

Colour Curve: Lighting experience within the bedroom

HDK

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Summary

Designing towards our emotion keeps our senses intrigued. Colour Curve, an architectural application considers the use of light filters and ambiance to bring sensory and emotional significance into an interior space. Set within the bedroom environment of a hotel in Scandinavia, Colour Curve provides mood lighting and an experience of awakening from sleep by mimicking the rising sun. It is a step towards lighting design that respects the broadest definition of sustainable lighting quality and healthy needs.

Abstract

Not only is lighting for visibility, but a broader necessity includes; lighting quality, human needs, architectural integration and economic constraints (including energy). The focus is on lighting quality defined as, comfort, health orientated, adapting to a lifestyle, controlling the atmosphere to improve a mood, or to set a mood. Clinical studies have demonstrated that light processed through the eye can influence human psychology, mood and behaviour.¹ These findings may provide the basis for major changes in architecture that benefits lighting strategies within a room to induce emotional value at the human perspective.

The report summarises the possibilities of using lighting to improve our lifestyle specifically within the Scandinavian environment during the winter season where there is lack of daylight. The light is to awaken the body from rest and to use light to offer a sensual experience. The design will be demonstrated using a hotel bedroom, where rest and comfort are essential aspects for guests within this environment.

The report concludes with guidance concerning lighting to react with the human sensibility in both aesthetics and health lighting and how it might be applied in an architectural way in response to lighting quality.

¹Veitch, J.A., Principles of Healthy Lighting: Highlights of IE TC6-11's Forthcoming Report, National Research Council of Canada, Institute for Research in Construction, Published March 2004, page 1

Preface

The plan of Avalon Hotel was a study application for Colour Curve. The plans were attained through Semrén & Månsson Arkitektkontor AB, Architects of Avalon Hotel.

Patrik Turnesjö, Avalon Hotel, Gothenburg - VD/ Managing Director, permitted the study on Avalon Hotel and photography within the building. A set of plans were attained from him.

Jan Simon, AB Svensk Ljussupport, Lighting technician. Lighting knowledge, products and technical support were attained from him.

The assistance of staff and technical support at Hobbex, Gothenburg.

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An inspirational experience

I've taken for granted sunlight since I was a child. I didn't think that I would come to sense it was missing. When I experienced my first winter in Gothenburg, I was surprised to know how easy it was to miss the sun, how normal it is to lose my shadow. I've come to re-appreciate sunlight and the ability it has to convey an experience of emotions. This project is influenced by the sunlight in Scandinavia and my reaction to it.



Introduction

Keywords: Desiring, evoking, fascination, health, light, awakening and bedroom

Until the late 1990's lighting recommendations were based primarily on lighting for visibility. Now it has embraced a more broad definition '*lighting quality*', encompassing human needs, architectural integration and economic constrain (including energy).² Good health aspects incorporate a wide range of topic, however this report focuses on the challenge in using lighting to explore ways to engage people's senses and respond to their mood and emotions. It aims to awaken the user with ambient experiences, experiences in which the light settings are created with architectural intensions to further an experience.

The idea of the project is inspired by the Scandinavian winters where there is a lack of daylight, thus emphasizing the role light plays on our life style particularly sleeping habits and bedroom lighting. This design called Colour Curve [abbreviated as CC in this report] has two main functions; as a light mimicking the intensity of the

rising sun to gently wake the user and secondly, the influences it brings upon our senses that exceed ordinary mood lighting towards our emotions.

This report presents research results through experimentation with lighting, architectural analysis, construction methods for design integration, material selection and colour analysis at the human perspective. Therefore this paper focuses on what this knowledge might mean for lighting applications within the bedroom environment for the comfort of the human needs towards health and aesthetic combination in respect to lighting quality.

²Veitch, J.A., Principles of Healthy Lighting: Highlights of IE TC6-11's Forthcoming Report, National Research Council of Canada, Institute for Research in Construction, Published March 2004, page 1

Background

'It's that morning light that seems to be important, bringing freshness and energy to the start of the day and it's the glow of ambiance at nightfall that brings comfort to the bedroom at the end of the day.'

Emotional design:

An emotion is a mental state that arises spontaneously rather than through conscious effort. Expressing emotions does not depend on a person's culture, rather it enables the user to feel for an object that appeals to him/her. Design towards emotion relates to the user that induces: imagination through visuals, colours and engaging functionalities. Emotions encapsulates memories and experiences. There is a need for lighting to bring out relationships and an experience towards the person not only the design object itself.

Climate: The focus is within the Scandinavian environment where there is a lack of sunlight during the winter period. Scandinavia in reference to Northern Europe, in particular November, December, and early January has as little as 6 hours of daylight. The changes in light become more pronounced the further up north. 24 hours of no daylight or twilight at noon during the winter period is common in certain locations of Scandinavia.

The need for interior lighting at a global scale is a necessity to enable activities after dark, however for regions that experience very little daylight, interior lighting becomes an even more important function. Due to this need, it is interesting to investigate the emotional values of lighting as an experience beyond a common out put of light source and the benefits of lighting that affects our health during the winter period.



Health and daylight: Lighting has the ability to affect the way we wake and the way our mood is influenced. Daylight is a naturally healthy source of light, which artificial lighting cannot easily replace. Daylight covers the array of the colour spectrum that attains healthy needs through exposure. Clinical studies have demonstrated that light processed through the eye can influence human psychology, mood and behaviour.

During the winter when there is less daylight, it is more difficult to awake from sleep. Our cardinal system (our internal clock to sleep and wake) is effected by the daylight we receive. Melatonin, a naturally occurring hormone that regulates our sleeping and waking patterns, is produced by our bodies at night to help us sleep and then stopped by the appearance of daylight. Without the regular daylight dosage, the effects of our sleep pattern are affected.

Health and Darkness: *'Healthy light is inextricably linked to healthy darkness.'*^{3.1}

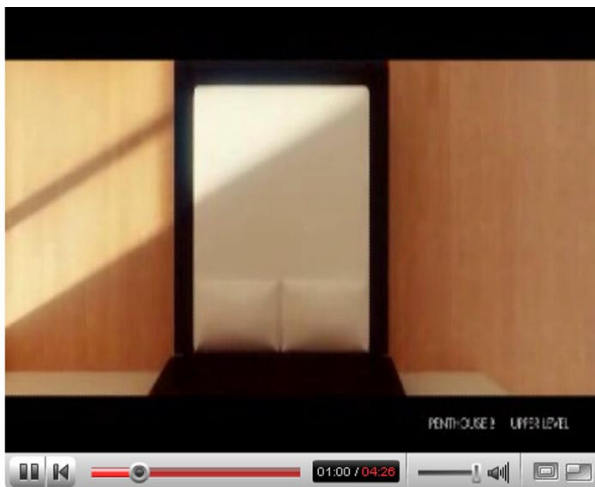
Maintaining circadian rhythms requires periods of darkness in addition to periods of light. The balance of both light and darkness is beneficial in providing adequate time each day for sleep, which some argue that we do not do. Recommendations for the daily dark dose are perhaps as important as those for a daily light dose, but do not yet exist.^{3.2}

CC is based on light emission, it does not provide darkness, but assumes there are periods of darkness that allows CC to work optimally for lighting effect.

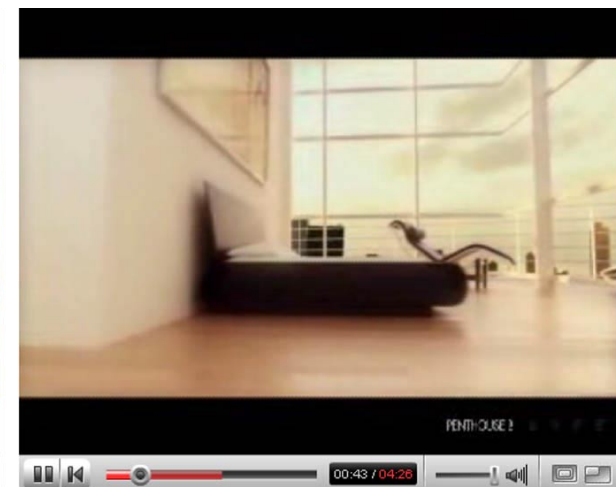
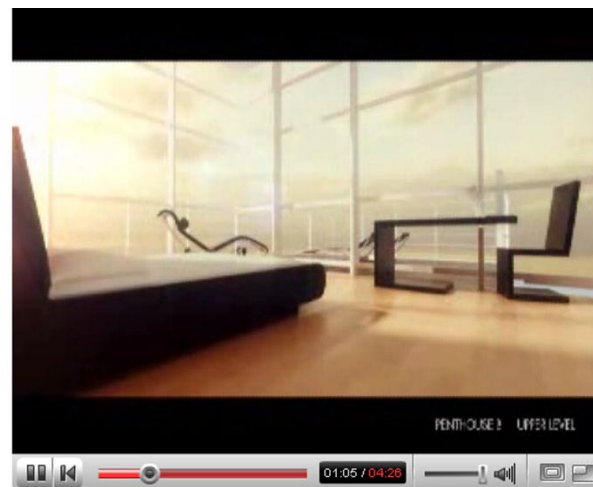
The bedroom: The lighting concept is placed into a hotel room scenario where the bedroom is the focus.

The bedroom environment is where good health begins, whether it is rest or to reside in the comfort of a personal space. It is where the day starts and where the day ends. The hotel creates a setting of relaxation, pampering and allows the guest to temporary be exposed to their senses placing priority on the feeling of an experience.

