



Universidad de Valladolid



**ESCUELA DE INGENIERÍAS
INDUSTRIALES**

UNIVERSIDAD DE VALLADOLID

ESCUELA DE INGENIERIAS INDUSTRIALES

**Grado en Ingeniería en Diseño Industrial y Desarrollo del
Producto**

**Proyecto de investigación sobre la luz, la
cultura y el medio: Tilt**

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TFG REALIZADO EN PROGRAMA DE INTERCAMBIO

TÍTULO: Tilt

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RESUMEN

“Tilt” es un proyecto de investigación sobre la luz, la cultura y el medio. El tema específico, que era de libre elección, es el siguiente: los contrastes que crea la luz y cómo repercuten en nuestro comportamiento. Para la realización de este proyecto se realizó una investigación sobre el cine negro y neo-noir, además de una investigación del interior de la ópera de Oslo, donde se encuentra una instalación luminaria diseñada por Olafur Eliasson. Con la información recibida a través de estas investigaciones, se ha realizado el diseño de un producto. Toda decisión de diseño ha sido apoyada por dicha información, creando una armonía entre investigación y diseño de producto. El resultado es una lámpara interactiva, cuyo movimiento es activado por el usuario para crear un pequeño espectáculo de luz y sombras.

PALABRAS CLAVE

Luz, contraste, comportamiento, cultura, interacción

tilt

report

Author: Jenny Smith
Product Aesthetics and Cultural Understanding
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Introduction

In the course of this assignment and by means of my design process, I wanted to learn about how lighting affects human behaviour, and also how lighting can be a consequence of a socio-cultural situation of an era.

“*Tilt*” is the result of a dedicated investigation into lighting and its effects. I have tried to connect the main concepts of my inspiration sources with my own design, and this is the reason why throughout all this research there has been a constant dialogue with my product.

My focus has always been the users’ enjoyment, and this mood-lamp will make them experience unique feelings from the comfort of their home.

The Design Process is not usually a one way process, and at one point, something found in the investigation might take you back to square one. Something similar to this has happened to me, and due to this I have been able to learn quite a lot.

As said, my research question was how light can affect the user's mood, and how different lighting situations have different cultural connotations. From this, I reached my first brief:

“Design a mood lamp in which the user can adapt the light to his mood necessities.”

With that, I set some design requirements, which have remained quite stable throughout the whole process:

- Mood lamp
- Shadow patterning
- Pleasant aesthetics
- Interactive

During my investigation, I realized that adapting the light was not so relevant in my product, whereas the fact that the resulting light had to be appealing was very important. The process in which I realized this will be explained further on. Finally, I changed my brief to:

“Design a mood lamp which the user interacts with to create an appealing atmosphere.”

My main investigation themes were two: the first was the Oslo Opera House, and more specifically, the light installation that can be found in the lobby, “The Other Wall” by Olafur Eliasson. This was the space I chose for the written assignment. The second was films, specially Film Noir, as lighting in this film genre is a vital ingredient to create a specific atmosphere.

3.1

Film Noir

I chose Film Noir as one of my research topics as I am very interested in films and filmmaking, and in this specific film genre, lighting plays a very important role. It is based on the use of chiaroscuro (high contrast between light and shadow) and they use shadows as metaphors not only to create a tense and confusing environment but also to emphasize the character’s psychology. In this way, a whole story can be told through light.

To fully understand these techniques, I captured photograms of some Noir films in which lighting expresses different feelings. Some examples can be seen below. The whole document can be found in the Appendix, section “Film photograms and their meanings”, p. 23.



1

Shadow suggesting her destiny- prison.



2

Projected shadow- dark side appearing, evil plans.



