

Reflection paper

Playing with light | the intecture of daylight and sports



The intecture of daylight and sports

The relationship between daylight and sports hall designs in the Netherlands compared to other European countries, whereby the European Committee for Normalization is the guideline for sports lighting at European Level

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1. RELATIONSHIP BETWEEN RESEARCH AND DESIGN

The Architectural Engineering studio starts with defining your thematic fascination. This fascination is translated into a research, what later forms the base of the design project. For me, this fascination is related to my interest for daylight. Nowadays it is more desirable for daylight to be the prevalent form of lighting in most types of buildings. However, there has been concern about introducing daylight to sports halls since the design of traditional sports halls has tended to exclude natural light. The first half year of the graduation project was mainly focused towards researching the topic. In my case, finding ways or strategies which can be applied to optimize the use of daylight in the design of a sports complex. There are wide ranging issues associated with daylighting which need consideration, although during the research part I found strategies to provide useful and controllable daylight and shows alternatives for increasing the daylight in sports halls.

My research did influenced the design a lot. I think it has led to a different form of my design than I would initially design without doing an extensive research into daylight. The research results gave me some starting points for the design. For example, one of my results is that rounded shapes / curves helps in softening brightness contrasts. Usually, I am designing more in a rational way to make a logical, ordered design and I hardly ever design anything with round shapes or curves. Without my research I think that I would not have dared to take this shift, but because of the transition from research to the design it felt very logical.

The scheme below (see *Figure 1*) gives an overview of how I have divided my research to ensure that I could eventually obtain design principles from my research. In this way I could make the process from research to design more iterative. Moreover, it has helped me to make a clear architectural translation from research to design. To conclude, not only gave the research me the possibility to gain more knowledge about daylight and the integration with sport, it also directly influenced the concept and spatial aspects of my design.

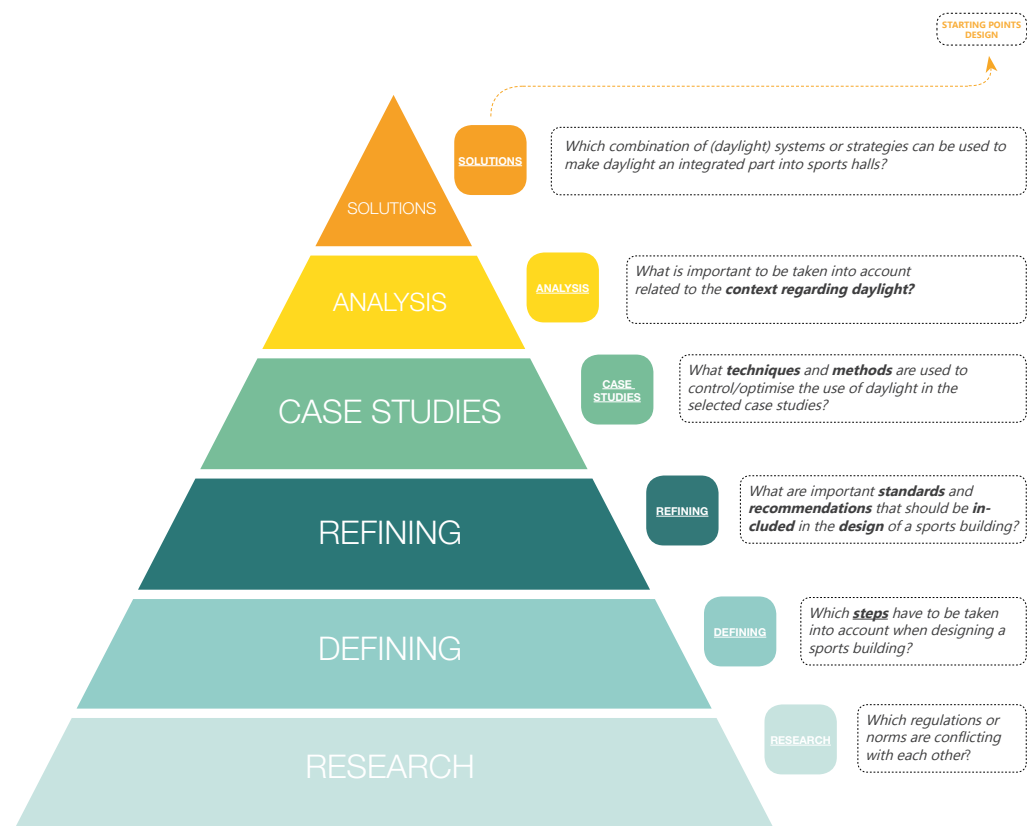


Figure 1. Approach from research towards the design of a sports complex (own image, 2017)