^{3.1, 3.2} Veitch, J.A., Principles of Healthy Lighting: Highlights of IE TC6-11's Forthcoming Report, National Research Council of Canada, Institute for Research in Construction, Published March 2004, page 2



Architect: Enrique Norten

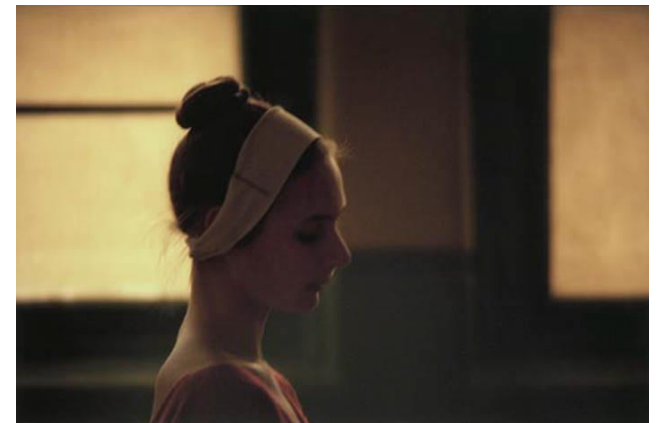


Light and the room: The experience of light is indescribable. Light has the ability to change our emotions, and keeping us healthy. The overall experience of being in a bedroom should be connected with our mood influenced by the ambience of light. The fusion of the room and light adds more depth and layering that accounts for a subtle or dramatic appearance. Interior lighting should no longer be a product in a room, but connectively integrated into the room that affects us at a different level.

Light source: The current system of light is tremendously inefficient; incandescent bulbs waste 95 percent of the energy flowing through them as heat.⁴ Fluorescent bulbs are more efficient, but their harsh color has prevented them from fully penetrating the lighting market.

Light emitting Diodes (LED) are long-lasting, extremely rugged and proven to be ten times more energy efficient than current incandescent lights. LED does not give off heat and in effect does not

increase the room temperature. LEDs even though are more expensive, the flexibility and the function have proven to be increasingly popular as it gradually embraced into the light industry. The use of LED in the project is to enable a more sustainable way of lighting and to promote LED as an energy efficient technology in lighting.



Untitled, 1974 (Ballet) Bill Henson

⁴Living on earth: LEDs: The Future of Light <http://www.ioe.org/series/LED.php> 18/02/2008

Psychology of Color: Color, without realizing it, can have a profound effect on how we feel both mentally and physically.⁵

As a personal reflection on my culture, 'White' symbolizes death, and it is colour not to be worn as an accessory on the head. However in other cultures, it is black that symbolizes death. Colours have significant meanings to cultures with numerous possibilities of meanings. Below are general emotional associations that humans tend to have with certain colors despite the difference in cultural perception

Blue can slow the pulse rate, lower body temperature, and reduce appetite.⁶ *Red* is the color that is paid most attention to. It is the warmest and most energetic color in the spectrum. *White* is what we see when all colors come together in perfect balance.



Bravia / Sony

⁵Dr. Morton Walker, The Power of Color, <http://iit.bloomu.edu/vthc/Design/psychology.htm>
20/02/2008

⁶Dr. Morton Walker, The Power of Color, <http://iit.bloomu.edu/vthc/Design/psychology.htm>
20/02/2008

Avalon hotel: The study application for CC is Avalon Hotel in Gothenburg, newly built in June 2007, located in Scandinavia. The hotel has 101 rooms with 202 beds, with 6 different standards of rooms. It is the size of the room that determines the category the room belongs to.⁷ The Avalon Hotel is used as an application study for CC within the existing spaces of selected bedrooms.

Audience: CC is placed within the hotel of the bedroom environment. CC is for guest who could be; on a holiday, a weekend trip, honeymooners, business travellers or visitors.

Specifically for Avalon Hotel, their market audience is;

- 1. 'Business travelers who prefer (and can afford) a small and high class hotel like Avalon.
- 2. Leisure guest that prefer the same kind of hotel and are willing to pay a bit more than in a more "ordinary" hotel.'⁸

Existing example: Nordic Light Hotel, Stockholm uses light as a feature to allow the guest to personalize the room. Nordic Light Hotel offers rooms for senses. Playing with the concept of northern light it allows the full pleasure of colour therapy in the bedroom.⁹ The exploration of lighting qualities is becoming more integrated into the life style aspects, where the emotions of our needs and experience becomes just as important as the stay itself.

Process: Various strategies taken up to explore this design process includes testing out different lighting using florescent, tungsten, daylight and LED, filters, models, 1:1 scales models. Joining a workshop 'Haptic - Sleep Culture' and working with lighting technicians has been an interesting journey as light is a complex medium that constantly changes.

⁷ <http://www.avalonhotel.se/en/accommodationandbusiness/25/03/2008>

⁸ Patrik Turnesjö - VD/Managing Director, Avalon Hotel 06/03/2008

⁹ Nordic light Hotel <http://www.nordiclighthotel.se/en/Experience-the-hotel/Hotel-rooms/Deluxe-Mood/29/0372008>



Avalon Hotel, Gothenburg



Nordic Light Hotel, Stockholm

Identified Problem:

Problem formulation

This design questions why;

- we need to wake up in a refreshing and gentle way and
- how mood lighting is used in the bedroom to further the experience of space with our senses.

Designing Emotions: Emotions have a crucial role in the human ability to relate and understand the surrounding. Light itself is an experience of encounter, however lighting with a story to tell is even more appealing to our senses. There is a need to design with emotional reason, specifically

in a hotel scenario where the temporary stay of the bedroom is no longer an ordinary space. There is newness or unfamiliarity towards this space where elements or features could accentuate the room. Lighting is beginning to take on more of a role in interior space with the help of technology, architecture and innovative thinking. This idea could only be further developed and not neglected.



Geographic location: The design idea was inspired by the lack of daylight in the Scandinavian environment leading to the essential interior lighting during the winter season. It became a question of how we experience light and how it could benefit the health and the importance of the emotional qualities of interior lighting in the bedroom to bring upon comfort and well being.



Australia, Outback



France, Nice



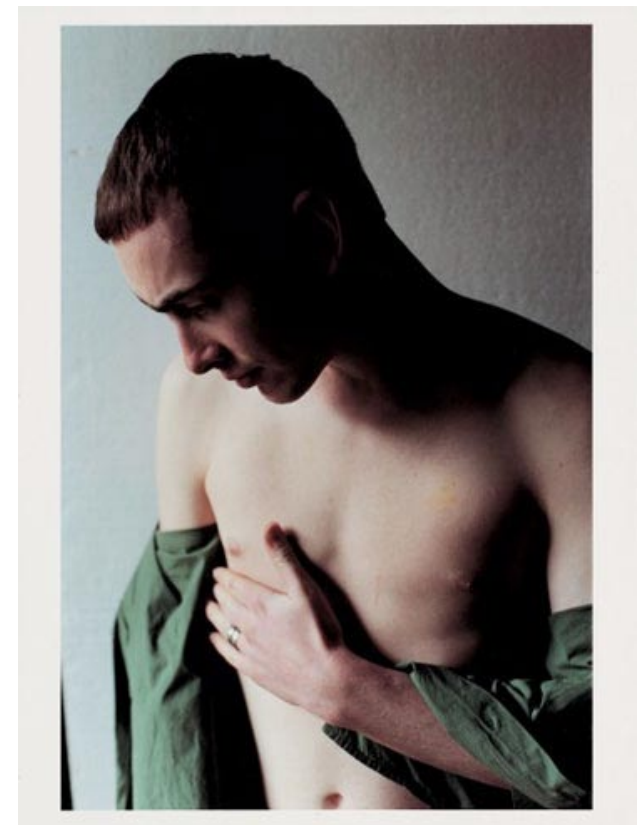
Abisko, Sweden

Care for the body: Though it is important to get the sleep that is needed, it is just as important to be awakened feeling refreshed and relaxed. During the winter it could be more difficult to wake up without daylight assistance as our body is designed to.

A common way to wake up is via an alarm clock that disrupts sleep usually by a mechanically pitched sound. Our bodies are not designed to wake up with an alarm, rather we respond to the natural elements such as birds chirping or the sun rising. Though it is a generally effective to wake up with a sound, it is startling, sending our bodies into a “fright or flight” response. ‘Digital noises that awaken us are startling, and none of these noises, it turns out, are good for us.’¹⁰ Attention to the awakening aspect of sleep should be given more consideration under these circumstances that has the ability to place stress and strain upon the body at the start of the day.

Common hotel guest are travelers, who could undergo long hours of flight or be flown into a dif

ference season. Travel could induce jetlag, which could affect their circadian system. Waking or sleeping could have a profound effect through the deregulation of various time zones otherwise known as Transmeridian travel, or altered day length.¹¹ Hotel bedroom should take into consideration of their travelers and the short daylight period in winter and to consider benefits of how quality lighting to assist guest and to ensure a better health and a better stay.



¹⁰ <http://searchwarp.com/swa222234.htm> 24.04.2008
¹¹ http://www.sciencedaily.com/articles/j/jet_lag.htm 24/03/2008

Lighting and the room: Room and light integration changes the typical perception of ‘a light looking like a light.’ The window location has a large role in affecting the interior, furthermore the direction the window faces in relation to the sun. Exterior lighting is connected with the interior space eg. night fall, the window appearance is seen as a dark panel of opening. The colours of the walls and the finish of the surface can also change the perception in size and the proportion of a room.

There are many lighting fixtures placed into a room, many of which include, lamps, hanging pendants, down lighting, which are obvious in form as a lighting object. CC intends to hid the source of light from the viewer when it is not in use. It questions the most appropriate space of application of the wall positioning, line of vision, proportion and window opening.



Goal and purpose

The goal is to explore the lighting conditions of the bedroom without neglecting aspects of the human senses, particularly the process of awakening and affects of mood lighting.

Care for the body starts from the bedroom. The bedroom environment is a place where sleep is attained and a fundamental starting point to good health where efficient rest effects how we approach the day. The purpose is using light as a response to our health needs and to improve our lifestyle. It is a necessity for people to fall asleep easily, and to feel refreshed and in a good mood the following morning. CC's two main priorities are:

- 1- Awaken the user in a refreshing and gentle way.
- 2- To be used as a mood lighting in the room to induce an experience.

