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(Re)framing Daylight
A theoretical transformation of daylight approaches in adaptive reuse architecture

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Acknowledgments

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Abstract

Adaptive reuse architecture is a multi-layered concept that tackles history, materials, memories, and structural concerns since it handles reusing an existing building and adapting a new function. Highlighting and preserving the characteristics of the old structure or revealing its muddied elements are important considerations for this architecture through its different categories of adaptive reuse methods. In this notion, daylight becomes a critical element to indicate the architectural design thinking of the past and emphasize it with interventions. The thesis aims to explore the impact of daylight transformation on the interior in adaptive reuse architecture by evaluating the architectural intentions and interventions. It is an investigation through literature review, analysis of reference projects, a case study and an experiment for a real case project Ångdomen, a flexible study room at KTH Main Library.

Based on the theoretical investigation and the experiment conducted in the thesis, it is determined that daylight can be used as a tool to highlight the old building’s value in adaptive reuse projects through their transformations and impact the spatial perception. Most of the responses to the survey and the subjective observations conclude that daylight impacts spatial perception through the openings of architecture even when it doesn’t provide high brightness values.

Keywords: impact of daylight, historical values, openings, spatial perception, architectural form, reused architecture

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1. Introduction

People are affected by their environments (Pallasmaa, 1996). As urban populations grow, architecture and the built environment have an increasing impact on people’s well-being. We build more and more each year, and eventually, we obtain a dense urban environment which causes a lack of green space and open spaces. To solve this problem, it is essential to reuse buildings that the city already has. Instead of occupying an open space to create new, old buildings that are not functioning at the moment can be utilized to have a new function. In this case, adaptive reuse projects are important to give flexibility to the cities to utilise rehabilitation areas devoted to regenerating and conserving the built heritage or the urban environment, including the ecosystems. Adaptation and reuse are crucial to larger discussions concerning the urban environment’s sustainability (Broker et al., 2018). These projects are critical for reducing environmental impact through their construction process as well as their benefits to the circular economy that concerns maximising recycling and re-use. Likewise, as an integral part of the collective memory of cities, these projects have distinctive meaning for each generation from past to present.

When a building is reused and gets a new function, the most significant factor in the design is the relation between old and new. Brooker and Stone (2004) developed three categories of building reuse dependent on the extent of integration to determine this relationship. These categories are installation, insertion and intervention (Fischer-Gewirtzman, 2016). Bollack (2013) expanded this development as Insertion, Parasites, Wraps, Juxtapositions and Weavings (Fig. 1). As Rafailidis (2020) states, ‘over time, most spaces stray from their original programs and develop lives of their own.’ These projects have numerous aspects to concern thoughtfully since they have existed for a long period of time. As well as history, materials, memories, and structural aspects, lighting is an important layer to reveal the architectural design thinking of the past and emphasize it with interventions. Openings of architecture function as an intersection between daylight and this relation between old and new.

Reuse contains an earlier existing element, which is taken out of its previous context and it contributes to the creation of something distinct and novel in the present. This complex item can last as it contains an important element from the past and therefore constitutes continuity and contributes to the further establishment of tradition. As such, despite containing an element of the past, reuse looks forwards and not backwards. It does not represent an end but a new beginning’ (Hegewald & Mitra, 2012)

(Fig.04) Sketches for architectural transformation categories are based on Bollack (2013). According to Broker et al. (2004) Insertions are constructed within the boundaries of existing building. Parasites, Wraps and Weaving are under Intervention category which includes constructions that undergo major transformation. Juxtapositions are considered as Installations that the old and new buildings exist independently.
Based on the previous motivation about adaptive re-use projects, Bollack’s (2013) and Fisher-Gewirtzman (2016)’s strategies and evaluations for analysing transformation projects have been examined to find architectural-related attributes and investigate the evaluation of daylight approaches. Seemingly, architecture practice on adaptive re-use tends to elaborate mainly on the form, mass, and “old + new” design notion by touching on daylight characteristics in a superficial way. Conversely, in some of those cases, natural light becomes the main design idea to express this notion as it continues the eaves line and pattern of window openings; it might rely on certain formal qualities or it can choose to highlight an individual element of the history of a place (Cramer at al., 2007).

Daylight doesn’t necessarily need to be designed to give a complementary impression, but it can reveal the complexity and the value of the old-new relationship. In this direction, the thesis explores the transformation of daylight approaches in adaptive reuse projects by evaluating the architectural intentions and interventions. The investigation constitutes a theoretical background for a real case project that is the transformation of both daylighting and artificial lighting design in the quiet study/ conference/ gathering room, Ångdomen, in KTH Main Library according to new functional requirements regarding the usage of space. After gathering comprehensive information through the analysis of reference projects and KTH Main Library as a case study, the thesis aims to investigate the existing place’s potential to find daylighting scenarios and lighting qualities.

1.1 Relevance and Aim: Investigating daylight in adaptive re-use projects & Its connection with the future project

The interventions to the reused buildings change the effect of daylight on the interior. The effect is related to the transformation of the form or the addition to the interior according to the adaptive re-use category. Brooker et al. (2004) developed tactics for reading reused buildings by considering attributes of planes, light, surface, object, opening and movement. It is seen that in every transformed building, the ‘light’ characteristics are constantly changing (Fisher-Gewirtzman, 2016). However, what is the relation between those transformation projects and continuously available natural light? This master thesis is an investigation through analysis of reference projects, a case study and an experiment for the future project Ångdomen, and research that aims to find this relation in the impact of daylighting transformation on the interior by creating parameters for analysis.

The building of KTH Main Library is an adaptive reuse project and contains two different adaptation categories. That so, the case study provides the opportunity of conducting qualitative and quantitative analyses for two categories to compare the different daylight intakes and user evaluation; Ångdomen as ‘insertion’ and Main Hall as ‘Parasite’. After synthesizing the findings, design principles were proposed for Ångdomen’s new function for the real case project.

(Fig.05) Tactics of remodelling and physical attributes in Caixa Forum. (Fisher-Gewirtzman, 2016).
(Fig.06) The intersection between new and old: Daylight. In Adaptive Reuse, daylight comes into play in section plane.

1.2 Research Questions & Sustainability Statement

Main Question that refers to theoretical research and the project:

1. How can daylight be used as a tool to highlight the old building’s value in adaptive reuse projects through their transformations and impact the spatial perception?

Secondary Question:

2. How does the transformation of daylighting through skylights affect spatial perception and correlate with the new function’s scenarios?

Sustainability Statement

The complex principle of the “Adaptive re-use of the built heritage” basically shows that it is always possible to modify the functional and distributive use of the indoor environment of any historical building, even when it has a strong cultural, social and religious value, that, if achieved within a sustainable lighting project also for a “smart” renovation, can contribute to remarkable energy and economic results’ (Balocco et al., 2020). In this consideration, adaptive reuse in architecture and the project’s daylight proportion directly correlates with SDG 12. Because, sustainable consumption and production require doing more with less. As I mentioned in the introduction, it is also about disconnecting economic growth from environmental damage, enhancing resource efficiency, and encouraging environmentally-friendly lifestyles (United Nations). Additionally, the project’s main topic establishes relations with SDG 3 through its daylight approach. Natural light is essential for health and well-being because it synchronizes physiological processes to the environmental day-night cycle (Münch et al., 2017).