2. RELATIONSHIP BETWEEN GRADUATION TOPIC AND STUDIO + MASTER TRACK

The subject chosen was based on my special interest in daylight. My interest in daylight was enhanced since I have lived in Sweden and Denmark during my studies. The contrast of availability of light in Scandinavian countries have led to the design of buildings with sophisticated daylight concepts whereby daylight is integrated in an aesthetic way within the design. But also the scarce light in winter and the long summer days made me personally aware of how important light is for your own needs. Furthermore, in my previous student house we did not have windows in our living room and kitchen. I find it very remarkable that this is 'legally' allowed. Hence my interest in daylight and therefore I wanted to gain more knowledge about this during my graduation.

In the second week of the graduation studio we had to define our thematic fascination (1), program (2) and context (3). As can be seen in *Figure 2* my thematic fascination is light (1). To define my program I started thinking about what type of buildings within the built environment we can improve the use of light. In the design of traditional sports halls natural light is often excluded which led to my choice for sports as the program (2). If one looks at the vast majority of sports halls in the Netherlands where gymnastics is given at primary schools, the sports hall often totally relies on artificial lighting to provide a glare and shadow-free environment. This means that all the benefits of natural light have to be eliminated. However, the resulting designs are rarely compatible with attractive architecture and pleasing indoor environments. Therefore, I wanted to look at the integration of sport and daylight. Hence, my reason for choosing Architectural Engineering where the main focus is on the integration of architecture and engineering/technics. For improving our built environment by exploring the potential of inventions from more technical disciplines daylight can be better integrated into the design. For a good integration of daylight and sports it requires an architectural approach together with a technical method from the start of a design phase. Since sports is one of the main themes in the redevelopment of the Marine area, I have chosen the Marine area as my context (3).

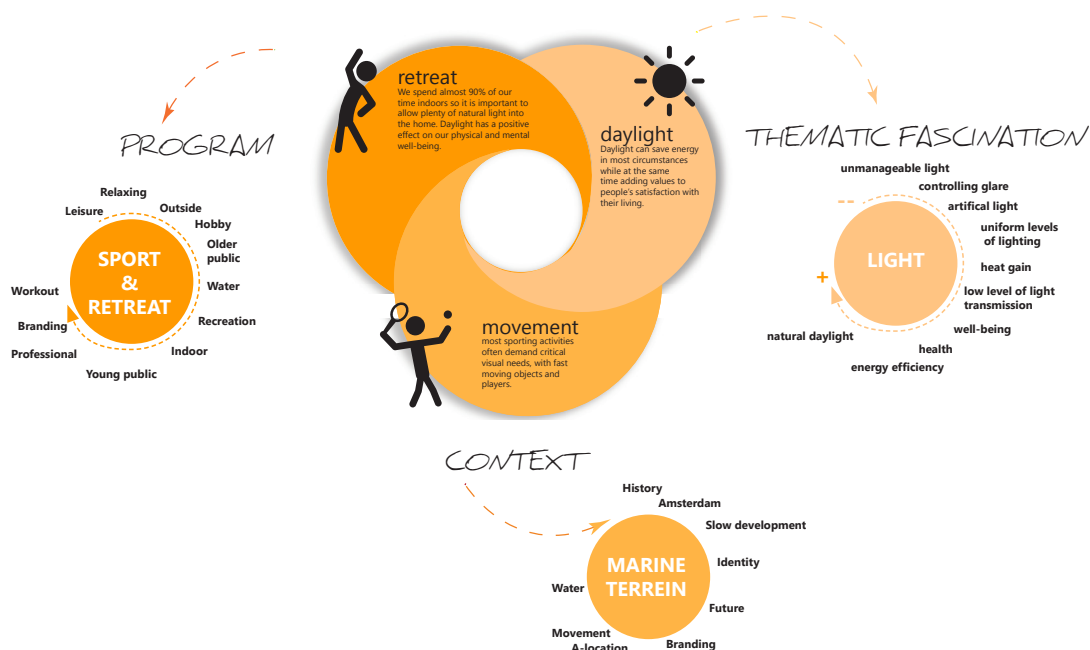


Figure 2. Approach from research towards the design of a sports complex (own image, 2017)