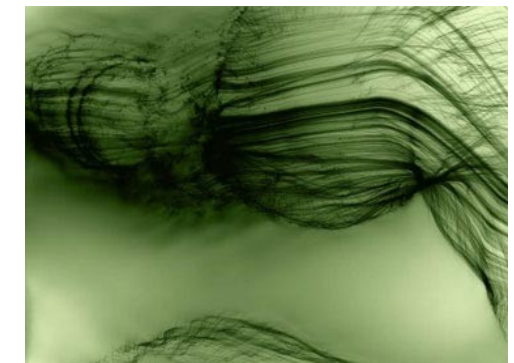
The Avalon Hotel has various standards of room, ranging from Penthouse suite, Suite, Deluxe, Superior, Business and Moderate. Within the 6 standards, CC will be placed into a selection of those rooms to demonstrate the variations of; function, space occupation.

Though CC is not a scientifically proven light therapy, the affects of light do help us to feel a certain comfort. The choice of colour, intensity, variations and speed setting are what many lighting applications does not have to offer for the personal setting depending on your mood.

It is a reflection of my own experience in re-appreciating a new sense of light from Scandinavia. This inspiration comes from a cultural difference and adapting to change that is reflected upon this project.



Corian Nouvel Lumieres 2007 Milan



Freischwimmer 15', 2003

Limitations

Depending on the geographic location where there is more sun exposure particularly during the winter, CC's application may not be preferred. CC is to help people awaken especially when there is lack of sunlight and to induce a room of experience with internal lighting.

The application of CC being architecturally integrated into a wall surface means it needs to be pre planned as lighting fixtures in the stages of building. It is not a product where it is placed into a space.

The LED market is still an expensive light source, however in the future alike most products, time and market demand will reduce the cost of the lights.

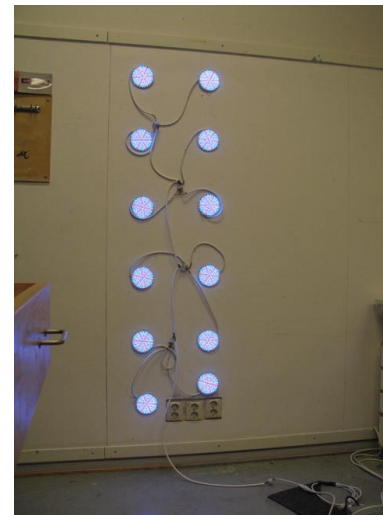
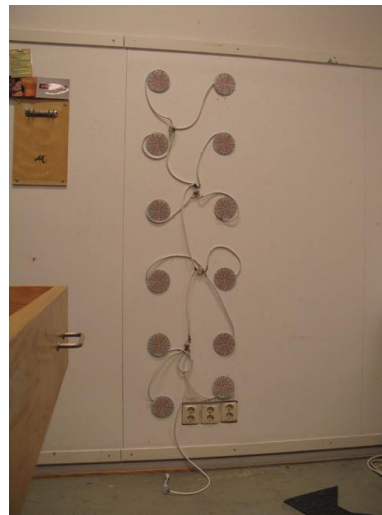
Generally speaking LED has a very high potential of being the future light source, however some current down falls include

-LEDs must be supplied with the correct current. This can involve series resistors or regulated power supplies¹³

-LEDs are currently more expensive, price per lumen, on an initial capital cost basis, than more conventional lighting technologies. The additional expense partially stems from the relatively low lumen output and the drive circuitry and power supplies needed.

However, when considering the total cost of ownership (including energy and maintenance costs), LEDs far surpass incandescent or halogen sources and begin to threaten compact fluorescent lamps.¹⁴

The progression of CC lead on to deeper development of filters with machanical movement. As time limit is a constrain this idea will diverge into a different project for further development.



¹² Hecht, E: "Optics", Fourth Edition, page 591. Addison Wesley, 2002.

¹³ <http://www.ledmuseum.org/> 24/04/2008

¹⁴ http://news.bbc.co.uk/2/hi/uk_news/scotland/glasgow_and_west/7162606.stm 24/04/2008

Method

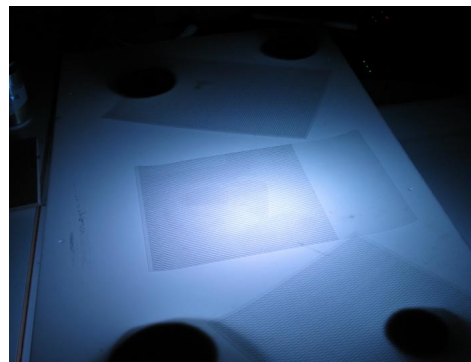
The process was playing with the filter and testing the lighting together. The idea of the filter is not to be an obvious object in the room, rather is it to reveal it self and in gentle way.

It plays on the idea of openings and the perception that it is not in a static state. CC emerges into the room and subtly moves with the user's line of vision and is intensified with lighting adjustments.

The filter is ultimately openings of which light passes through and through these openings, the light is controlled.

A series of experiments included:

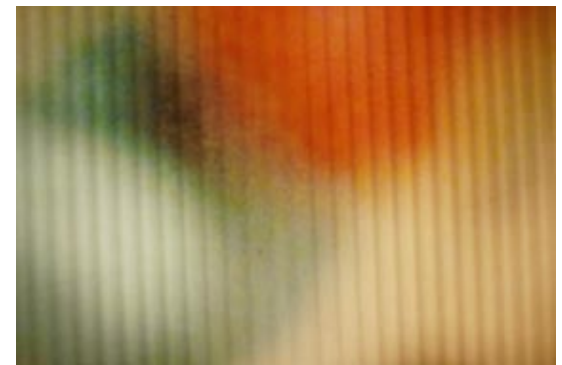
- 01 Perception of visual illusion was tested on to trace.
- 02 Testing all sorts of materials and how it penerates with various lights sources.
- 03 A model was made to show the wall of a room, light projection was used to light up a wall to understand the effects of a vertical wall light.



01



03



02

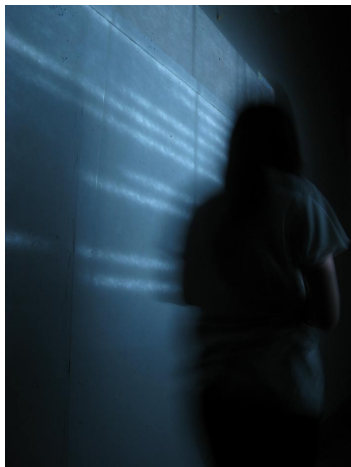
04 Projection at 1:1 to understand the light occupied at a large scale.

05 Testing the characteristics of LED

06 Testing the strips as compressed loops using various heights, colours and transparencies.

07 Models using the Avalon Hotel plans made at 1:350, LED light source were tested according to the wall that was to be applied with CC.

Please refer to supplements for further detail



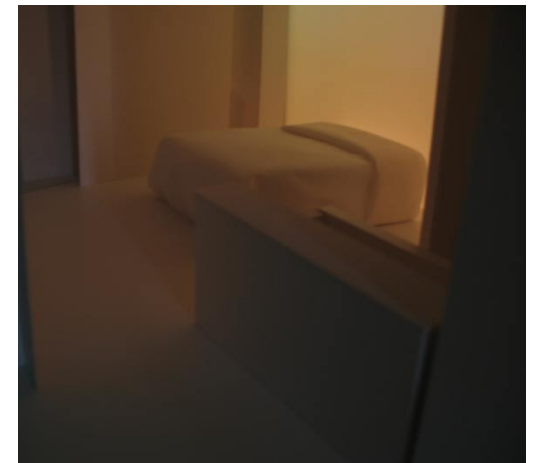
04



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06



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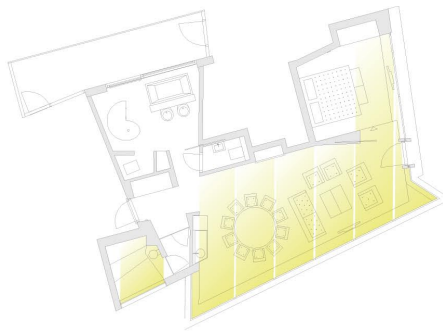
Analysis of the 6 standards of hotel rooms in relation to the direct daylight exposure was tested. June and November were the months that were selected specifically during the hours of 9:00, 12:00 and 15:00 to see the changes of the sun path in the room. CC would be placed in the most appropriate location under these analysis as guidelines.

This is an example of the Penthouse and the direct daylight it receives.

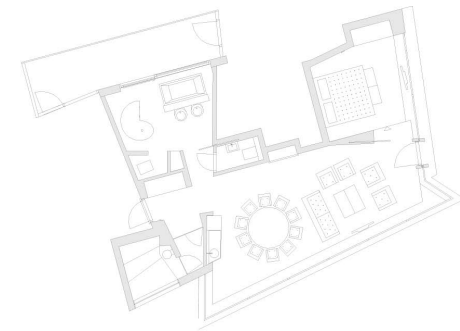
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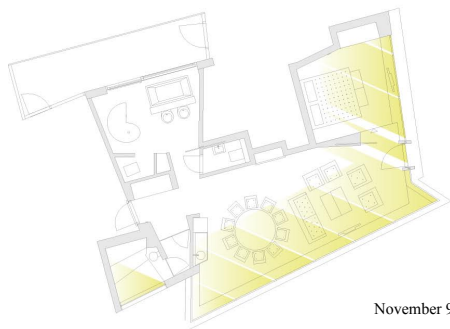
June 9:00



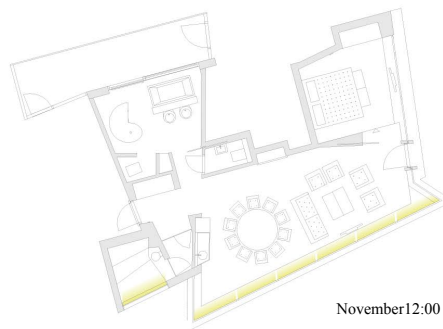
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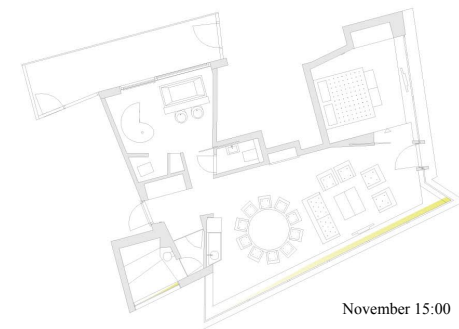
June 15:00



November 9:00



November 12:00



November 15:00

Result / Solution

Awakening light: The CC is a solution of vertical light element that is built into the wall of a bedroom. To assist the user to wake up in the morning as CC gradually intensifies from soft warm amber light to bright white reaching its highest intensity level to gently wake the user. The change in intensity is over 30 minutes similar to the gradual change from the sun. The awakening light is the mimicking of the rising sun in the bedroom gently preparing the body to wake up.