(Fig.07) Correlated Sustainable Development Goals: SDG 12 Responsible Consumption and Production and SDG 3 Good Health and Well-being

(Fig.08) (Re)framing Daylight
2. Methodology

2.1 Aim and Objectives

This thesis follows five phases to answer the research questions and aim to create design principles for daylighting approach to Ångdomen’s new function. The first phase is a literature review to obtain a deeper understanding of the study. The second phase is Matrix. In the Matrix section, reference projects are studied to comprehend adaptive reuse projects and their design processes to create an evaluation strategy for daylighting transformations in those buildings. Matrix is one of the main sections which aims to answer investigation questions by revealing those projects’ complexity. The third is Case Study that seeks to select a project that includes two different adaptive reuse categories in Stockholm. In this direction, KTH Library is selected to examine the daylight transformations and daylight intake by conducting qualitative and quantitative studies to compare both categories in Main Hall and Ångdomen rooms. The fourth is an experiment that takes place in the Ångdomen room using the skylights on the ceiling and two different daylighting scenarios. The experiment investigates the possibilities of creating perceptual differences in spatiality corresponding to the new function/scenarios. During the experiment, participants are interviewed to understand if they feel any changes in the room regarding the light quality. After the experiment, I conduct two surveys. Section 1 focuses on the perceptual differences in light qualities, spatiality and user preferences at Ångdomen. Section 2 evaluates the impact of daylight on highlighting architecture and arousing feelings in the Ångdomen. The equipment used in the experiment consists of a spectrometer to measure task horizontal plane illuminance and CCT of daylight for future implications and requirements, and the Fusion Optix app for the distribution of brightness in the visual field. Conducting luminance mapping aims to comply with the survey results and interviews for the skylights’ impact on spatial perception.

2.2 Limitations

The thesis contributes to a partial daylight proportion for a future project with theoretical background and investigation through an experiment. The basic idea is to propose a system for the project rather than an actual solution by only considering openings of the architecture and daylight. The investigation includes finding scenarios and lighting qualities of the project area by considering the specific time of the day and the particular sky condition. Therefore, the experiment takes place under conditions of the following: Artificial lighting is on, windows are not covered, investigated only in the morning, partially cloudy sky.
3. Literature Review

Daylight is one of the oldest design tools for architects. As architect Steffen Vogt emphasized at Velux Daylight Symposium held in 2019 Paris, natural daylight is a primary target of the design, and the ability of skylight and direct sunlight is a precondition for the experience of spaces and, therefore, a basis for the existence of architecture.

In their provocative ‘Cronocaos’ exhibition in 2011, Rem Koolhaas and Shohei Shigematsu argued about ‘a new kind of historical amnesia, one that, perversely, only further alienates us from the past’ (Ouroussoff, 2011). Has preservation become a dangerous epidemic? Is it destroying our cities? In line with Fisher-Gewirtzman (2004), Some 70% of today’s structures will still be standing in 50 years; thus, refurbishing and upgrading for present and future demands must become a priority in our current practices. As a result, the adaptive reuse technique could also be the most effective choice for dealing with historical structures. From this point of view, the notion of exploring the daylight strategies becomes essential for creating healthy environments in the old buildings that stand as sad memorials to a past era and a failed social order.

This chapter will discuss the basics of the case studies and the project: categories of adaptive reuse, daylighting through skylights, highlighting the value of the old building with daylight and the perceptual effect of daylight. The gathered information is a basis to build up criteria for observation and methods of the investigation and will be utilized for the project’s conceptual stage.

3.1 Adaptive Re-use Design Phases in Architecture and Categories

‘Adaptive reuse precedents have at least two phases of physical existence: The original design containing its original function; and The new structure, containing its new function, after the adaptive reuse process. This leads to three stages of formal inquiry: (1) Original building form (original stage); (2) Reshaped building form (final stage); and (3) The transformation from the original stage to the final stage in terms of tactics, strategy, and type of intervention.’ (Fisher-Gewirtzman, 2016). Bollack (2013) described five categories to read those buildings according to their types of interventions as follows:

- **Insertion:** The inserted component has its own identity; it creates its own universe, and the enjoyment of this new world is enhanced by the sensation of its connection to the old.

- **Parasite:** The architectural interventions in which the new element attaches itself to the side or top of the original building and becomes one with it, depending on the original structure.

- **Wrap:** The intervention creates a new mantle for the older building. The expansion may be spread on the above umbrella to protect a weak structure or it may envelop an older building.

- **Juxtaposition:** The addition is next to the existing building and does not engage in visible dialogue with it.

- **Weaving:** The new structure becomes inseparable from the old. The intervention is weaved in and out of the original building fabric.
3.2 Daylighting in Architecture through Skylights

When it comes to utilizing daylight and molding the form of architecture, openings in architecture have always been a matter of discussion. "Daylight offers many benefits in architecture. It provides for healthy environments, comfortable room temperature and illumination level, eases the performance of tasks, increases productivity, adds aesthetic quality, enhances the sense of spaciousness, and helps energy efficiency by reducing the demand for electrical lights and air-conditioning resulting in a reduction of overall emissions of atmospheric pollutants." (Demirbilek et al., 2009). As it is known, skylights admit more light than windows and distribute it uniformly in the space. By considering the new daylight controlling technologies, the skylights of the old buildings can be utilized for providing natural light to the interior and reducing energy consumption. Also, while explaining the daylighting approaches to historical buildings, Phillips (1997) states the extent of the reconstruction must depend upon how closely the original building corresponds to the functional requirements of the day.

3.3 Perceptual Impact of Daylight

Architects have long recognized the value of natural light in terms of its ability to create an atmosphere, reveal design, draw a choreography of geometry and light, provide texture to built volumes, or add dynamics to a space, in other words, to enhance the visual interest and provide emotional and experiential delight to the observer (Andersen, 2015). Our world is rendered in an infinite variety of visual permutations by light, exposing colours, textures, distances, and the passage of time. These and other aspects of light can evoke emotions and memories, contributing to the uniqueness of a location (Descottes, 2011). Again, according to Andersen (2015), the impression of daylight in architectural space is an undeniably significant part of visual performance that influences how that space is experienced. In addition, brightness can influence spatial perception; in this way, people may perceive differences in size that are not present in the actual space (Lindh, 2012).

(Fig.12) Daylight controlling with skylights in Pinacoteca do Estado, Eduardo Colonelli and Paulo Mendes da Rocha. Left: Skylights are not totally covered with diffuser elements and create a playful atmosphere with direct sunlight in the inner courtyard. Right: Skylights are covered with transparent diffuser material for diffused and controllable illumination in the gallery.