3. RESEARCH METHOD AND APPROACH IN RELATION TO STUDIO

The graduation studio 'Architectural Engineering' is divided into two parts: (1) the research; (2) the design. Personally, I would approach my design project comparable to this, although I tend to incorporate the 'design part' a little earlier than they do within the planning of the studio. However I enjoyed the intensive focus on the research in the first semester without too much consideration to design solutions. This gave me the opportunity to do an extensive literature study and also to gain more knowledge about the Dutch building regulations regarding daylight and sports buildings. Because I had divided my research method into six steps, I kept an overview of what I was working towards in every step. In this way, I was able to easily set up starting points for a design from my conclusions. (see *Figure 3*)

Personally, I was struggling with the connection of my design with the context. During the research the main (design) focus was to find daylight strategies which can be implemented to introduce more natural light into the design of a sports complex. However, the strategies which I got from my research do not have any direct link with my location. Firstly, because sports buildings are often turned inwards and have a less strong relationship to the outer context. Secondly, my focus was mainly on techniques of how light can be brought into a sports hall and strategies to provide useful and controllable daylight. With this my focus was mainly on the experience / feeling from the interiors of the building and less on the outside appearance. Eventually, after the P2 I think I found a decent balance between generic solutions and the specific context. Looking back I think I could have saved time by defining the project better before the design process started. I realised that the pre-design which resulted from my research did not fit well in the context. Hereafter I would start earlier with analysing the context, if possible parallel to the research part.

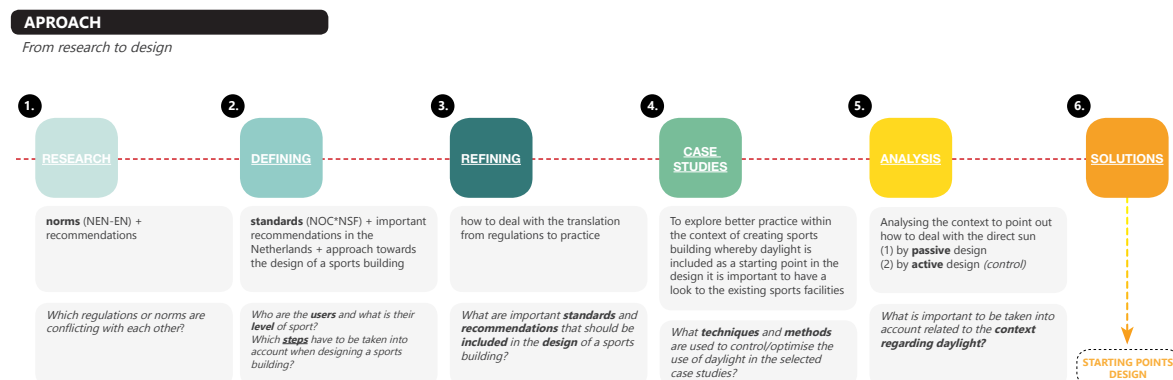


Figure 3. Approach from research towards the design of a sports complex (own image, 2017)

4. RELATIONSHIP BETWEEN THE PROJECT AND THE WIDER SOCIAL CONTEXT

In the recent years sustainability has been one of the leading trends in architecture. Moreover, we came back of not only using artificial light anymore. It is now more acceptable that daylight, when available, should be the prevalent form of lighting in most types of building. Since there are no specific daylight requirements in the Dutch building code for sports halls, windows become an excluded element from the sports hall design. Windows are normally considered as the potential glare source which may cause visual discomfort for users. However, with increased concern for users and environment, daylight, which is essential for humans beings health, is often introduced into different types of building to reduce lighting consumption and ensure architecture quality. If the daylight system is appropriately designed, it can minimize visual discomfort, improve the users experience and reduce the energy consumption. With my graduation project I would like to aim to change currently the way how a large part of our sport buildings in the Netherlands are designed without having natural light. Why are we doing that? It is convenience, tradition or costs? Or simply because changing regulations is not that simple as it may seem. The method and extent to which daylight is to be used must be considered from the very outset of building programming and design, and then as well for the design of a sports-related building, where daylight is often excluded from the beginning.