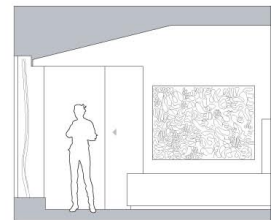
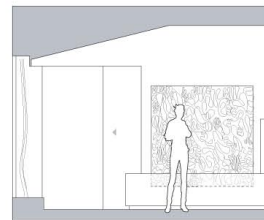
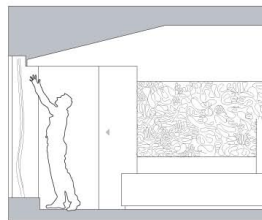
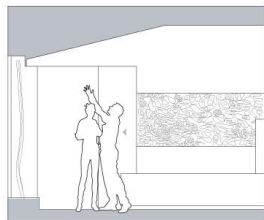
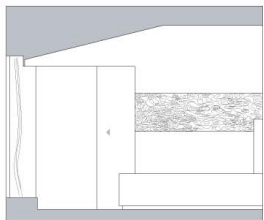
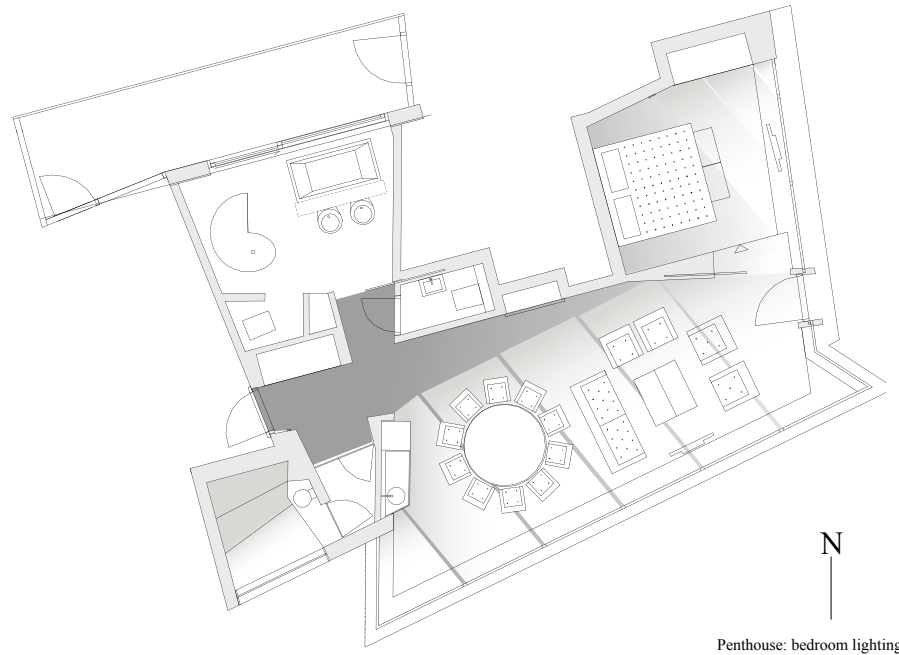
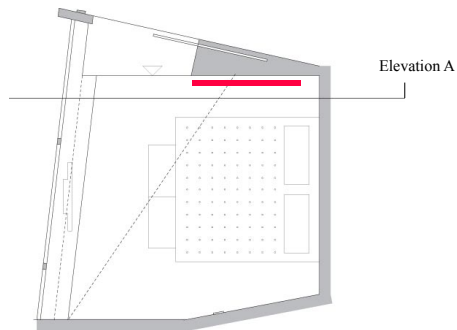
Colour Curve in the room: CC whilst it is not in use to awaken the user, it provides an ambience to the room that sets a mood or a tone. This is achieved by:

- 1- The lighting from LED that is able to change in colour, speed and intensity
 - 2- The filter that disperses the light
- The light is more obvious when it is in function as the wall glows, however when it is not in use it appears to reside into the wall almost blending into

it as the wall surface. CC is not a product that is pre-made, it is a design that is fitted into the internal elements, resulting the light become apart of the room. The light and the room is joined together as a whole working to achieve a balance that educes our sense and bringing lighting quality to another level.



Below are diagrams to show the different ways of which CC can be used on a wall surface of different sizes and proportion. The guideline for the positioning is to have it near the bed and away from direct daylight, if any. The location of the position below has considered the orientation of the sun path and is placed in accordance within the existing environment of the Avalon Hotel Penthouse.

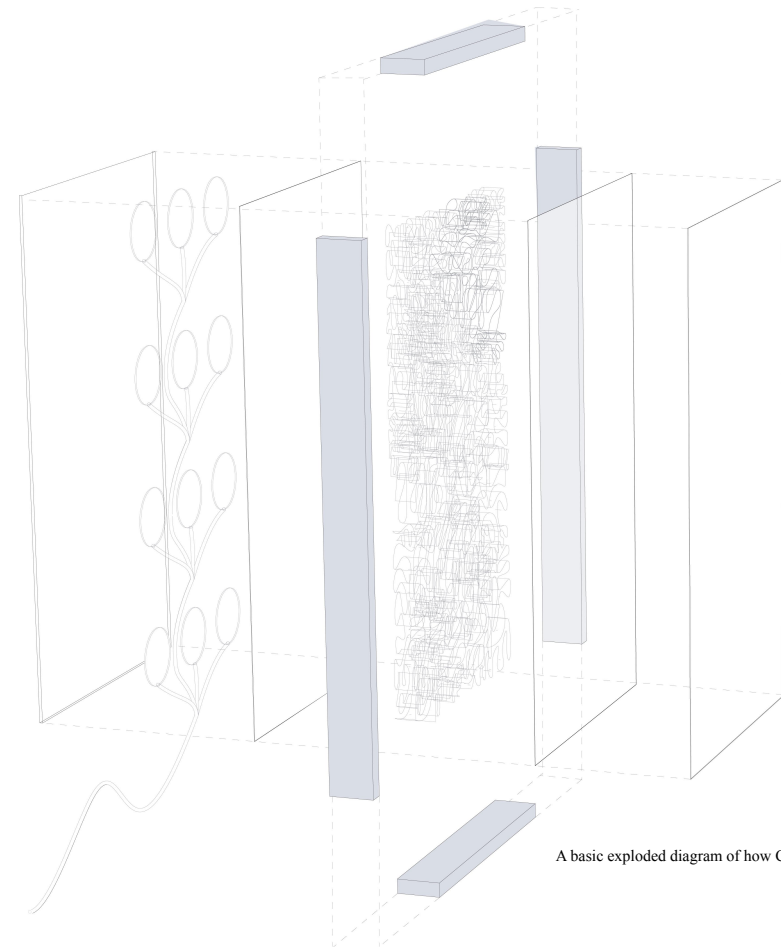


All elevation drawings are the same with different sizes of wall applications of CC

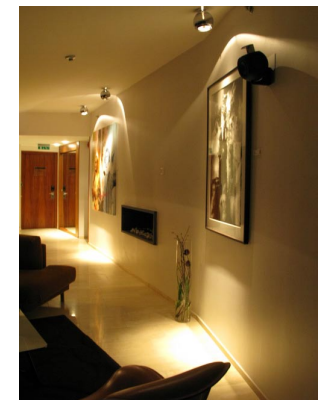
Avalon study: Using the Avalon as the application study with the interior environment in conjunction to the standards of the room, the application of CC will change in accordance. For example, in the Deluxe, CC will be able to provide light on a larger wall area; however in the Business CC will be adjusted on a smaller scale, but also providing the lighting quality needed.

1:1 CC: The end result will be CC at 1:1. Through this prototype, photos taken will show how the human relates to the light, in wake and sleep periods and during different times of the day.

CC is not a product, it is an architectural application that enables the room and light to be connected to further an experience of an intimate and sensual experience. It is composed of LED light source and a filter that disperse the light. Together the filter and the light produced the colour change in speed and intensity colour, patterns that provide emotional quality through the visual play on the eye. CC is a design application in hotel rooms that enable a better wake up mimicking the rising sun setting a mood in the bedroom. It allows for the guest to personalize their room and to discover an experience. For this reason CC is able to assist the user in a variation of function adding both comfort and health assistance for the user.



A basic exploded diagram of how CC works



Discussion

Result in a larger context

General thoughts concerning CC: To produce a mood setting within the hotel room, the use of lighting is used, but most importantly the filter of which the light is dispersed from enabled the overall feeling to capture the quality of the lighting effect. The filter here has been a large part of trial and error to determine the specific desired lighting. The effect that is achieved ultimately from CC can be seen as an illusion to the eye.

CC is made of strips that are compressed that enable loops to form the structure of the filter. Through the compression of the curves, it the size of the opening, that determines the light to penetrate through. The more compressed the curves, the more dense the filter becomes. The compression of the loop affects the subtlety of the appearance in both on and off state overall.

The depth of the curves determines the strength and weakness of the structure and stability. The depth is considered to be the horizontal distance of the

curve whilst in compression. The greater the depth the more visual change there is. For this to work at optimal level, the 'eye level' view point is required, however below or above the eye point, strong visual tonal changes are seen from the filter.

The strips play a large role achieving the effects of colours whether it is: translucent, coloured or height variation. The transparency allows the light to penetrate through effecting colour dispersement onto to neighbouring curves. Using translucent strips, more light was able to pass through. Prints placed on the strips enable the light to pick up texture and colours from the printed material.

The distance of the curve in relation to the outer filter has the most direct effect in terms of blurring the curve. The closer the filter, the more clearly defined the curve. The continual motion of the change in distance eg the filter moves back and forth horizontally, an effect of blurring and focus will occur.