3.4 Highlighting the old building's value with daylight

Consideration of effective daylight strategies was critical in the twentieth century (Nyole, 2013). Indeed, Le Corbusier stated in 1989, "Architecture is the masterly, correct, and magnificent play of volumes brought together in light..." underlining that "...the history of architecture is the history of the struggle for light." "For centuries, daylight was the only efficient light available as a primary source of daylighting in buildings and the architecture of the day was dominated by the aspiration to span wide spaces and create openings large enough to distribute daylight to building interiors." (Phillips, 2004). Throughout the history of architecture, this was significant in that bright areas denoted special functions or events that occurred within the space (Nyole, 2013). As always with any modernisation or reconstruction of a historic building, it is visible that daylight affects the exterior appearance of the building as well as the interior, and in most cases, will impose its own discipline in terms of window patterns to external elevations (Phillips, 1997). It may be possible to provide for overhead daylight by glazing over otherwise solid areas to allow natural light to permeate some internal spaces. Still, in all cases, the spatial possibilities of the building will derive initially from daylight (Phillips, 1997). As Phillips (1997) states, the key to success in this field is maximizing the opportunities available to express the qualities of the original historic building while satisfying the functional needs of its new use.

"The structures passed down to us throughout history are those that survived and there’s little doubt that many would have failed. So it must have been with daylighting. The structural analogy is valid since the incorporation of openings or windows in the walls is implicit in the form of the building." (Phillips, 1997)

Adaptation category: Parasite

Old Function: Laboratory
New Function: Library

Adaptation category: Insertion

(KTH Library North Gallery)

(KTH Library Main Hall)
4. Matrix & Case Study

As mentioned in the introduction section, to evaluate the daylighting transformations of five categories of adaptive reuse projects, it is essential to comprehend the concept of reuse by studying the context, aim and method of these complex projects. In this direction, six videos, two books, and two research papers were analysed to select adaptive reuse projects to complement the literature review and investigate the spatial impact of the transformation. The big challenge in investigating adaptive reuse architecture and the transformation of daylighting is the necessity to consider both the original building with its original use and form, and the transformed building with its new use and new form. Therefore, throughout the evaluation process of precedents, the proposed analysing parameter is composed through subjective interpretation. In the first section of Matrix, eleven reused projects are evaluated subjectively, with one chosen to be analysed in detail for the second section. Finally, a complete analysis of observations and measurements is conducted on the KTH Main Library in Stockholm, redesigned by Per Ahlbom in 1999 and Ahlbom & Partners in 2016.

4.1 Reference Projects

This first section analyses five categories of adaptive reuse projects with distinctive features in exploring the daylight transformations considering the form of architecture and its openings. These projects have strong relations with values clarified in the literature review. The structure of this section starts with classifying the information collected about the projects and follows subjective interpretation by describing the observations and using sketches to reveal the potential impact of their daylighting transformations.

4.1.1 Classifying Reference Projects

Figure 14 presents the eleven projects that are part of this analysis. They are listed by name, location, architects of the adaptive reuse, original and new use, and year of original and new constructions. Each project is presented with representative pictures in a chart with its exterior and interior conditions to reveal the transformation of the architectural form. Based on the description of adaptive reuse categories in the Background section, Figure 15 sorts the projects into relevant types of insertion, parasite, wrap, juxtaposition and weavings, and states the architectural intentions of creating the new form. The process of categorising the precedents solely focuses on the form of architecture.

(Fig.14) List of precedents. The selected projects are function as public spaces.

(Fig.15) Reference Projects (Precedents).

The photos from exterior and interior to reveal the transformation of the form of architecture and effect of daylight. The photos regarding project’s old situations in Appendix 9.1.
4.1.2 Subjective Interpretation with precedents: Evaluation

Transformation of daylighting in reused buildings is evaluated by mapping the observations represented by sketches focused on each project’s intervention areas and openings, and descriptions of the architectural and daylight qualities. Detailed data is in Appendix 9.1.

Architectural evaluation includes the architect’s conceptual approaches, and daylight observations reflect the subjective evaluation of my impression about the projects by considering the highlighting aspect of daylight and transformed spatiality.

La Centrale Restaurant, Beirut 33°N
Architectural Evaluation
(Bernard Khoury, n.d.)

Value: Preserve the scarred walls
Aim: Carefully insert a new structure within an existing wall with openings matching those of the old building
Daylight Observations (Subjective)
The new horizontal elements filter the daylight through the windows showing signs of war and an inescapable past. So, the new daylight solution becomes a factor in highlighting the value of the old building. Visual connection with the outside remains the same; however, the effect of daylight changes due to the new cladding. This cause perceptual differences in the spatiality because the intervention creates a darker atmosphere than the old situation.

Champollion Museum, Figeac 46°N
Architectural Evaluation
(Bollack, 2013)

Value: Preserving the original structure
Aim: Insert a new building within the walls to create a museum by displaying the original structure and separating the new glass volume from the old masonry shell.
Daylight Observations (Subjective)
Inside, the effect of daylight filtered through hieroglyphic cutouts creates a dappled pattern of signs on the exhibits. Daylight control is constituted using the copper sheet on the new separated glass facade and creates a dark environment which is convenient for museum lighting. The remnants of window frames and hieroglyphic cutouts represent the old and enhance the past.

KTH Main Library, Stockholm 59°N
Architectural Evaluation
(AOP, n.d.)

Value: Preserving the old architecture and courtyard.
Aim: Creating a narrow entrance and library building between the two old angled building lengths. Enclosing the courtyard without losing its historical characteristics.
Daylight Observations (Subjective)
The new ceiling on top of the courtyard gives an impression of flying on the old brick walls. The delicacy of the intervention emphasizes the courtyard’s old spatiality and historical structure. Daylight enters through a new structure; however, the solution gives the feeling of being outside.

Sharp Centre for Design, Toronto 43°N
Architectural Evaluation
(Bollack, 2013)

Value: Access to the park through McCaul Street
Aim: Locating the building on stilts so that it is not built on the ground to create a new roof, it still causes a dark environment.
Daylight Observations (Subjective)
The roofs have lost their original purpose. This intervention causes the daylight impact on old structures. Since the new roof covers the earlier buildings, direct daylight cannot go into the interior spaces. Even though there are cloud shape cutouts in the new roof, it still causes a dark environment.

Contemporary Art Centre
Le Fresnoy National Studio for Contemporary Art, France 46°N
Architectural Evaluation
(Tschumi, n.d.)

Value: Protecting most affected parts - ‘the beautiful vaulted hall’
Aim: Developing a new model of a centre for artistic practice and public exhibition by sheltering the existing buildings’ roofs which are not in a good condition.
Daylight Observations (Subjective)
The geometric pattern of sunlight merges with the industrial building’s steel construction, in this way, light patterns highlight the sense of innovation. As Valentiny Hvp Architects explain, the screen-printed glass provides protection against the sun by reducing heating and glare in the open-plan space. Also, it creates natural, indirect and soft lighting for reading and working areas. The geometric pattern of sunlight merges with the industrial building’s steel construction, in this way, light patterns highlight the sense of innovation.

