

## **Personal Reflection**

The present document constitutes a reflection of the process and the methodology followed during my graduation thesis. The following aspects are discussed:

### **1| The relationship between research and design**

This research focuses on adaptive solar shading systems and explores adaptation mechanisms for east/west and south orientation, in terms of visual comfort. Various designs and adaptation mechanisms have been developed throughout the years, offering a wide range of alternatives. By analyzing and evaluating them, a data base was created which was used as a guide during the design process.

The methodology followed during the research part of the graduation thesis includes literature review on shading systems and the basic characteristics of daylight. To proceed with the analysis of study cases and the daylight simulations, essential was to get familiar with the terminology of daylight and the basic principles on how to control it. Ten academic and ten real projects were analyzed for inspiration and better understanding of the various shading principles. An initial evaluation and qualitative classification of their efficiency was performed as a first approach. Afterwards, computer-based simulations were conducted to obtain quantitative results in terms of efficiency.

The proposed design constitutes an adaptive solar shading system for both east/west and south oriented façades. Even though it is adaptive, it is designed to be fixed in place, without any movable parts. Its adaptation lies in the concept of transparency, as PDLC smart glass is used.

To conclude, research and design were totally interdependent during this graduation thesis.

### **2| The relationship between the theme of the graduation lab and the subject/case study chosen by the student within this framework (location/object)**

The sustainable design graduation studio is a part of the Building Technology master program. There are three possible orientations, the Façade, the Structural and the Climate design. All of them explore new innovative technologies. The present study is related to adaptive shading systems, focusing on indoor visual comfort. Thus, the main objectives are the Climate and the Façade design.

Adaptive shading systems are considered to be innovative components of the building envelope as they react to external stimuli, by transforming the building into a living structure. They adapt in order to perform as efficiently as possible, by providing optimum indoor climate conditions and energy saving. Both visual and thermal comfort can be calibrated through solar control, therefore energy consumption can be reduced.

The present project aims to introduce a fixed adaptive shading system, free of movement mechanisms, by making use of the existing technology of the PDLC smart glass. Its performance efficiency, its structure and the way of its installation are objects of this study. Hence, this graduation project explores the application and the performance of innovative technologies with a sustainable approach.

### **3| The relationship between the project and the wider social context**

Sustainability is becoming a crucial concept in everyday life. The connection between nature and the built environment is more than ever necessary, for the sake of a “green” way of living. Daylight is one of the most important aspects of nature which influences the built environment. Both thermal and visual comfort of indoor spaces are totally related to the incoming natural light.

This project focuses on the most efficient way of controlling daylight in terms of visual comfort. A successful daylight management results in reduction of artificial light needed and therefore reduction of electricity consumption. In addition, the impact of daylight in indoor thermal conditions is equally important. Heating and cooling loads can be by far limited during winter and summer time respectively only by controlling natural light which penetrates indoor space.

An adaptive shading system can trigger the interest of individuals in controlling and taking maximum advantage of nature. Adoption of such systems increases the environmental awareness and introduces sustainability as a way of life.

In addition, the proposed design highlights the importance of simplicity. Various designs have been developed during the last years, most of which are extraordinary and eye-catching. It is widely believed that anything extreme, big and complicated is smart and efficient as well. Reality, though, shows that such systems are usually too expensive to be structured and maintained. Hence, even though they have been designed in order to reduce energy consumption and improve indoor climate conditions, total expenses are not reduced. The proposed shading system is efficient in the most simple and delicate way. The transparency of the system is achieved by the smart glass technology, making it almost invisible when needed. Thus, this system is considered to be adaptive, as it changes its characteristics, even though it does not incorporate any movement mechanism. Because of that, both construction and maintenance costs are reduced.

Society has to think and act in a simple way. Robert Browning introduced the phrase “less is more” in one of his poems in 1855, which was then adopted by the architect Ludwig Mies van der Rohe in 1947. This phrase should find application in every aspect of life.