the basis for Integrated Energy Design (IED) and means that a variety of parameters are considered throughout the design process."



How shall we design our future cities and buildings so that they become both energy efficient, functional and at the same time aesthetically beautiful? This question is three new PhD projects at DTU Civil Engineering trying to answer through studies of the way we design and organize our surroundings. The projects started in fall of 2008.

The projects are sponsored by the foundation Realdania and carried out in collaboration with Henning Larsen Architects. In their motivation Realdania writes: The present projects have a good possibility of becoming the spearhead for how the collaboration between the two trade groups (architects and engineers, red.) can evolve. It will also contribute to a softening of the rigid professional demarcations – which will benefit the building of a sustainable environment."

The projects revolve around the same hypothesis: it is possible to qualify the basis of decisions when designing future cities and buildings through technical scientific sustainability analyses. All projects have energy efficient buildings as a focal point, but try to determine the potential within three different scales.

Scale

The underlying basis is a realization of the close relationship between urban planning, the building and the façade that, not only require technical knowledge, but also a new design process.

Large scale - integrated Energy Design in Urban Planning. Jakob Strømmand-Andersen does research in the design of future

urban plans and their influence on the buildings energy consumption. So far focus has been pointed at the optimization of the individual building and its systems, their operation and maintenance. However, the design of the individual building and its contextual placement should always be a result of the urban geometry. By considering the building as an isolated unit, the interaction between the surroundings and the buildings energy performance is neglected.

The study is morphological and every considered parameter is related to the urban geometry. The project does not have a fully diagnostic goal. Furthermore the goal is not to supply exact measurements of the energy consumption at the urban level, but to set up comparable values that dynamically can be used in an integrated design process.

Medium scale - Integrated Energy Design of larger Buildings.

Michael Jørgensen does research in the design of future buildings with focus on the problematics that arise between building physics, climate, geometry, component and system solutions. The thesis is that if one is able to analyze and optimize the organization of rooms in regard to the energy consumption, one can improve the basis of decision for the building geometry and thereby contribute to the development of a new type of architecture where the spatiality itself is optimized in relation to low energy consumption. The goal is that the method and the model should function as an "intelligent" tool to aid the creative process through a basis of dynamic analyses at the early stages of the design process.

Small scale - Integrated Energy Design of the Building Envelope.

Martin Vraa Nielsen does research in the design of future facades and their dynamic potential and subsequently their impact on the buildings overall energy consumption and indoor climate. The thesis is that a great potential exists in considering the dynamic possibilities of the façade through involvement of engineering knowledge. Thus will a greater degree of adjustment and adaptability result in a more optimal utilization of the present resources in form of daylight and solar energy.

A dynamic façade can furthermore, in collaboration with architects, become a source of development regarding aesthetics and design with technical knowledge as design facilitator. Thereby the purpose of the project becomes partly a clarification of the facades problematics and potential including the known solutions, partly an investigation of conventional design methods and their problem areas and subsequently suggestions for a solution.

A new Design Process

All three PhD studies deal with energy efficient buildings and have great focus on the process. Consequently a parameter such as Integrated Energy Design (IED) runs like a red thread throughout the research projects. It is done because of the realization that the preliminary design choices, such as the width of the streets and the orientation, geometry and the overall expression of the building have great effect on the overall energy consumption of the building. Parameters, which engineers rarely have an opportunity to

have an influence on the traditional design process because of their late involvement when a number of crucial decisions already have been made.

The concept behind IED is a closer cooperation between engineers and architects. Therefore the research is carried out in collaboration with Henning Larsen Architects, which gives an opportunity to investigate the possibilities and the effect of implementing technical knowledge already in the sketching process. Fundamentally the aim is to advocate a more rational approach, where design choices are analyzed technically in regard to energy consumption and indoor climate thus obtaining a more informed process so that the designer or architect makes the informed and "correct" decisions from the start.

Perspective

Joined, the projects therefore search to necessitate solutions, which can fulfil the increasing demands for energy efficiency and sustainability, which have also become very important parameters in architectural competitions. The close collaboration between engineers and architects is therefore essential in order to obtain a more open and rational process, which can meet the stricter demands of the future for low energy consumption and good indoor climate, without compromising the architecture.