3

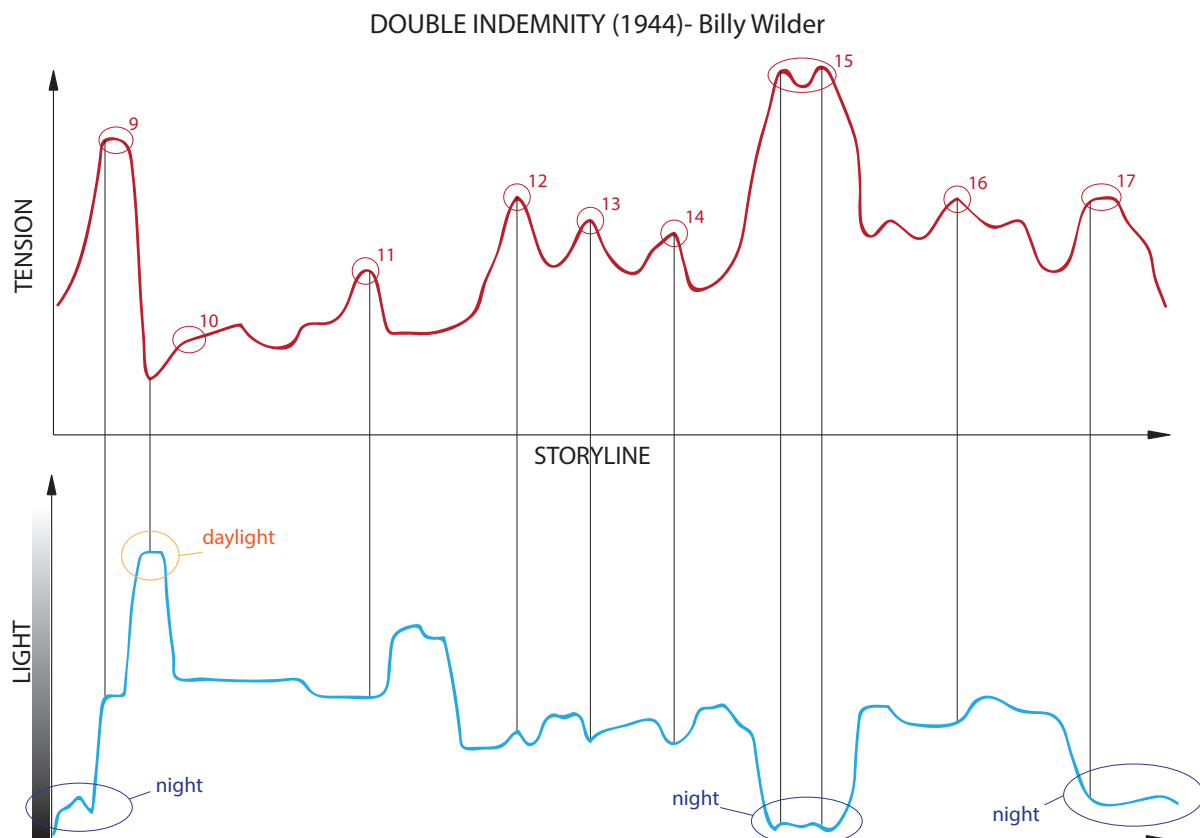
Illuminated face- confession, sheds light on the truth.



4

Light at lower angle- menacing look, planning evil.

I also conducted an investigation that contrasted the emotional tension of the film with the amount of light in the scene. For this purpose, I chose two Noir films: “*The Maltese Falcon*” (1941), by John Huston, and “*Double Indemnity*” (1944) by Billy Wilder. Two graphics were made for each film, one indicating the tension, and the other, the amount of light in the scene. One of the film’s graphics can be seen below, but details can be found in the Appendix, section “Tension and light graphics”, p. 24.



Conclusions

As I had foreseen, different lighting techniques created different moods. This conclusion can be seen in the images on the previous page. In these images what can also be observed is that high contrast between light and shadows enhances the feeling of mystery, intrigue and evil. Shadow patterning is also used in a symbolic way, for instance, to indicate the characters’ fate or their dark side.