Luxembourg Learning Centre, Luxembourg 49°N
Architectural Evaluation
(Pintos, 2019)

Value: Preserving all traces of the building’s industrial past activity
Aim: Keeping the old structure and creating, in a rigid volume predefined by the industrial framework elements, an open and welcoming space in the spirit of a Learning Centre
Daylight Observations (Subjective)

The figure shows the sketches and descriptive evaluation of each project under the categories of Insertion, Parasite, Wrap, Juxtaposition and Weavings. In the sketches, red colour represents the new elements.
In Figure 16, reworked sketches reveal the relationship between old and new elements and the daylight effect in the interior. It shows how the opening of architecture frames the daylight according to each category of adaptive reuse and the influence of the built environment.

### 4.1.3 Synthesizing the observations to create analysis parameters

The subjective interpretation process of the precedents revealed some similarities that impact the daylight characteristics through the transformation of architecture. In this sense, the evaluation strategy “When?, Why?, How?” was created to detect the reasons for daylighting transformations (Fig.17). This analysis parameter was applied to the case study and the project.

#### Parameters that impact the interior through the transformation of daylighting

- **WHEN?**
  - Context
  - The method to accomplish the aim
  - Technologies of the old building
  - Architectural strategy (Concept & Structure)
  - Functional requirements for reuse

- **WHY?**
  - The Reason
  - Value of existing building
  - Aim of the new approach
  - Physical conditions of the old building
  - Conceptual approach
  - Project Brief

- **HOW?**
  - Old and new building’s architecture styles (Openings of architecture)
  - Daylight strategy

(Fig.17) Analyzing the design process of daylighting transformation in adaptive reuse projects through ‘When?, Why?, How?’ strategy.

### Pratt Institute, Higgins Hall, Brooklyn 40°N

**Architectural Evaluation**
(Steven Holl, n.d.)

- **Value:** Recognizing the wing’s architectural style and historical value
- **Aim:** The addition had to prove a functional internal connection between the wings after the demolition due to a fire in 1996.

**Daylight Observations**
(Subjective)

The skylights in the new form are placed accordingly to the height of the existing building. That way, working areas in the new building are lit by indirect and soft daylight. The new structure does not affect the perceived spatiality in the old building because the addition locates itself within the demolished volume.
4. Matrix & Case Study

4.2 Case Study

The thesis includes a theoretical background and spatial investigation for the real case project in the Ångdomen room in KTH Main Library in Stockholm, Sweden. This second section analyses the KTH Main Library project as a case study to conduct in-depth studies of observations and measurements. Based on its new function and historical value, this project is exposed to many users during the day. At the same time, it contains two different adaptive reuse categories that enable daylight evaluation through the building; Main Hall as parasite and Ångdomen as insertion.

4.2.1 Historical context and the need for a change of use (Parameters: When?, Why?)

The laboratory building transformed into the main library and was built for practical research and engineering in 1917 by Erik Lallerstedt. There was a water tower in the southern part, and the room in the middle of two angled buildings was a large steam room, Ångdomen, which functioned both as KTH’s heating centre and laboratory for research and development. In addition, there was an open triangular courtyard, Laboratoriegården, which was in contact with the large Borggården. In 1950, Laboratoriegården was rebuilt with a hall building (now demolished) for water research. When Per Ahrbom designed the reuse project, this intervention became one of the architectural concerns because the value of the courtyard and its beautiful connection with Borggården disappeared (AOP, n.d.).

When KTH’s main library at Valhallavägen became too small and outdated for the large scale activities, a renovation and extension were conducted to fulfill all the requirements for a modern library and a central meeting place. During the last fifteen years, using the digitised book increased and led to a reduction in books and bookshelves that existed in the library. In 2014, Per Ahrbom designed new study places, conference rooms and social interaction areas (AOP, n.d.).

1917 - Laboratory building designed by Erik Lallerstedt
1935 - Listed as a historical monument
2002 - Transformed into a library by architect Per Ahrbom
2014 - New furnishing for the library’s new needs and ceiling renovation by adding skylights to Ångdomen by Ahrbom & Partner

![KTH Library. Left: Courtyard before transformation. Middle: Main hall (courtyard) after transformation in 2002 (fin.) and 2014 (furnishing). Right: Ångdomen after transformation in 2014.](Fig.18)

![Reflections of historical fabric on the new glass facade of KTH Main Library.](Fig.19)
4.2.2 Architectural and Daylight Analysis (Parameters: How?)

(Fig.20) Ångdomen and Main Hall are studied as respectively insertion and parasite adaptive reuse categories. The ground floor plan is based on Ahrbom and Partner’s (2014) original drawings. Photographs: Miray Altındiş, 2022

(Fig.21) KTH Library site plan and daylight sun chart (Sunearthtools, 2022). The satellite view of the site is adapted over the site plan (Google Earth, 2022).

(Fig.22) Daylight solution of the library for Ångdomen and Main Hall. Currently, skylights in Ångdomen are covered with blackout for controlling daylight and in Main Hall librarians control the facade blinds. Photographs: Miray Altındiş, 2022.
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(Fig. 23) Synthesizing the architectural elements and function of old and new. The further investigation of elements of the adaptive reuse architecture according to my observations of the building and the historical projects in Stockholm (Fig. 24).

(Fig. 24) Stockholm Central Station by Adolf W. Edelvärd. Photograph: Lennart Petersens, 1933. Original construction 1871- Railway hall, Restoration in 1921- Waiting Hall.

(Fig. 25) KTH Main Library's Angleden (left) and North Gallery (right) after the transformation by Per Ahlborn in 2002. Original structure designed by Erik Lallerstedt as laboratory in 1917. Photographs: Miray Altındiş, 2022.
4.2.3 Personal observations of daylight qualities, perceived spatiality and architecture

Fig. 26 and 27 show a sequence of being in darker and brighter spaces in the building. During the journey from the entrance through the main hall to Ångdomen, perceived brightness and spatiality change from dark to bright and low to high, and the same sequence repeats.

4.2.4 Results of Measurement

The results show that the light qualities provide high values of illuminance in Main Hall and lower values in Ångdomen. Also, the journey in the building starts with low illuminance levels at the entrance, continues to significantly high levels at the main hall to the darkest area and ends in Ångdomen at a low illuminance level (Fig.29). On the other hand, the luminance study reveals the impact of materials on the visual field’s brightness distribution. The places that have dark coloured materials include low values of luminance (Fig.30).
5. Experiment & Survey

The experiment’s survey and measurements directly relate to the design principles since they are conducted in the Ångdomen room. To comply with the client’s brief on reusing the existing covered skylights and evaluate the impact of daylighting on spatiality and architecture, the experiment includes two scenes using different rows of skylights on the ceiling. It is only conducted under daylight conditions of a partly cloudy sky in the morning. (The preparation process is in Appendix 9.3)

5.1 Results of Interviews

During the experiment, 5 participants working in the Ångdomen answered the questions for two scenes. The interview is conducted at 9:30 during scene 1 and at 10:15 during scene 2 on the 29th of April 2022. The 5 participants (two females and three males) were between 25 to 45. During the interviews (appendix 9.3), all participants reported they didn’t recognise until I asked them that we were uncovering and covering the skylights above them, and both scenes are natural light.

'Scene 1 feels open up the place.'
'Scene 1 feels brighter, take all those blackouts off.'
'Scene 2 feels lower and the black strip in the middle is compressive.'
'Scene 1 directs your vision to the wall.'

