

Graduation Plan

Master of Science Architecture, Urbanism & Building Sciences



Graduation Plan: All tracks

Personal information	
Name	Tim Schouws
Student number	5244153

Studio		
Name / Theme	Energy & Climate Computational Design	
Main mentor	Dr. E. (Eleonora) Brembilla	Climate Design
Second mentor	Dr.ir.P. (Pirouz) Nourian	Design informatics
Argumentation of choice of the studio	I have followed the Climate Design course in Q3. This project was about the Co creation center and light related aspects. This project gave me interest in the subject of daylight in buildings and the studio climate design. Since Design informatics also piqued my interest, I have chosen this subject because the subject combines both studios.	

Graduation project	
Title of the graduation project	Measuring Daylight: The New European Standard and Green Building Certificates
Goal	
Location:	Amsterdam, Netherlands
Problem statement	Global warming will increase the risk of overheating in buildings. If one looks at the requirements of the new NEN standard for daylight in buildings (NEN 17037), they are extremely demanding. The requirements from the NEN 17037 are supporting making a facade entirely out of glass. In an urban environment, these requirements will be even more difficult to meet. If one looks at energy consumption, this will have a negative effect on the heating and cooling needs of the building. It will increase the total energy consumption of a building. The requirements for daylight are also higher than those of green certificates such as BREEAM. It is therefore questionable whether a new building can meet the new European requirements for daylight, but also broader green energy building certificates such as BREEAM & LEED.

Research questions	<p>Research Questions</p> <p>How does the European standard for daylight in buildings influence the energy performance in buildings and what influence does this have on the BREEAM and LEED certificates?</p> <p>Sub Questions</p> <ol style="list-style-type: none"> 1. What requirements does the new European standard set for daylighting in buildings? 2. What is the difference between the requirements of the European standard for daylight in buildings and the BREEAM and LEED requirements for daylight in buildings? 3. How does the European standard for daylight in buildings influence the energy performance in buildings and what influence does this have on the BREEAM and LEED certificates? 4. What requirements can be proposed in order to still be able to comply with the green certificates, but also to guarantee sufficient daylight in buildings?
Design assignment	<p>This research is intended to provide advice for architects and designers that can be used in the early stages of the design process. This makes it possible to find a good balance between sufficient daylight in buildings and the energy consumption of a sustainable building. Whereby one gains insight into the influence of choosing between Minimum, Medium and High described in the European standard on the feasibility of green certificates.</p>

Process

Method description

The thesis will consist of two parts. First, a literature review will be done on the European standard, Green Certificates and the current rules of the Dutch Building decree. The literature search will also consist of looking at studies who have already done some research on the new European standard. When the literature review is done, it will become clear what the European standard is about and what influence the standard will have on achieving green certificates. The parameters will be determined with the help of the literature review, which are related to an early design phase. The different variables are determined on the basis of literature information, requirements of green certificates, the building decree and other standards.

The second part of the thesis consists of a case study in which a project that achieved a high score in BREEAM is studied. It is checked whether this project also meets the recommendations mentioned in EN 17037.

With the help of Grasshopper and various plugins such as Honeybee and Ladybug, different options are formed. Daylight factor and energy consumption are calculated for the various options. They will be examined on the extent to which they comply with the standards and the green certificates. At the end, a set of recommendations is made for people who want to realize a sustainable building, but also want to have enough daylight in the building.

Literature and general practical preference

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Reflection

What is the relation between your graduation (project) topic, the studio topic (if applicable), your master track (A,U,BT,LA,MBE), and your master programme (MSc AUBS)?

The graduation topic is related to Energy & climate + Computational design as it investigates the relationship between daylight parameters and energy use using computational methods. As a result, it also has a relationship with the Building technology track & MSc AUBS, since it is looking at how a design can be realized in which a balance is sought between enough daylight and the energy consumption of the building.

1. What is the relevance of your graduation work in the larger social, professional and scientific framework.

Scientific relevance

Since the new NEN standard for daylight was only released in 2018, not too many studies have been done yet. The scientific relevance of this research consists of the fact that it complements the previous research done. Paule & Flourentzos (2019) reported that the objective set by the European standard is demanding. They show that the requirements can lead to an increase in the building energy consumption. With this research a conclusion can be drawn how much influence the European standard has on green certificates with respect to energy consumption. It can also be demonstrated how much stricter the European standard is compared to BREEAM & LEED requirements for daylight in buildings

In another paper by Paulet (2018) it is mentioned that sometimes the simplified approach is better and other times the dynamic approach gives a better outcome. With this research it is investigated if with different parameters an association between the outcomes can be found using the simplified approach and the dynamic approach.

Social relevance

This research serves as advice for people dealing with the new norm. In this study, an association between using the simplified and the dynamic approach is investigated with several parameters. If it turns out that there is an association, it can be used as an advice on which approach produces a better result and what influence this has on the building energy consumption. It can also be used to determine which recommendations should be used in the building code.