What can also be said is that generally, high tension points of the film are connected to dark lighting. Moreover, the climax of the film usually occurs at night. It is quite interesting that a lot of the Film Noir night scenes were actually filmed at night, which is not very common in other film genres, where they are recorded in daylight.

3

3.2

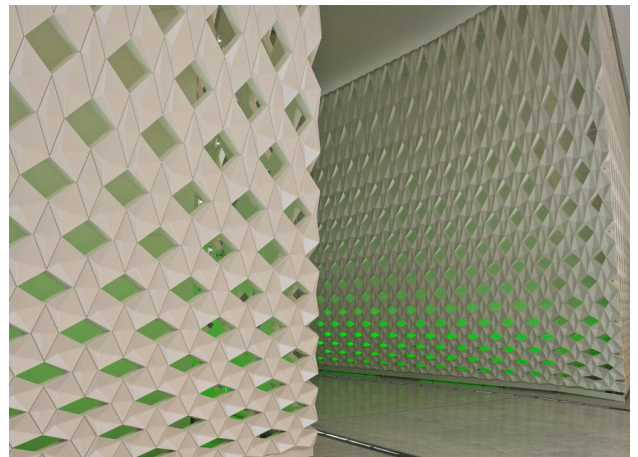
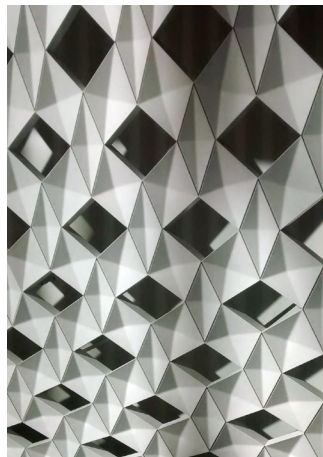
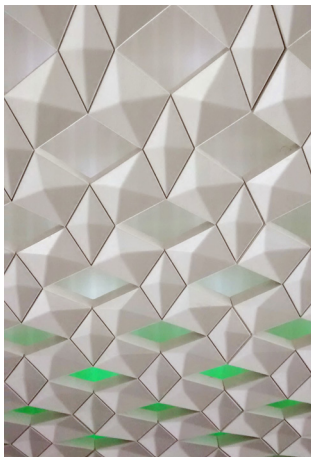
“The Other Wall”

“The Other Wall” is a light installation that was designed by the Danish-Icelandic artist Olafur Eliasson for the lobby of the Oslo Opera House. I became particularly interested in the space this installation creates because of the sensations it makes the viewer encounter.

Observing the “Other Wall”, I noticed that different lighting situations changed the way you see the installation. When fully lit, there is a sensation of a union between wall and background, and it seems like they become one. In contrast, when the sun falls on the piece, the space changes completely: the wall looks empty; the background is lost.

I also discovered while walking through that you get a calm sensation, which makes the hectic everyday life of the city seem far away. This was Olafur Eliasson’s goal in his design: inspired by the interior of a glacier, he wanted to portray the slow temporal sequence that prevails there. In this way, “The Other Wall” gives the opportunity to enjoy the calmness that cities prevent us from experiencing.

Eliasson also used the ripples of water from the seafront as inspiration for his design. He translated the movement of water into waves that can be seen in the pattern, that subtly cross each other like waves in the ocean do.



The installation lit with artificial light left, and with sunlight, right.