5.2 Measurements of Scenes

Fig. 33 shows Scene 1 only affects the middle part of the room by increasing the illuminance and CCT levels. For example, at Point A, lux levels increased from 599 lx to 995 lx. In Point C, CCT levels rose from 3042K to 3800K. Moreover, Scene 2 increased the lux and CCT levels at the corners of the room. However, it also affected the middle part to a smaller extent than Scene 1.

(Fig.33) Spectrometer measurements are conducted from 09:30am to 11:20am on the 29th of April in the partially cloudy sky condition. During the measurement the artificial lighting was on. Measurement grid are indicated on the Ångdomen’s ground floor and mezzanine floor plans. Detailed data in Appendix 9.3.
5.3 Sections of Survey

First Section:

Twenty-two responses are recorded in the first section evaluating two sets of scenes from two different viewpoints. Survey 1 collects the data on perceived light qualities, spatial perception and user preferences (see appendix 9.4).

Second Section:

In the second section, twenty-three responses are recorded, evaluating three sets of scenes from the experiment and the current situation in the Ångdomen room. Finally, survey 2 collects the data on the impact of daylight on highlighting architecture and arousing feelings and additional comments (see appendix 9.4).

5.4 Results of Surveys

The survey includes two sections, as explained in the methodology. The results are generated automatically through a digital survey engine. The survey data is documented in detail in the Appendix 9.3. The analytical graphs are prepared manually.

First Section - Survey 1 Perceptual Impact of Light Coming From Ceiling

(Fig.35) Exploration of the perceptual impact comparison in Scene 1 and 2 from Viewpoint 1

(Fig.36) Exploration of the perceptual impact comparison in Scene 1 and 2 from Viewpoint 2

Second Section - Survey 2 Highlighting Aspect of Daylight

In the second section, 565 participants evaluated scene 1 as highlighting the qualities and values of architecture the most. Both Scene 1 and scene 2 were evaluated as giving a slightly positive effect; however, scene 1’s evaluation as very positive was higher than scene 2’s values. Detailed data is in appendix 9.4.
6. Design Principles

As a part of the thesis, the daylighting proportion of a real case project focuses on proposing a system adapted for present-day needs rather than a real solution. The project uses current architectural elements and aims to preserve the value of the old building while transforming the daylighting through its openings. As a synthesis of the background, case study, and the experiment's survey, the design principles tackle the idea of combining spatial perception, architectural intentions, and planned scenarios for Ångdomen.

6.1 The vision

Machines mainly occupied the place before the reuse project. The transformation not only consists of architectural form and function but also relates to the user because it is used by people now. The old building’s daylight strategies were efficient for people working around the machines during the day. After the reuse, daylight was tried to be controlled. However, it failed in the Ångdomen room because of the need for new functions. That’s why client ‘Akademiska Hus’ wants a controllable daylighting system for this room. They want this area to be transformed into a gathering/presentation/event/black box room when needed. On an everyday basis, Ångdomen will serve as a silent study room.

6.2 Scenarios of functions and supportive daylighting qualities

**SCENARIO 1 - Study**

Daylight Strategy

Interviews showed participants on the mezzanine floor prefer to work there because they feel close to daylight. Also, in Survey 1, participants evaluated Scene 2 from viewpoint two as more pleasant to study. In both scenes, illuminance levels increases but don’t cause inadequate lux levels.

**Daylight Strategy**

Interviews and survey results showed participants perceived the space as higher in Scene 1 and perceived their vision to the wall. Illuminance levels also showed the brightness in the middle part of the room. Therefore, the speaker scenario only uses Scene 1 of the skylight experiment.

**SCENARIO 2 - Panel discussion/Speaker session**

Daylight Strategy

Direct vision to the speaker

**Daylight Strategy**

One of the client’s briefs was to create a black box space for presentations which uses projections on the white wall in the middle. Therefore, for this scenario, all the skylights have to be covered with a blackout blinds system.

**SCENARIO 3 - Gathering**

Daylight Strategy

Using Skylights

**Daylight Strategy**

Interviews and survey results showed that participants perceived the space as higher in Scene 1 and wider in Scene 2. Consequently, the gathering scenario combines both scenes of the skylight experiment to create a perceptually expanded space.

**SCENARIO 4 - Presentation (Black-out)**

Daylight Strategy

**Daylight Strategy**

One of the client’s briefs was to create a black box space for presentations which uses projections on the white wall in the middle. Therefore, for this scenario, all the skylights have to be covered with a blackout blinds system.

(Fig.37) Attributes that effect the process of the project's design principles

(Fig.38) Section showing perceived brightness and spatiality in the KTH Library according to the interventions of the concept.

(Fig.39) Daylight strategy collages for each scenario according to their skylight scenes. Daylight strategy text explains the reasons to combine the experiment’s scenes with Ångdomen’s future functions.
7. Discussion

Due to the procedure of methodology consisting of a literature review, a matrix of reference projects, a case study and an experiment that leads to the design proposal, this chapter discusses three main topics to connect the dots of similarities and possibilities that impact daylighting transformations. Also, it correlates with the main research question by touching on the impact of daylight to highlight the values of the old building and spatial perception. The structure continues to discuss the design principles for Angdomen, the conclusion and future implications.

7.1 Critically commenting on Matrix in relation to the impact of daylight through openings of adaptive reuse architecture

As mentioned in the literature review and the results of the 4.1 matrix, the interventions for reusing an existing building are analyzed in five categories as insertion, parasite, wrap, juxtaposition and weaving (Bollack, 2013). The results of 4.1.2 confirm that architecture criticism tends to elaborate on the form, mass, and the relation of new and old while explaining the ‘aim’ and ‘values’ of the reusing approaches. The daylight observation of the ‘Le Fresnoy National Studio for Contemporary Art’ project reveals this notion critically (Fig. 16). The new volume dominates the existing mass and wraps it. The impact of daylighting probably changed to a large extent but the priority of the aim for the architect was architectural intentions rather than daylight. As a consequence of the subjective interpretation presented in Fig. 16, the evaluation of daylight as a contributing element shows that ‘insertion’ and ‘wrap’ categories significantly change the daylight impact depending on the force of work that comes from their concept. The observation shows the ‘insertions’ create a new environment within an older structure and ‘wraps’ encapsulate the older in an all-around enclosure. In this way, the alliance between old and new fits the notion of ‘historical amnesia’ demonstrated in the 3.1, which criticizes preservation projects that cause a losing sense of the identity of the old buildings that have accumulated over time. That’s why in the design principles of the thesis, it is important to preserve its appearance while using its potential. It also relates to the results of the survey’s second section presented in the 5.3, sections of the survey. The majority of the participants evaluated scene 1 as having the most highlighting impact on architecture, and also, they perceived this scene as giving the most positive feeling. A possible explanation for these results might relate to Descottes (2011) and Andersen (2015) elaborating on the aspect of daylight evoking emotions and providing experiential delight to the observer.