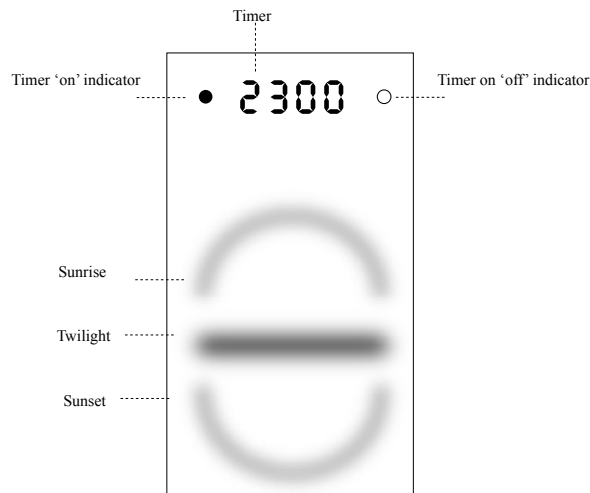
Consideration of the CC during on and off state is crucial. The effect is to enable subtlety, layering without dominating the room, rather the light emerges with the room.



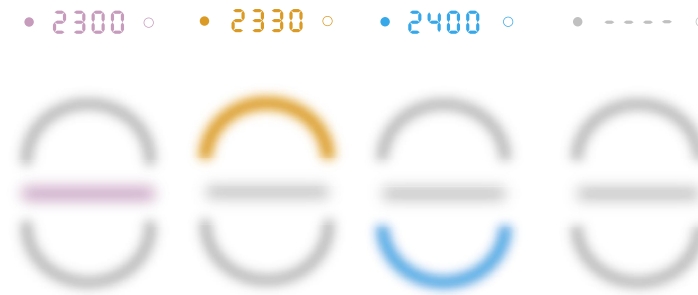
Colour Curve activation - The touch panel

The activation of the light is placed with in 3 places of the bedroom. One on each side of the bed head and one at the entry of the room. Activation panels utilises the sense of touch and light to indicate better communication through visibility. Below are examples of the function.

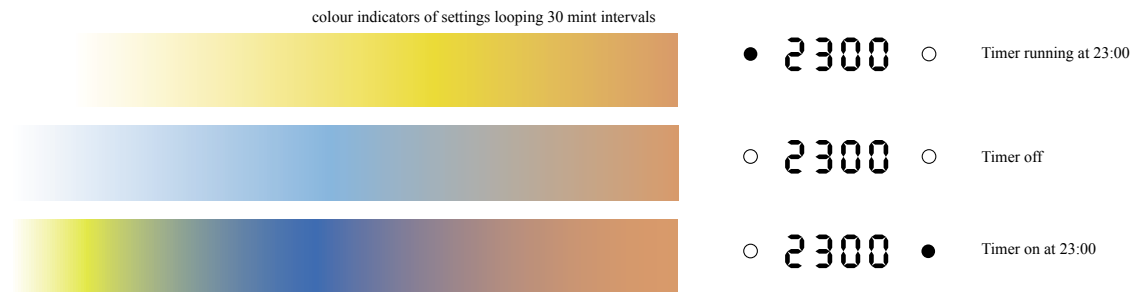
CC has 3 main options to choose from, this is only an example to show the fundamental operation. The touch panel has a time display and 3 symbols. The diagrams represent Sunrise, Twilight and Sunset. Eg Sunrise setting will be amber, ranging in colours of orange, and yellow to a bright white. Each diagram has a programmed setting that loops of a period of 30 minutes.



Note: The simple diagrams symbolizes the sates of sunrise, twilight and sunset.



Note touch panel is colour co ordinated with the time, eg sunset is orange thus timer is orange.



Possible further development

Sound: Researchers have shown that our bodies are very responsive to sound. We respond well to natural sounds compared with mechanical sounds or synthesized tones. For instance, our bodies prefer certain kinds of classical music or tone that creates Alpha brainwave (a state of deep concentration) of which certain classical music can induce. Sound is a common way to wake us up, however the sound that is produced usually an alarm clock, take us to '*flight of fright*' reaction. The awakening process could benefit the user by using sound that the body preferred to induce the wake up process in a positive way.

Awakening sound: As a future concept, sound settings are to accompany the light. Researchers have shown positive responsive to sound, particular to the natural sounds and musical instruments. Mechanical sounds or synthesized music does not work to wake us up. For this reason, classical music, natural sounds such as of birds songs or even chimes are preferred in the setting. The sound does not become intense it maintains a calm clear tone to maintain a peaceful state. The elements of these

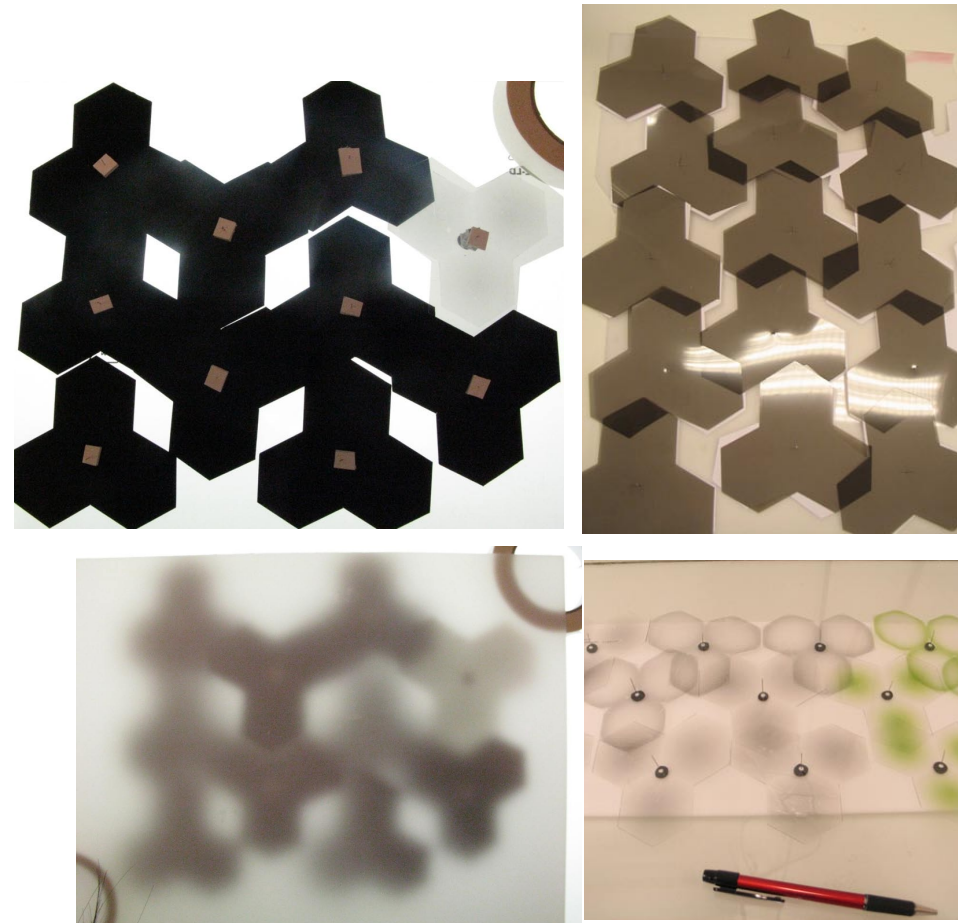
sounds prove to be non disturbing. Awakening in a gradual way has been proven to increase emotional well-being, enhance health, and increase cognitive memory.¹⁵ Waking up to CC can enable a positive start to the day.

¹⁵ <http://www.zenalarmclockinfo.com/> 24/03/2008

More motion: ‘physical moving objects’ and ‘visual illusion’ are both considered types of motions perceived by the eye. Capturing the attention of the user through motion is more effective compared with static from which could go unnoticed. Patterns in motion reveal layers, imagination and intrigue, allowing the user to subtly be in a place where there is continuously slow change in the room. It is one aspect that CC could progress with.

Using motion, various detection and changes in shapes allows pattern to be generated. The light is also affected by the amount of openings from the shape. Both paper models and translucent materials have been tested. Translucent brings more flexibility as prints could be placed onto the surface at the same time allowing the light to pass through. When the shapes overlap during the motion, various shades and tones are seen. This is also a way to elude an emotion response that could be further explored in the future.

The process is of learning to find new ways in developing the filter. Visual motion in CC influenced this design to become a layer of moving parts. The idea of the shape is significant as it is tiled, thus fits together perfectly, however when the center pivot begins to turn, the shapes begin to overlap, where openings are created to allow light penetration. Through the rotating process, light will be influenced in intensity, speed and motion.



Benefits or consequences of result:

Benefits: The benefit of CC is that it is both mood lighting and a lighting that is designed to awaken the user. It is to improve on the features of a room, that effect a life style. As guests their temporary stay is indulged with in their sensory perceptions, whether it is to relax, or wake up feeling refreshed.

CC could compensate for hotel rooms that might not have such a pleasing view, using the light to make their stay more personal and relaxing.

Because CC uses the wall structure, it could be applied to any wall variations. Further more it could work outside the bedroom environment into more public areas where lighting is to make a space more of an experience. It is a flexible design that still works without the need to awaken the user from rest.

CC could be a free standing double sided feature wall in place of a single sided wall. The double sided wall lights up both sides of a space.

Consequences: Using this light source of LED requires a filter as the beam of the LED is too bright and may bring discomfort to the eye. Further more filters are highly recommended to disperse the light to give it an even colour wash that takes away the intensity.

CC needs a dark space to display the optimum out come of the desired effect. It loses the effect in daylight unless the LED lighting colour is in contrast to the existing room lighting. CC is used at optimum level during night time conditions or when there is less light.

Due to CC being a wall application the exact size of foot print is dependant on the amount of the wall surface, whether is it the whole wall, or a segment of the wall.

CC is a light that spreads the light, it is not a lighting function for a specific task such as spot lighting. The consideration of spot lighting is still needed within the bedroom depending of the users function.

Reflection

Quality of work (merits and weaknesses)

Light emission of LED is limited in controlling the gradient of light on the overall surface. For this to happen, complicated programming needs to be applied of which I am unable to do on my own. CC does not demonstrate this lighting technique of gradational change, which could be more effective towards the experience of light.