Waves on Olafur Eliasson’s pattern

Basketmaking

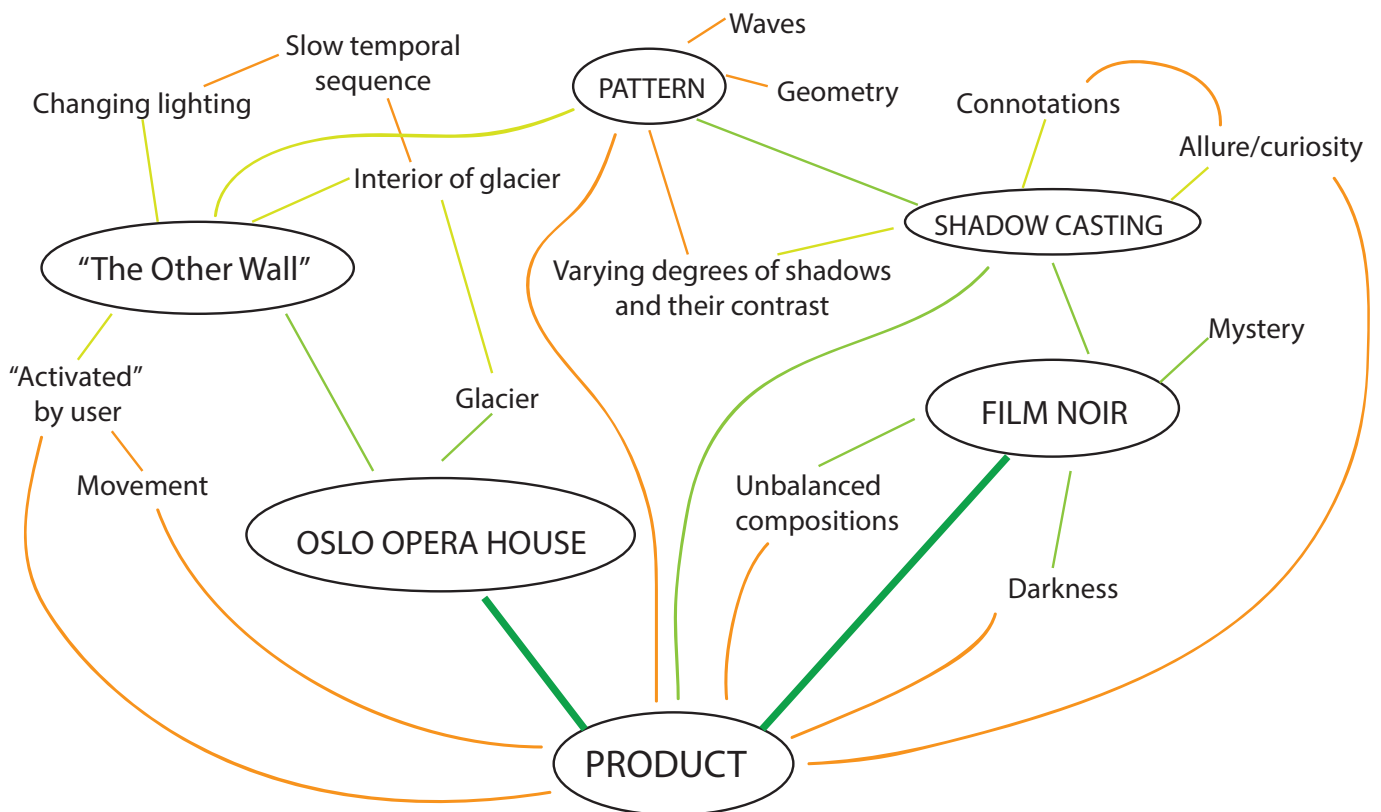
In the course of my design, I came up with the problem of how to figure out the pattern of my product. As it had production-wise similarities to basketmaking, I looked into these techniques to find out more about them, as they could provide me good insight about how to produce my product. I got quite a lot of valuable information from this investigation about how to make my product. The decisions which were result of this research will be explained in the “Design Process” section.



4.1

Concept-Map

To be able to draw connections between my research material and my future product, a concept-map was made, in which all the ideas could be seen in a schematic way.