The other important aspects while highlighting the old building’s values are perceived spatiality and light qualities. The case study shows that the transformation of the KTH Library project preserved the spatiality and light qualities with its new form and daylight strategy. The results in 4.2.3 show that enclosed outdoor space still gives the feeling of being outside while being inside, and with the effect of daylight, this feeling becomes stronger. A comparison of these findings with the result of measurements demonstrated in 4.2.4 reflects the similarities between personal observation and measurements.

7.2 Daylighting to highlight the old building’s value in adaptive reuse

The case study investigation presented in 4.2 shows unanticipated findings that both the first architecture in 1917 and the reused project in 2002 contain distinct valuable characteristics. The first structure has value as a listed building with its form called ‘Byxbenet’ (trouser legs), its facade and courtyard, and the reuse project with its new contemporary form and the created complementary dialogue with the old. Most notably, the reuse project’s ceiling interventions and the preserved spatial aspects become the value of the transformation project. The findings in Fig. 23 and 24 reflect that the ceiling is a continuum of the city in which the building is located. We can trace the connection between the KTH Main Library’s transformation project reused in 2002 and Stockholm Central Station, originally constructed in 1871. It is possible that Per Ahborn was influenced by the historical environment of the city while proposing a daylight solution for a new function. It is encouraging to compare this finding with the notion of ‘historical amnesia’ demonstrated in the 3.1, which criticizes preservation projects that cause a losing sense of the identity of the old buildings that have accumulated over time. That’s why in the design principles of the thesis, it is important to preserve its appearance while using its potential. It also relates to the results of the survey’s second section presented in the 5.3, sections of the survey. The majority of the participants evaluated scene 1 as having the most highlighting impact on architecture, and also, they perceived this scene as giving the most positive feeling. A possible explanation for these results might relate to Descottes (2011) and Andersen (2015) elaborating on the aspect of daylight evoking emotions and providing experiential delight to the observer.

The first section of the survey provides adequate data to investigate the impact of daylight on perceived spatiality and on enhancing the architectural elements. Participants evaluated the depth and width of the room by comparing two scenes presented in 5.3. The results show that when skylights in the middle row are used, people perceive it as higher, and when only the side rows are used, people perceive it as wider. Also, these results are in line with the interviews conducted during the experiment. These findings broadly support the literature stating that brightness may influence the perception of the size that is not present in the actual space (Lindh, 2012). In contrast, the evaluations of perceived brightness are inadequate. Because participants’ comments indicate that the impact of artificial lighting in the room is dominant to judge perceived light levels, however, the interviews in the Angdomen show that people felt the difference in perceived light levels and could evaluate it.

(Fig.40) The impact of urban environment considering daylight characteristics in the interior.
7.4 Creating design principles for Angdomen

As a synthesis of each stage of the thesis, the design principles reveal the spatial potentials that can be created through daylight approaches to comply with the new scenarios of the function. This reflects the statement of Phillips (1997), who explains the relation between the original building and new functional requirements. The conducted experiment for the project may corroborate with the literature that states the importance of designing the daylighting should be based on observations and a form of experimentation upon which an empirical theory would have been built (Phillips, 1997). It plays an integral part in combining the daylighting strategy with each scenario. As people evaluated the spatiality of scene 1 as higher and scene 2 as wider in the survey section 1, the presentation scenario uses Scene 1 to draw attention to the front wall and create a central light distribution. Also, the gathering scenario combines scenes 1 and 2 to make people perceive the room as higher and wider.

7.5 Conclusion and future implications

Based on the theoretical investigation and the experiment conducted in the thesis, it is concluded that daylight can be used as a tool to highlight the old building’s value in adaptive reuse projects through their transformations and impact the spatial perception.

Even from the relatively short list of adaptive reuse buildings presented, the variety of reuse projects is rich and diverse in terms of the original uses of transformed buildings and their various new uses. The concept of adaptive reuse is directly associated with the sustainability consideration by reusing the resources and providing healthy environments. The evaluation process shows that to investigate daylight transformation, the form of architecture, ‘values of old’ and ‘aims for the new’ are crucial aspects of the impact of daylight in the interior. As a synthesis, the created analysis parameter reveals the enormous complexity of reused buildings by evaluating their context, values, aim and solutions. When these parameters are considered, the aim of the design proposal corresponds to its context and maximizes the opportunities available to express the qualities of the original historic building while fulfilling the functional needs of its new use. Additionally, the experiment shows the user preferences to evaluate the impact of daylight transformations on spatial perception, the value of architecture and its evoking feeling. Most of the responses to the survey and the subjective observations conclude that daylight has an impact on spatial perception through the openings of architecture even when it doesn’t provide high values of brightness.

The thesis contributes to theoretical research about adaptive reuse projects and a real case project. The subjective interpretation process of reference projects can future investigate the daylight intake by conducting calculations for this particular concept of architecture. It would also be interesting to further the investigation by taking into account the movement in architecture to be able to evaluate the original building’s potential and challenges for the daylighting strategy.

The investigation for the real case project in the thesis focuses on spatial and architectural aspects of the existing space to find scenarios and daylighting qualities for the new function by using current architectural elements. The next step is to develop the project and conduct calculations for each scenario by studying the maximum potential of the existing skylights.
8. References & List of Figures

Literature

Articles, Websites and Symposiums
List of Figures

Fig.01 The creation of collective memory, Sketches by Miray A.

Fig.02 Dick, W. (1950). [Photograph] (Retrieved April 25, 2022, from https://arquitecturaempresa.es/noticia/el-museo-kolumba-de-peter-zumthor-i-ciudad-y-memoria)

Fig.03 Ghinou, L. (2018). [Photograph] (Retrieved April 25, 2022, from https://www.architecttiroma.it/ar-web/video-e-interviste/i-architettura/roma-indagine-sul-futuro-intervista-a-domenico-de-masi-de-marco-maria-sambola/). Reworked as black & white.

Fig.04 Sketches for architectural transformation categories are based on Bollack (2013). Sketch by Miray A.

Fig.05 Fisher-Gewitzman, D. (2016), Adaptive Reuse Architecture Documentation and Analysis, J Archit Eng Tech 5:172. doi: 10.4172/2168-9717.1000172

Fig.06 The intersection between new and old, Daylight, Sketches by Miray A.

Fig.07 Correlated Sustainable Development Goals. Graphics by Miray A. based on data retrieved April 25, 2022, from https://www.globalgoals.org/

Fig.10 Bertoloi, R. Magic light at Colosseo [Photograph] (Retrieved April 30, 2022, from https://www.architettiroma.it/ar-web/video-e-interviste/i-architettura/roma-indagine-sul-futuro-intervista-a-domenico-de-masi-de-marco-maria-sambola/). Reworked as black & white.

Fig.11 Reusing an old chapel by transforming the form, Sketches by Miray A.


Fig.13 Overlapping Visual Surroundings, Altındiş, M. (2022) [Photograph]. Sketches by Miray A. Reworked as black & white.

Fig.15 Reference Projects (Precedents), Graphics by Miray A. Photographs: La Centrale Restaurant, 1. from Bollack, F. (2013), Old buildings, new forms : new directions in architectural transformations, Monacelli Press.) and 2. Varan

Fig.16 Subjective evaluation of reference projects, Part 1 and Part 2, Sketches by Miray A.