The exploration a 1:1 model is very interesting and exciting. It has positive impacts to understanding practical issues of construction and the perception 1:1 at the human proportion. Flaws could be identified and to exam whether is works or not. The design begins to live outside the mind.

Principles of good lighting practice should be the starting point for lighting design; we can expect that these might be amended as our knowledge about what constitutes healthy light improves. These principles include energy-efficiency and environmental considerations that should not be

forgotten. Healthy light in the broadest sense must also be ecologically sound.¹⁶ Though CC is design lighting of health consideration, the application of the product is unsound due to the cost of the technology used to produce this design leading to a weakness currently at time.

¹⁶ Veitch, J.A., Principles of Healthy Lighting: Highlights of IE TC6-11's Forthcoming Report, National Research Council of Canada, Institute for Research in Construction, Published March 2004, page 3

My own process (please refer to supplement for detail): The main process was on going filter testing the filters are made at 1:1 and experimental. The filter preparation was a main part of CC, which was continuously worked on. The filters along with the light were design together to create the effect of: motion, transparency, opacity and colour dispersement.

Models of the hotel rooms have been created to place the light into the space to see the effect of CC. CC at the moment is still in working process where it is at the state of putting together the light structure with prototype filters.

Experimenting with light is an intangible process, as it hard to capture. It is impossible to attain the exact state of desired lighting or to repeat it continuously. Due to the change of lighting, filters play a large role as it is able to reflect upon the theme and the mood.

It was an important experimentation to not use

improvisation of LEDs. It was a necessity to work with the right light as the filters were dictated in appearance by the intensity and colour of light. It was able to see the how the filters reacted and if it was the desired effect.

Selected rooms of the hotel environment were built at 1:135 models. This was to show a scenario of the light possibilities with the filter. It is an impression of a general overview of how it could affect the room of an existing space. The importance of this process was to test the possibilities of CC considering the limitations of the built hotel room. Potential aspects and options were given more clarity in this process.

Digital work were done on goingly whether it was down loading photos from a shoot, comparing images, testing of images of shapes before 3D digital concepts were generated. Documentation through photography is an essential process as it recorded the stages, progression and an expanding reference of work to rely on.

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Personal source:

Semrén & Månsson Arkitektkontor AB,
Architects of Avalon Hotel

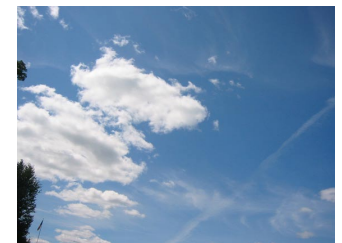
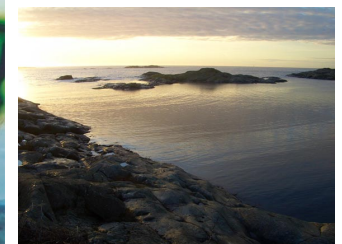
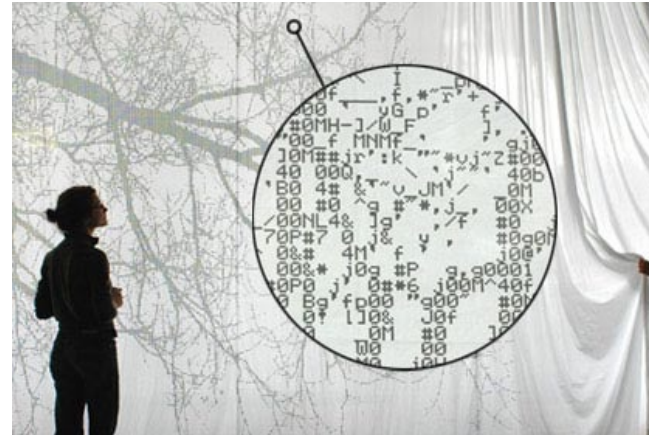
Jan Simon
AB Svensk Ljussupport

Avalon Hotel, Gothenburg
Patrik Turnesjö
VD/Managing Director

The assistance of staff and technical support at
Hobbex, Gothenburg.

Supplements

These images show variations of light, colour, tone, reflection, shadows, intensity and diffusion of light. Whether it is the daylight or twilight the general landscape images investigated the types of light in various environments. The characteristics of the inspirational images were important to the outlook of the design of CC.



01 Visual illusion

Transparency as a filter became an interest due to the material quality. Both light and the print are able to work well together on both occasions. There is a play on illusions of a subtle change in the room depending on where and how the surface was being viewed. The over laying of lines similar to Moray patterns has a hidden image in the print that one can see depending on the light and the direction of where he or she is standing.



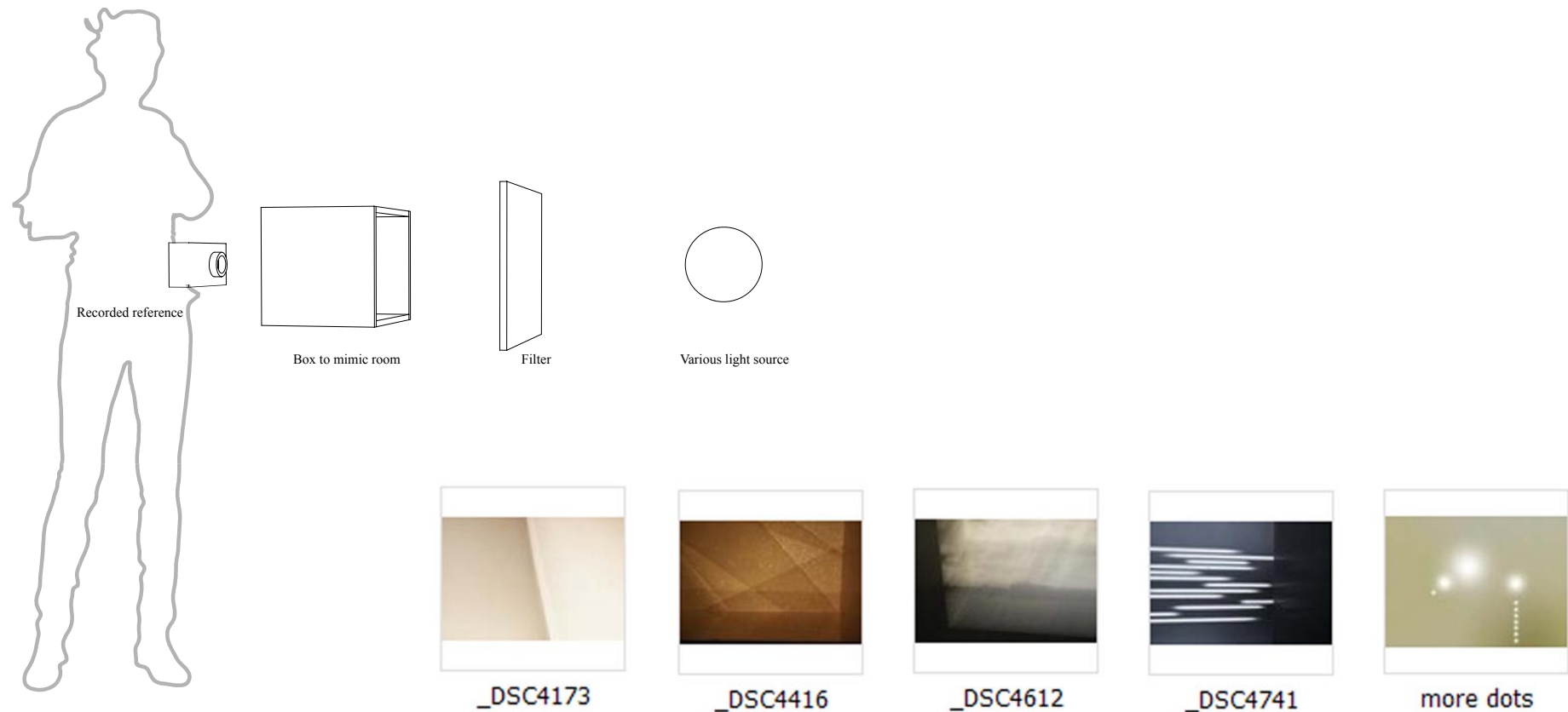
02 Filters

Because CC's two main element of lighting control is based on the light source and the filter to create a specific layering of lighting effect, investigation of the dispersement of light was a fundamental experiment. This experiments aim was to play with daylight, tungsten lighting, florescent and computer screen projection lighting to see the effects placed behind the filters. A box was created to mimic the

formation of a room to further see how the walls were affected by the light.

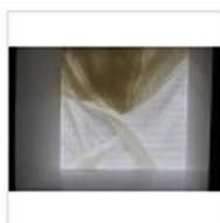
The filters used included thin cotton fabric, tracing paper, digital imagery that was projected via the computer screen and photography overlay. The play on the gradient of light was explored to intimate qualities of the rising sun. As a result the filters

achieved were able to set a strong mood, theme and setting through the type of lighting. A preference was the more ambient tone where the there is a subtlety in gradient change. Though other filters with direct projection of images, the effects is too dominate without the impression of in wonderment and abstract visual interpretation.