- Main inspirations and research topics
- Concepts connected with main topics
- Secondary concepts connected with main topics
- Tertiary concepts that connect with main topics and are also input for Product

4.2

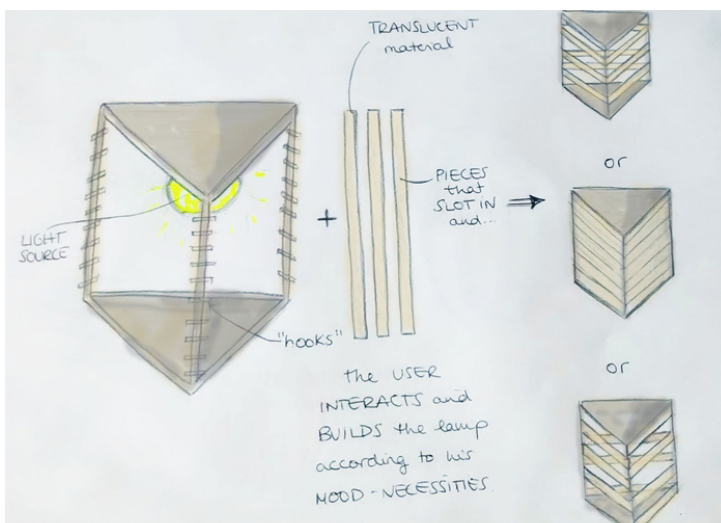
Initial ideas

From my investigation into Film Noir I concluded that I wanted a lamp that would create a mysterious atmosphere, which the user could be attracted to, like the viewer of these films. Shadow patterning would be the most interesting option, which would also correlate with my investigation. User's interaction was another concept I wanted to work with, as it creates a special bond between user and product.

My first thoughts were to design a mood-lamp in which the users could adjust the light to achieve the desired lighting effect according to their mood. Using the ideas of shadow-casting and user interaction, these were my first product sketches.