Fig.20 Angdømen and Main Hall are studied as respectively insertion and parasite adaptive reuse categories. Altındiş, M. (2022) [Photograph]. Reworked as black & white. Graphics by Miray A. Floor plan is based on drawings retrieved May 1, 2022, from: https://docplayer.se/7458365-l-nya-kthb-finnos-900-studieplatser-i-gamma-kthb-fannos-440-studieplatser.html

Fig.21 KTH Library site plan and daylight sun chart. Graphics by Miray A, satellite image is based on data retrieved May 1, 2022, from https://earth.google.com/web/, sun chart is based on data retrieved April 29, 2022, from https://www.sunearthtools.com.dp/tools/sun_angle.php?lang=en

Fig.23 Synthesizing the architectural elements and function of old and new. Sketch and Graphics by Miray A.

Fig.24 Lundgren, V. (1933) [Photograph] (Retrieved May 28, 2022, from https://stockholmskallan.stockholm.se/post/24201)

Fig.29 Graphics by Miray A. Floor plan drawing is based on drawings retrieved May 1, 2022, from https://docplayer.se/7458365-l-nya-kthb-finnos-900-studieplatser-i-gamma-kthb-fannos-440-studieplatser.html. Sun angle is based on data May 27, 2022, from:https://drajmarsh.bitbucket.io/sunpath3d.html

Fig.30 KTH Library site plan and daylight sun chart. Graphics by Miray A. Floor plan drawing is based on drawings retrieved May 1, 2022, from https://docplayer.se/7458365-l-nya-kthb-finnos-900-studieplatser-i-gamma-kthb-fannos-440-studieplatser.html. Sun angle is based on data May 27, 2022, from:https://drajmarsh.bitbucket.io/sunpath3d.html

Fig.31 The two scenes of Angdømen’s daylight approach by using skylight on the ceiling. Altındiş, M. (2022) [Photograph]. Graphics by Miray A. Floor plan drawing is based on drawings retrieved May 1, 2022, from https://docplayer.se/7458365-l-nya-kthb-finnos-900-studieplatser-i-gamma-kthb-fannos-440-studieplatser.html

Fig.33-34-35 Graphics by Miray A. Floor plan drawing is based on drawings retrieved May 1, 2022, from https://docplayer.se/7458365-l-nya-kthb-finnos-900-studieplatser-i-gamma-kthb-fannos-440-studieplatser.html

Fig.40 The impact of urban environment considering daylight characteristics in the interior, Sketches by Miray A.

Fig.41 (Re)framing daylight in Angdømen. Sketch and Graphics by Miray A.
9. Appendix

9.1 REFERENCE PROJECTS

Original situations of reference projects: old buildings

La Centrale Restaurant

Neues Museum

Champollion Museum

KTH Main Library

Sharp Centre for Design

Le Fresnoy National Art Studio

Luxembourg Learning Centre

Pratt Institute, Higgins Hall

Some projects’ photos couldn’t be found. However, replaced with photographs of their current situation or excluded.

Evaluation/Investigation of adaptive reuse projects

The investigation and evaluations of all adaptive reuse projects which are studied but not all of them are included in the thesis.
Evaluation of adaptive reuse projects

9.2 CASE STUDY

Transformation of the library and KTH Campus. (kartor.stockholm 2022)

The real-time occupancy table in the library.

April 20, 2022 at 10:54 am
April 20, 2022 at 11:30 am
April 20, 2022 at 13:50 am
Angdomen room when skylights are in use after the second refurbishment process in 2014. Photograph by Erik Fredriksson.

Detailed measurement grid of spectrometer measurements presented partly in Fig.29 and more detailed data. The measurements are conducted at 16:00 on the 29th of April in the sunny sky condition. During the measurement the artificial lighting was on. Measurement grid are indicated on the sketch plan.
### Result of measurement

<table>
<thead>
<tr>
<th>Scene</th>
<th>Time (h:m)</th>
<th>Date</th>
<th>Measurement Details</th>
</tr>
</thead>
</table>
| Scene 1 | 14:20 | Apr 29, 2022 | 9.3  EXPERIMENT
| Scene 2 | 14:20 | Apr 29, 2022 | 9.3  EXPERIMENT

#### Detailed results of spectrometer measurements presented in Fig. 29

- **Scene 1**
  - 14:20:45
  - CIE 10:08, CCT = 4900 K, R9 = 93
- **Scene 2**
  - 14:20:45
  - CIE 10:08, CCT = 4900 K, R9 = 93

#### Experiment process of each scenes at the attic (area between glass roof and ceiling)

- **Current Situation**
  - Scene 1
  - Scene 2
**Experiment process of each scenes in the room**

**Current Situation**

- Scene 1
- Scene 2

**Interviews**

Interviews were conducted on the 29th of April 2022. Participants prefer to be anonymous.

**Participant 1** - Male, 19 years old, KTH student
He was working in the ground floor under the mezzanine floor.
Generally prefers this room to work.
Didn’t realized the changes before I asked.
Do you think this is natural light?
Scene 1: ‘It is natural light’
Scene 2: ‘Natural again’

What do you think about the room’s brightness and differences in the volume?
Scene 1: ‘Brighter and feels higher’
Scene 2: ‘It feels darker, I would select this one because I like to work at dark, I can focus more.’

Additional comment:
‘This place feel darker normally’

**Participant 2** - Female, 28 years old, Former KTH student
She was working at mezzanine floor.
She generally come here to work.
Didn’t realized the changes before I asked.
Do you think this is natural light?
Scene 1: ‘Natural light’
Scene 2: ‘It must be natural light’

What do you think about the room’s brightness and differences in the volume?
Scene 1: ‘Feel open up the place, feel brighter’
Scene 2: ‘Feel darker’

**Participant 3** - Male, 35 years old, Usually doesn’t come here.
He was at ground floor.
Do you think this is natural light?
Scene 1: ‘Natural light’
Scene 2: ‘It must be natural light’

What do you think about the room’s brightness and differences in the volume?
Scene 1: ‘Directs your vision to the wall, brighter’
Scene 2: ‘Don’t fit the space. Feels lower and black strip is compressive. The space feels wider’

**Participant 4** - Male, 28 years old, He was at ground floor.
Usually doesn’t come here.
Didn’t realized the changes before I asked.
Do you think this is natural light?
Scene 1: ‘Natural light’
Scene 2: ‘Natural light’

What do you think about the room’s brightness and differences in the volume?
Scene 1: ‘I don’t mind ceiling lighting but it feels brighter because I like to study with daylight’
Scene 2: ‘Feels a bit darker’

**Participant 5** - Female, 25 years old, She was working at mezzanine floor.
Usually prefers this room to work.
Didn’t realized the changes before I asked.
Do you think this is natural light?
Scene 1: ‘Natural light’
Scene 2: ‘Natural light’

What do you think about the room’s brightness and differences in the volume?
Scene 1: ‘I don’t mind ceiling lighting but it feels brighter because I like to study with daylight’
Scene 2: ‘Feels a bit darker’
Measurements of each scene

Detailed measurement grid of spectrometer measurements presented partly in Fig.33. The measurements are conducted from 09.30am to 11:30am on the 29th of April in the partially cloudy condition. During the measurement the artificial lighting was on. Measurement grid are indicated on the sketch plan.
Detailed results of spectrometer measurements presented partly in Fig.33. The measurements are conducted from 09:30am to 11:30am on the 29th of April in the partially cloudy condition. During the measurement the artificial lighting was on. Measurement grid are indicated on the sketch plan.