_DSC4175



_DSC4367



_DSC4369



_DSC4372



_DSC4393



_DSC4412



_DSC4415



_DSC4439



_DSC4440



_DSC4443



_DSC4462



_DSC4576



_DSC4585



_DSC4602



_DSC4625



_DSC4666



_DSC4669



_DSC4675



_DSC4680



_DSC4686



_DSC4695



dots



DSC04229



DSC04313



grey room



grey roon01



lines

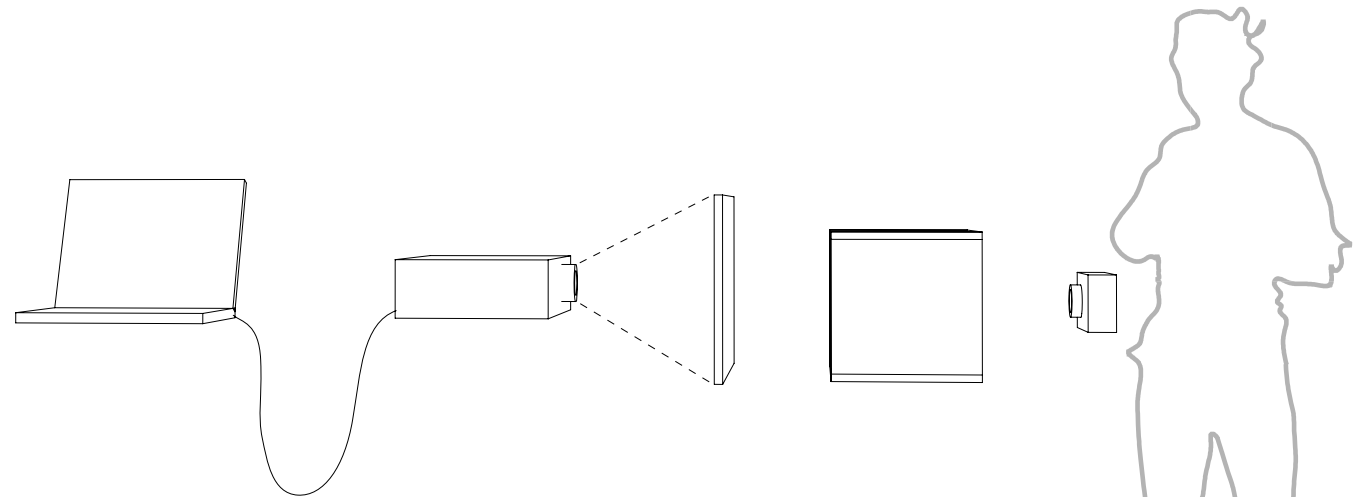


lines and more dots

03 Walls and lights

The goal was to set up a room environment and to use back light projection to show the images. The light projection explores the whole wall surface being exposed to the light source. There are both 'on and off' states as a comparison study. Gloss walls were used as a preference to further reflect the lighting. This study was to show how the light could appear in a room. Both motion picture

and static images were explored. Plexiglas is the surface used to allow the various penetration of light of which the images were projected onto. The result gave a general idea of the design is taking place. The feeling of intensity and colour of the light enabled a setting of a mood through the change of colour or texture projection, in which it was useful to clarify a mood or setting.



IMG 3748



IMG 3762



IMG 3766



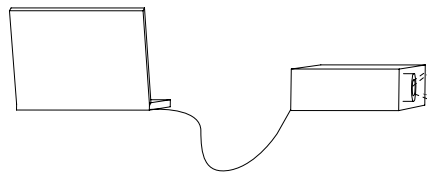
IMG 3768



IMG 3771

05 1:1

This was using a projector as a light source to have an experience at the human level. The light intensity and colours used is only an example to understand the scale and the effect of the light. It explores how the light hits or affects other surfaces and how humans have on the presence of light. This process was interesting to see the light dispersion over a large area, though it is not the desired affect, it was a process that allowed a change in the room. It was positive to have a 1:1 perception.



IMG_3750



IMG_3757



IMG_3697



IMG_3718



IMG_3698



IMG_3699



IMG_3705



IMG_3706



IMG_3708



IMG_3709



IMG_3715



IMG_3724



IMG_3729



IMG_3733



IMG_3735



IMG_3741



IMG_3745



IMG_3749

04 Testing LED

A small study with LED, this was a torch light, 8mm white LED, narrow beam. This was an attempt to see how it worked behind any filter, in which case it was tissue paper. The room had daylight, however the LED intensity proved to dominate in the contrast of light and colour. The result of this in general show LED as a powerful light source and needs to be controlled in specific manner to achieve the desired effect.



IMG_3663



IMG_3671



IMG_3673



IMG_3674



IMG_3675



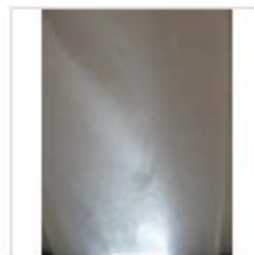
IMG_3676



IMG_3683



IMG_3684



IMG_3677



IMG_3682

06 Loopy filters

This processed played with the depth of the strips in comparison to show tactile patterns. The effect could be dramatic or subtle depending on the surface to blur out the filter. Various filters were crated using different materials such as photo paper

and translucencies. The strips need to have a bit of bounce. For it to remain as loops it has to sustain compression. LED lights were used, colour, tone, intensity were experimented with.



IMG_4590



IMG_4593



IMG_4595



IMG_4602



IMG_4604



IMG_4605



IMG_4606



IMG_4638



IMG_4670



IMG_4675



IMG_4688



IMG_4689



IMG_4690



IMG_4695



IMG_4697



IMG_4698



IMG_4699



IMG_4700



IMG_4705



IMG_4706



IMG_4710

07 Hotel models and light experiment

The Avalon Hotel plans were used to create models at 1:350. Through this exercise the bedroom environment and the lighting was placed in context with one another. Tests show various wall surfaces, colour, pattern and intensity of the light. Testing out the effects of lighting and to see how it affects the room and so forth. The lighting used was LED, the actual light source that will be used for CC.



IMG_4950



IMG_4951



IMG_4952



IMG_4953



IMG_4980



IMG_4982



IMG_4985



IMG_5000



IMG_5001



IMG_4987

Avalon Hotel:

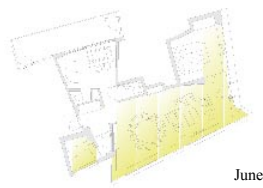
Note: all text information below attained from the Avalon Web site.

Penthouse: *'The world from above - 'At the top of the building one is on one's own, but with constant access to first-class service.'* - Avalon Hotel

Here, one can both be left in peace and yet still be in the centre. Out on the terrace, one has Gothenburg's downtown core far beneath one's feet. Avalon's Penthouse Suite is 83m² and offers views across the roof-tops in three of the Cardinal points.



June 9:00



June 12:00



June 15:00



November 9:00



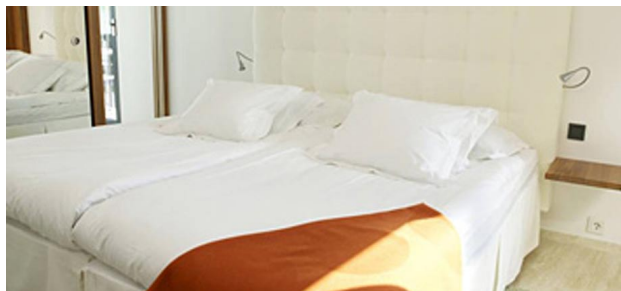
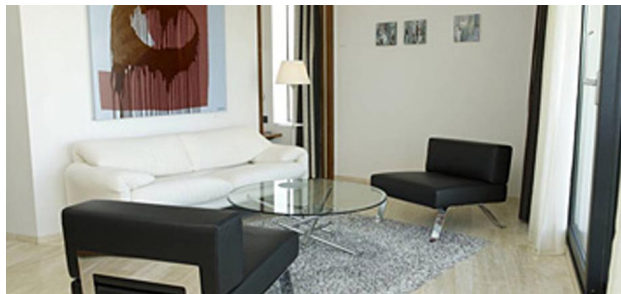
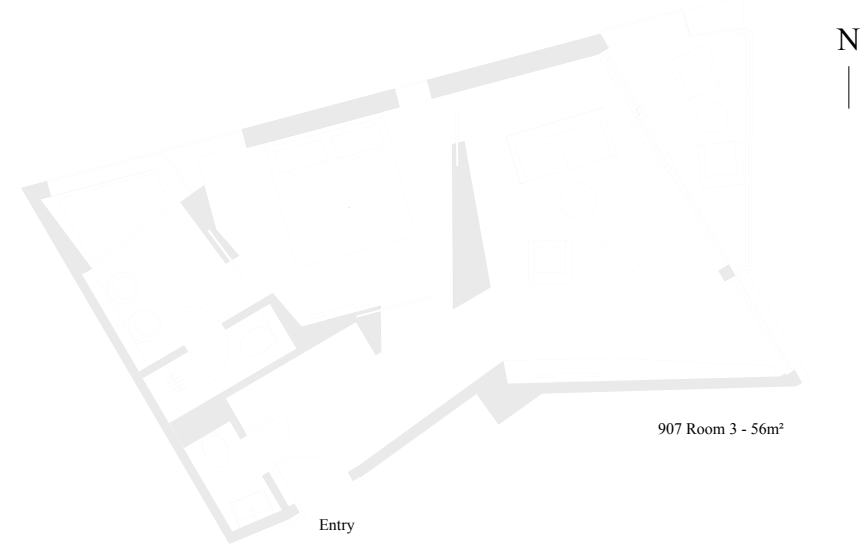
November 12:00



November 15:00

Suite: *Home like existence*

The two Suites, Kungstorget that is 56m² and Vallgatan at 50m², there is plenty of space. The interior design of Kungstorget is based on the furniture of *Arne Jacobsen*. There is also a mini-gym, an open fireplace and the opportunity to hold meetings. The separate bedroom, living room with sofa suite and balcony make it easy to live well in the suites. In the Vallgatan Suite, one has a view of central Gothenburg from the bathtub.



June 9:00



June 12:00



June 15:00



November 9:00



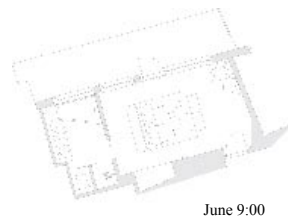
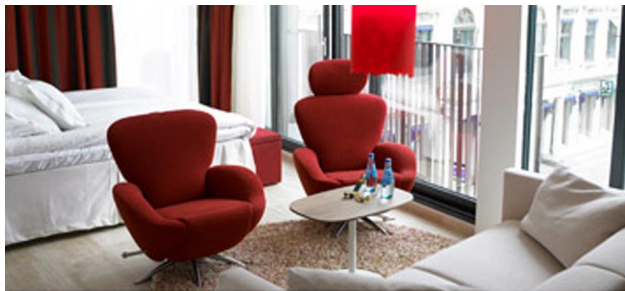
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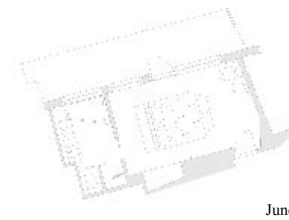
November 15:00

Deluxe: *Having only the necessity could be good enough*

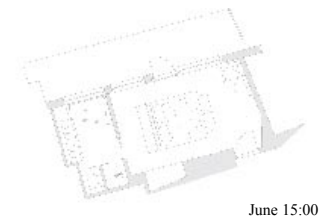
On the sixth floor, far out overlooking Kungstorget, are our 14 Deluxe rooms. 8 of them have connecting doors to Superior rooms. They are between 30-34 m² in size. Several of them have their own terrace. *King-size beds ensure that one wakes up well-rested.* With the same high-class interior design that can be found in the whole hotel – hand tufted Kasthall rugs, travertine flooring and specially crafted bed ends – an expression of relaxation and elegance is created.