**1**

It consists of two translucent lampshade layers which form a sphere with gaps in between. The outside layer is fixed, and has constant distances between the strips. The inside layer is mobile, which enables the user to rotate it to adjust the light to the desired effect. This is due to the different distances between strips, making the light that filters more diffuse or more intense. The shadow casting will change in this process, making the interaction with the lamp interesting for the user.

**2**

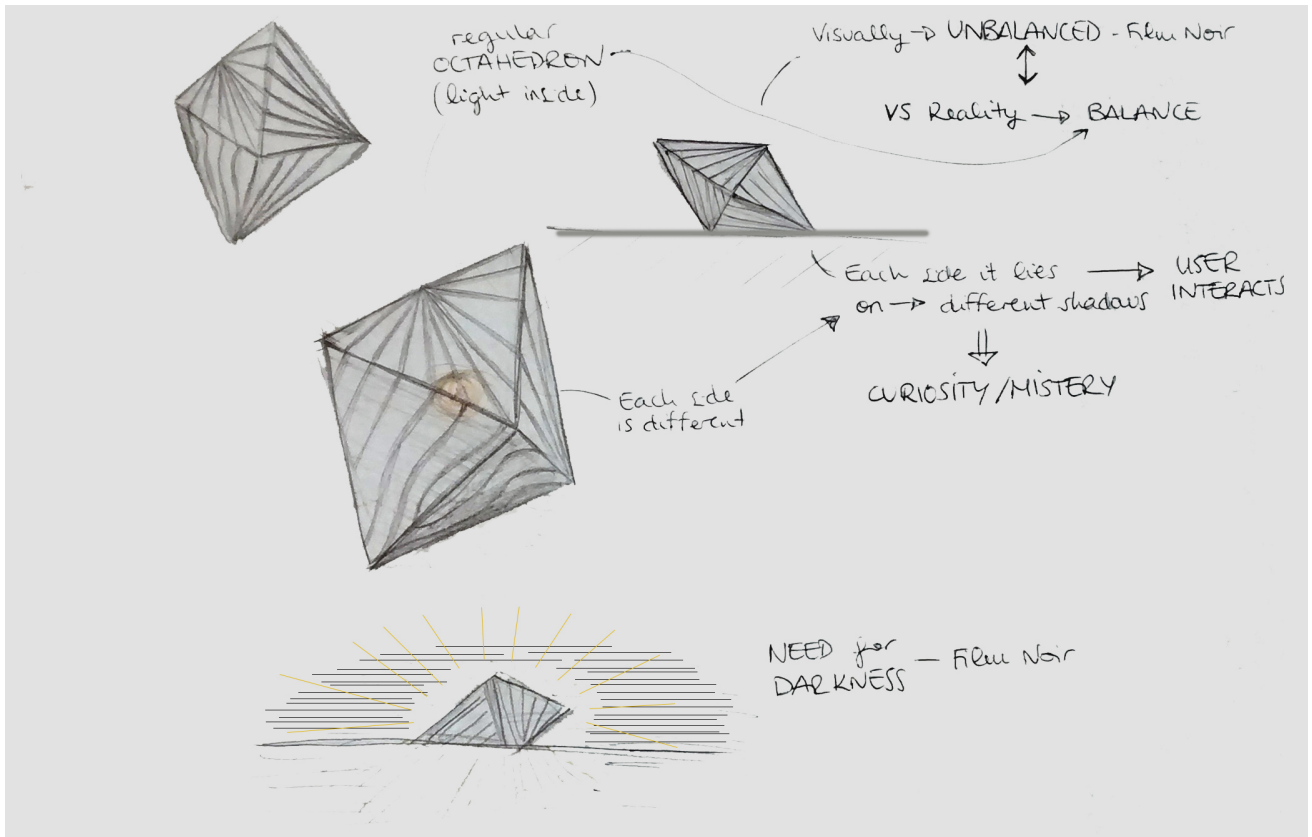
It is a frame in the shape of a triangular prism which has small "hooks" on its vertical edges. It comes with additional pieces, which are translucent, and these "hooks" enable the user to slot these pieces in the frame, producing a lampshade. In this way, the user creates and builds his or her own personalized lampshade, making it possible for the user to adapt the light to his mood necessities.