In conclusion, with my research I want show that for the design of sports halls we have to think about more creative approaches to the design of naturally lit and energy efficient sports hall designs which can be made widely obtainable. There are wide ranging issues associated with daylighting which need consideration, although the discussed strategies in my research shows ways to provide useful and controllable daylight and shows alternatives for increasing the daylight in sports halls.

5. DISCUSSION OF THE ETHICAL ISSUES DURING DOING THE RESEARCH

The NEN EN standard provides different requirements acquired from the European standards, where the NEN-EN 12193 describes the standards of lighting within sports-related buildings for each type of sport at three different levels. Consequently, for a recreational athlete, the requirements will be lower than for a top-level athlete. Nonetheless, the only term that appears is lighting and all the associated relevant technical light factors, although they are not further concentrated into a percentage required daylight. In short, no direct requirements have been drawn up in the NEN-EN for sports buildings with regard to daylight. Since there are no requirements regarding daylight this is often the direct cause in practice of the exclusion of windows in the design. However, regarding the users of a sports hall, is often only viewed from the perspective of a (top)athlete. While there are other users who also each have their own view on the use of daylight. For instance, a P.E. teacher who stands his entire working day in a gym probably has a different opinion about it. Work-related activities must comply with the rules laid down in the Working Conditions Act (Arbo). This legislation states that for employees who are working more than two hours a day in the same workplace, a daylight area of at least five percent of the floor surface should be met (Arbo, 2009). However, this is not a requirement, there are always exceptions when rules conflict. Nonetheless, this also applies here, given that the P.E. teacher practices a work-related activity. On the other hand, the top athlete wants to have good and reliably light so that he can practice his sport optimally. If the multidisciplinary sports accommodation is used for educational purposes, the previously mentioned, applicable health and safety legislation (Arbo) must be taken into account. This means, concerning a sport accommodation which is used for educational purposes, the same rule applies, a daylight area of at least five percent of the floor surface should be met. However, in practice it is often said that the application of daylight is not possible which leads usually to the use of artificial light since this is the easiest and most simple solution. Government-driven cost control forces municipalities and managers of sports facilities to make choices. Budgets are often under pressure, which can easily lead to loss of quality. I think because of this creative approaches will often be left out of consideration in the practical field.

While often one forgets that light has properties that cannot be simulated with artificial light. Daylight has exactly that light level and composition in which people feel most comfortable and can function the best. Even with the current technologies, artificial light cannot exactly simulate this. We spend almost 90% of our time indoors so it is important that the light level and the composition of the light indoors are also of sufficient quality and quantity. If people are insufficiently exposed to the 'appropriate light dose', their biorhythm can be disrupted and they may develop symptoms such as sleep disorders, depression and fatigue.

In today's society, the target group of sports buildings has expanded considerably and is currently a very diverse group of people. Many new groups are arising and municipalities want to contribute to social participation and integration on the basis of sport by connecting sports and exercise providers with other sectors such as care, welfare, childcare and education. More and more, older people are also doing sports. Given the aging of the Dutch population, the average age of athletes will probably rise even further. On the one hand, this sets higher lighting requirements, but on the other hand, and perhaps even more importantly with regard to the health and well-being of the users, is the matter of the integration of natural light. Hence, the integration of natural light is just as important as the application of energy-efficient quality lighting aimed at optimizing the use of light within sports facilities.

After my P3 I got the feedback to see if I wanted to lower my sports hall to the ground floor, to create a direct connection with the urban square at the front of my design. However, I had to eliminate my entire program on the ground floor (including martial arts, boxing, etc.). Because I use north-oriented shed roofs to bring light into my sports hall there was no possibility to put the program with the martial arts above my sports hall. By eliminating the entire martial arts program I had the idea that my design was going to be an too elitist building where only rich people come (yoga, pilates, swimming pool, sports hall). My teachers understood my point that I want to design a sports building in Amsterdam for a broader group of users. Therefore, I have kept the program with martial arts and reinforced the connection of the sports hall and the urban square in a different way (by applying a loggia).