**Measurements from the attic** (the area between glass roof and ceiling)

Lux and CCT values under clear sky and direct sunlight.

Above: Measurement right under the glass.

Below: Measurement of direct sunlight was taken from outside.

**The Site Visit and Measurement**

At the moment, the Angdomen's skylights under the glass roof are covered with blackouts to control the daylight.
9.4 RESULTS OF SURVEYS

Survey 1 on ‘Perceptual Impact of Light Coming From Ceiling’  
(KTH Main Library)

The survey is part of a collective evaluation for a project-based research thesis.

The academic research is about ‘The transformation of daylight approaches in adaptive reuse projects through the form of architecture’. The thesis contributes to the completion of ‘Degree Project in Architectural Lighting Design’ to graduate in Master of Science program at KTH Royal Institute of Technology in Stockholm, Sweden.

(This survey may take approximately 2 minutes)

Instructions

To answer this survey, please imagine yourself inside the building and that the images correspond to your view. Try to focus on the experience of the place rather than rating the image itself.

Experiment - Viewpoint 1

Please see the set of 2 images marked as per 01 and 02. Kindly answer the following questions.

Please concentrate on the ‘daylighting conditions’ for Viewpoint 1.
Which space seems more comfortable to study/work (considering lighting qualities) to you?

Experiment - Viewpoint 2
Please see the set of 2 images marked as per 03 and 04. Kindly answer the following questions.

Please concentrate on the ‘daylighting conditions’ for Viewpoint 2.

How do you perceive the ‘light level’ among the two spaces? Please evaluate the images based on the given qualities.

How do you perceive the ‘characteristics of light’ coming from ceiling? Is it natural or artificial lighting?

How do you perceive the ‘width’ (see diagram) among the two spaces? Please evaluate the images based on the given qualities.

How do you perceive the ‘height’ (see diagram) among the two spaces? Please evaluate the images based on the given qualities.

Which space seems more comfortable to study/work (considering lighting qualities) to you?

You may comment about additional light qualities perceived in both spaces (optional)

3 responses

Artificial light has most of the impact on the room.

I notice the above windows are either open in the middle and closed on the sides or vice versa. I am not sure if there's any difference between pictures 1 and 2 and 3 and 4, but perceptually it feels different. Answered to the best of my ability! Interesting research, for sure.
Results of Survey 2

Survey 2 on ‘Highlighting Aspect of Daylight’ (KTH Main Library)

The survey is part of a collective evaluation for a project-based research thesis.

The academic research is about ‘The transformation of daylight approaches in adaptive reuse projects through the form of architecture’. The thesis contributes to the completion of ‘Degree Project in Architectural Lighting Design’ to graduate in Master of Science program at KTH Royal Institute of Technology in Stockholm, Sweden.

(This survey may take approximately 2 minutes)

Kindly choose your age group from the options
23 responses

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>18-20 years</td>
<td>28.3%</td>
</tr>
<tr>
<td>21-30 years</td>
<td>22.0%</td>
</tr>
<tr>
<td>31-40 years</td>
<td>20.0%</td>
</tr>
<tr>
<td>41-50 years</td>
<td>15.0%</td>
</tr>
<tr>
<td>50+ years</td>
<td>4.3%</td>
</tr>
</tbody>
</table>

Please specify your gender
23 responses

<table>
<thead>
<tr>
<th>Gender</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>56.5%</td>
</tr>
<tr>
<td>Female</td>
<td>43.5%</td>
</tr>
</tbody>
</table>

Do you go to KTH Main Library to study?
23 responses

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Always</td>
<td>26.1%</td>
</tr>
<tr>
<td>Often</td>
<td>41.1%</td>
</tr>
<tr>
<td>Sometimes</td>
<td>15.9%</td>
</tr>
<tr>
<td>Seldom</td>
<td>5.3%</td>
</tr>
<tr>
<td>Never</td>
<td>1.7%</td>
</tr>
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</table>

Do you study in the Ånglovan Room?
23 responses

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<th>Percentage</th>
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<td>Always</td>
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</tr>
<tr>
<td>Often</td>
<td>4.3%</td>
</tr>
<tr>
<td>Sometimes</td>
<td>7.3%</td>
</tr>
<tr>
<td>Seldom</td>
<td>0.0%</td>
</tr>
<tr>
<td>Never</td>
<td>0.0%</td>
</tr>
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</table>

You may inform about your professional background (optional)
17 responses

<table>
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<th>Percentage</th>
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<tbody>
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<td>Architectural lighting designer</td>
<td>30.0%</td>
</tr>
<tr>
<td>Architectural student</td>
<td>23.5%</td>
</tr>
<tr>
<td>Architect</td>
<td>11.8%</td>
</tr>
<tr>
<td>Designer</td>
<td>11.8%</td>
</tr>
<tr>
<td>Interior designer</td>
<td>11.8%</td>
</tr>
<tr>
<td>Lighting designer</td>
<td>11.8%</td>
</tr>
<tr>
<td>Teacher</td>
<td>5.9%</td>
</tr>
</tbody>
</table>

Instructions

To answer this survey, please imagine yourself inside the building and that the images correspond to your view. Please concentrate on the architecture and its elements.

Which scene highlights the qualities and values of the architecture the most?

<table>
<thead>
<tr>
<th>Scene</th>
<th>Percentage</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>30.4%</td>
</tr>
<tr>
<td>2</td>
<td>95.2%</td>
</tr>
<tr>
<td>3</td>
<td>0.0%</td>
</tr>
</tbody>
</table>

Which scene gives positive or negative feelings?

<table>
<thead>
<tr>
<th>Scene</th>
<th>Very Positive</th>
<th>Slightly Positive</th>
<th>Average</th>
<th>Slightly Negative</th>
<th>Very Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>10</td>
<td>10</td>
<td>8</td>
<td>0</td>
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</table>

You may comment about additional light qualities perceived in the spaces (optional)
8 responses

In scene 1 the ceiling looks clean in 2 it appears a bit busy and in scene 3 the skylight is not lit and this makes me feel a bit low and gloomy in the space.

I have a hard time seeing any significant differences between the images (maybe due to small phone screen).

The completely covered windows makes the space look dull and makes the spaces loses its depth

I would have preferred to clearly see daylight from all windows in the ceiling, otherwise the window seem redundant and the space looks heavy and closed.

Should really be an adaption between artificial light and daylight. Back to the original idea of when it was build over 100 years ago. Great to use new technic in older buildings. Many places at KTH/ Akademiska Hus could use new ideas for bringing the ideas of the Architecture forward.

It was super interesting that the rightmost image was so chillingly negative to look at, and that the left was a significantly better emotion than the middle!