Development

I soon realized that recreating the moods of Film Noir in a lamp might not be such a good idea, due to the negative connotations they have, such as fear and evil. Nevertheless, I wanted to represent that mysterious atmosphere that the shadow-casting creates, as it becomes interesting and appealing to the user. This is when I decided to change my brief to creating a mood-lamp that the user could interact with to create this kind of atmosphere.

After the whole research into films seen above, I concluded that for the shadow-casting to maintain the viewer's interest, it would have to change in some way, or have some movement. In order for the user to interact with the product, he or she would be the one causing this movement. The product would need some darkness to fully enjoy this shadow-patterning show, creating a similar atmosphere to a Film Noir scene.

As Film Noir is characteristic for its visually unbalanced scenes, which create stress and uneasiness, I decided to use a visually unbalanced shape for my design.



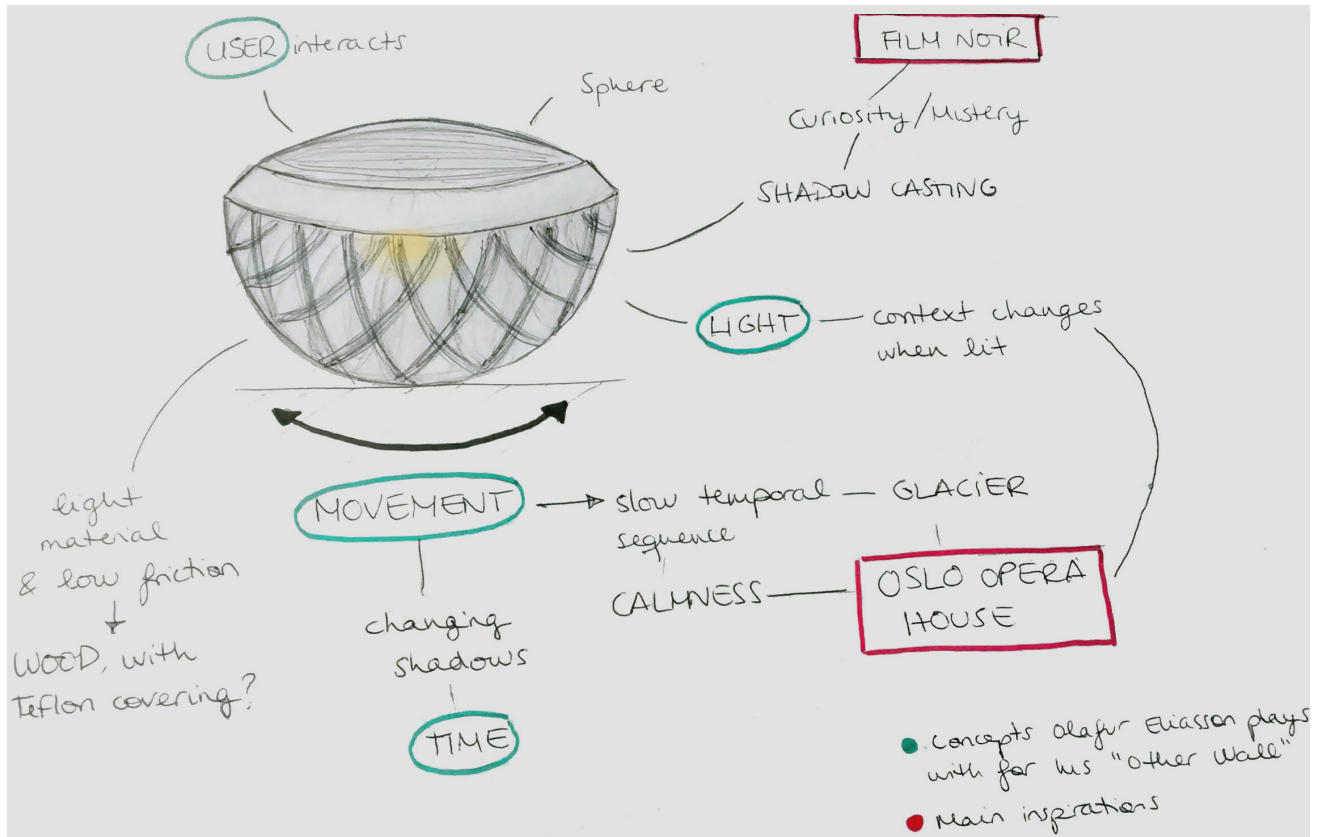
3

This is a lamp in the shape of an octahedron, and although it looks visually unbalanced, it is a very regular shape that is completely balanced. The user interacts with the lamp by placing it on different sides of the octahedron, which all have different patterns on, so the shadows that the lamp casts will be different each time, in this way maintaining the viewer's interest.

The problem I faced with this design is that my investigation into "The Other Wall" had not created enough input in the product. This was the reason why I had to carry on working on the shape.

Design Process

In order to connect the Oslo Opera House with the output of my product, I had to investigate more into the issue. The research can be found in the “Research” section. Finally, I came up with my final shape.



4

As explained in my research, the context of “The Other Wall” changed when lit. In my design this will also happen, because when lit, it casts shadows that will create a totally different space. The product’s aspect will also change, due to the different degrees of contrast between light and shadow the light will produce.

For my design I have also used that concept of slowness that Eliasson described of the interior of a glacier. I have translated it into the shape of a half sphere, which the user tilts to get it moving and little by little it slows down to a halt. This shape will also create a continuous movement, instead of the abrupt changes of light that the octahedron produced.

Another reason why I chose this shape was because I re-interpreted the waves that appear on the pattern of “The Other Wall” into the actual movement that the ocean waves produce, which is the rocking motion. The sphere is the shape that would best replicate this movement.

I also wanted waves in the pattern of my product, but as spheres are complicated shapes, I had to make a physical study of the shape to be able to define it.