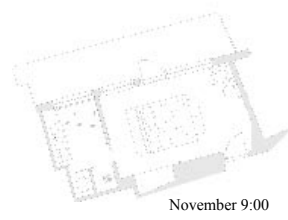
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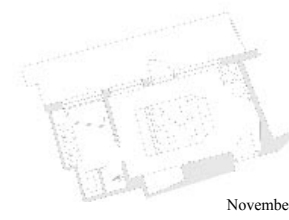
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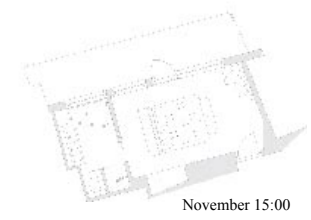
June 15:00



November 9:00



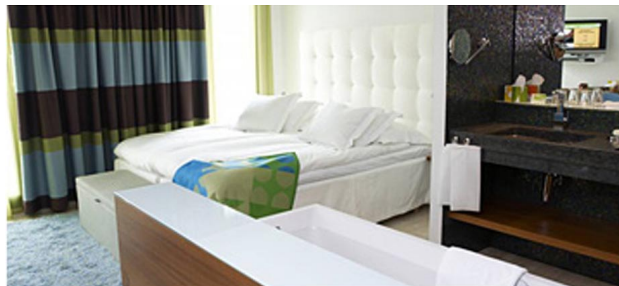
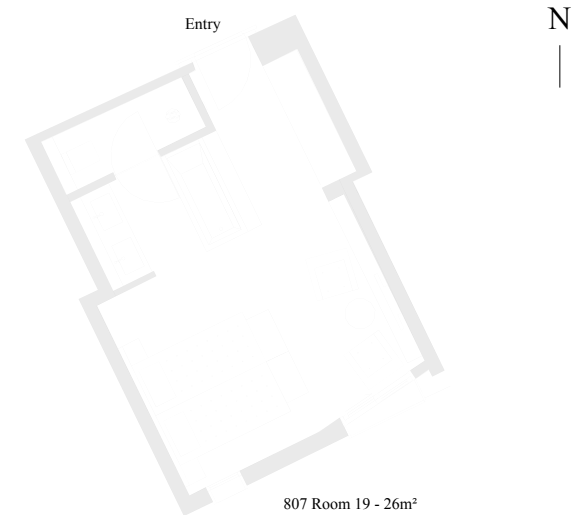
November 12:00



November 15:00

Superior: *Much more*

The 30 Superior rooms, which are between 24-32 m², overlook Vallgatan and Larmgatan. They are available in a variety of different styles, with 24 of them having their own mini-spa where the bathroom opens out to the sleeping area. One can enjoy the view whilst relaxing in the bath. Two of the rooms are designed to suit those who wish to exercise regularly and privately – there is a mini-gym. Some of the rooms have French balconies and some have bay windows. Regardless of which room one chooses, Avalon's central location means that one has direct contact with the city.



June 9:00



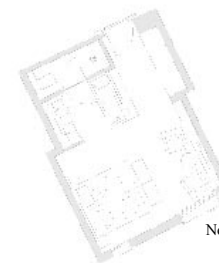
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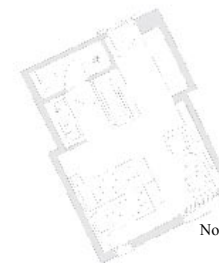
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November 9:00



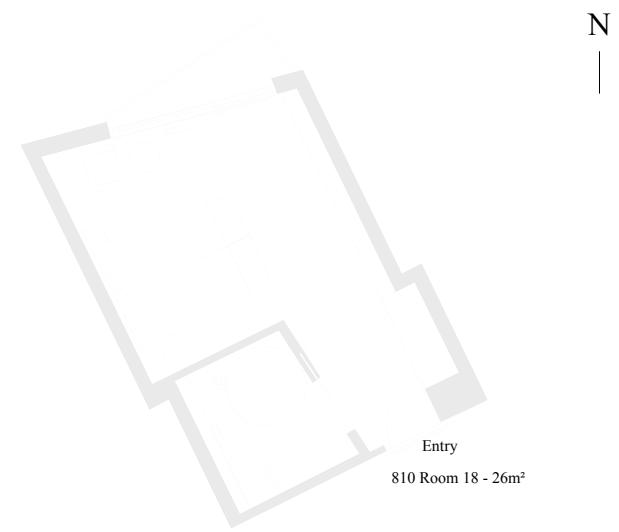
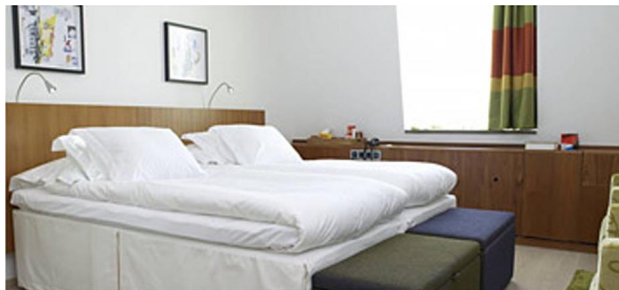
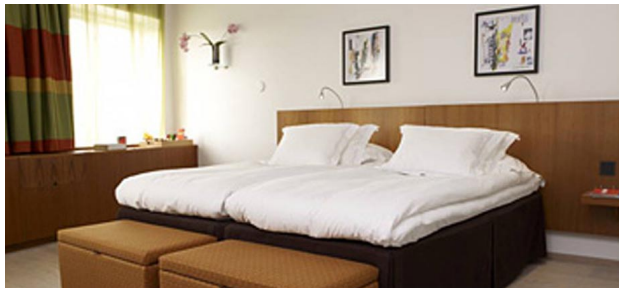
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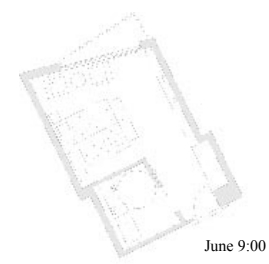
November 15:00

Business: *All that is needed*

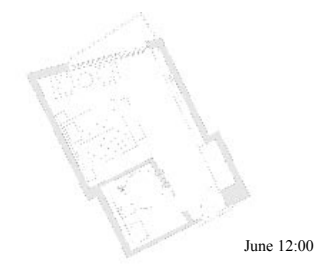
Even when traveling on business, one is not always at work. Just to kick off the shoes, stretch out and just be for a moment is vitally important. Of course you can work in the room as well - in one wall there is a hidden fold away workplace and naturally there is wi-fi. But it is still the room's ability to give sanctuary and to recharge that we have focused on. There are 28 Business rooms that can be accessed and are available to all our guests.



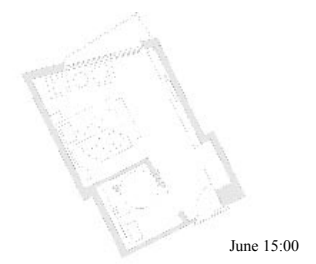
Entry
810 Room 18 - 26m²



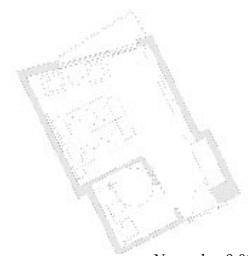
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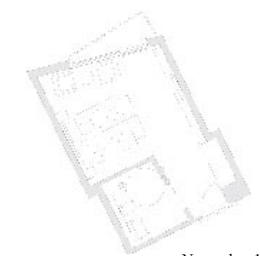
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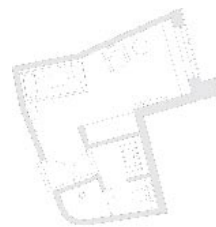
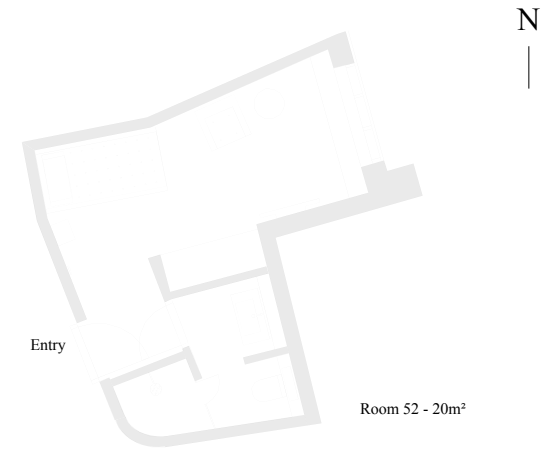
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Moderate: *Let the days become a little longer*

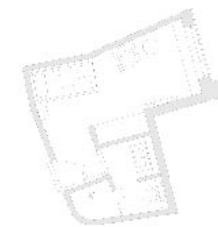
There are 6 Moderate rooms. They were the basis on which all Avalon's hotel rooms are defined. A kind of model for how they believe a hotel room should be. Calm and light. In the personally and carefully decorated rooms there is everything the guest need to live a meaningful life away from home.



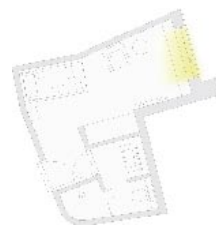
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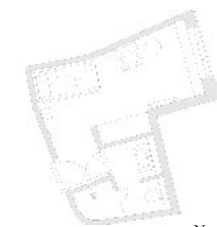
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