4

Design Process

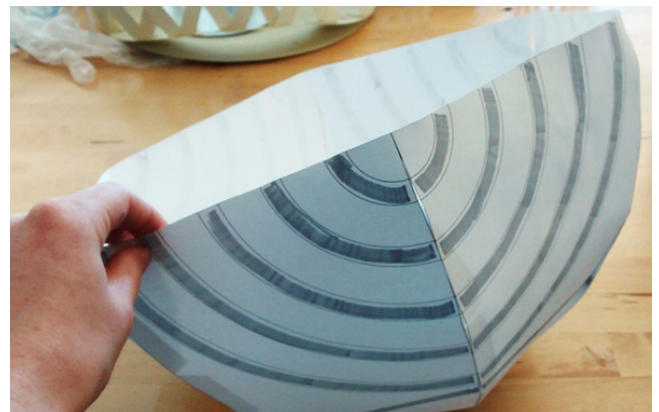
4.4

Scale models

Firstly, models were made to determine the size of the product. As it is a lamp that is supposed to be enjoyed in the user's home, the size should fit this purpose. After making many paper models of different sizes, it was concluded that the semisphere should have a diameter of 300mm.



Process of making semi-spheres in paper.



Paper model in the final product size, using hand to visualize scale.

Later on, paper models were made to deduce the product's pattern. As I wanted it to have a wavy pattern, I first thought of using semicircles that gradually increased in radius. Nevertheless, when it came to building this idea physically, it became problematic, as all the waves together did not form the semisphere I pursued.



Model in which semi-circles did not create the sought semi-sphere.



Paper models testing different patterns which created semi-spheres.

Design Process

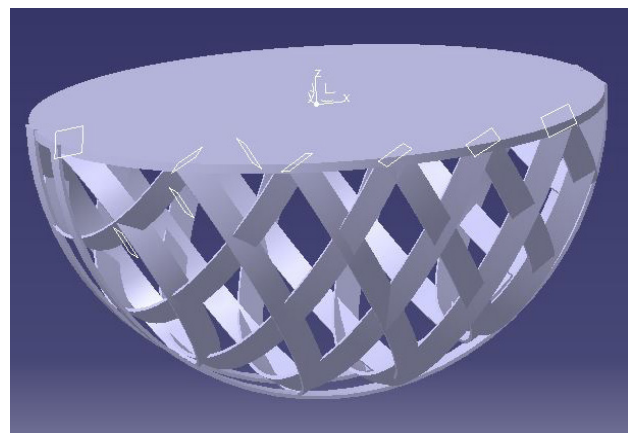
At one point I became quite blocked figuring out the pattern that would suit my requirements. Nevertheless, I realized that my product, due to its shape and pattern, could be quite similar to a basket production-wise. This is the reason why I looked into baskets and basketmaking techniques.

This investigation helped a lot, as it made me realize one crucial thing: circles are not needed to create a wave-like sensation. As the shape is a sphere, diagonal strips that wrap around it will simulate this feeling. This made the production much easier, and would also have the desired effect.



5

Baskets with hexagonal weave.

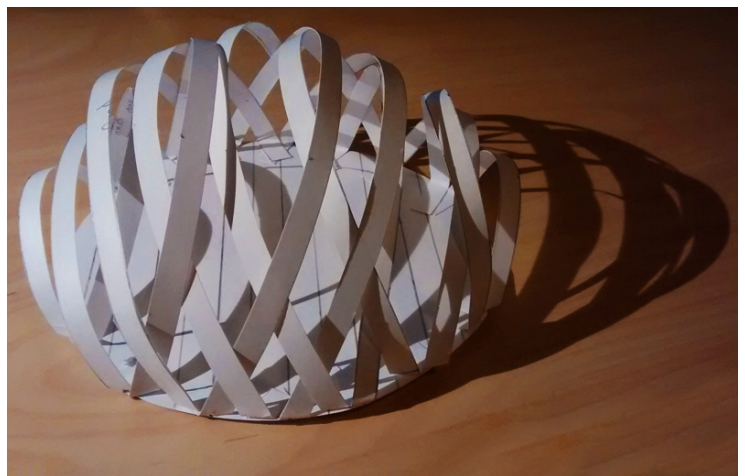


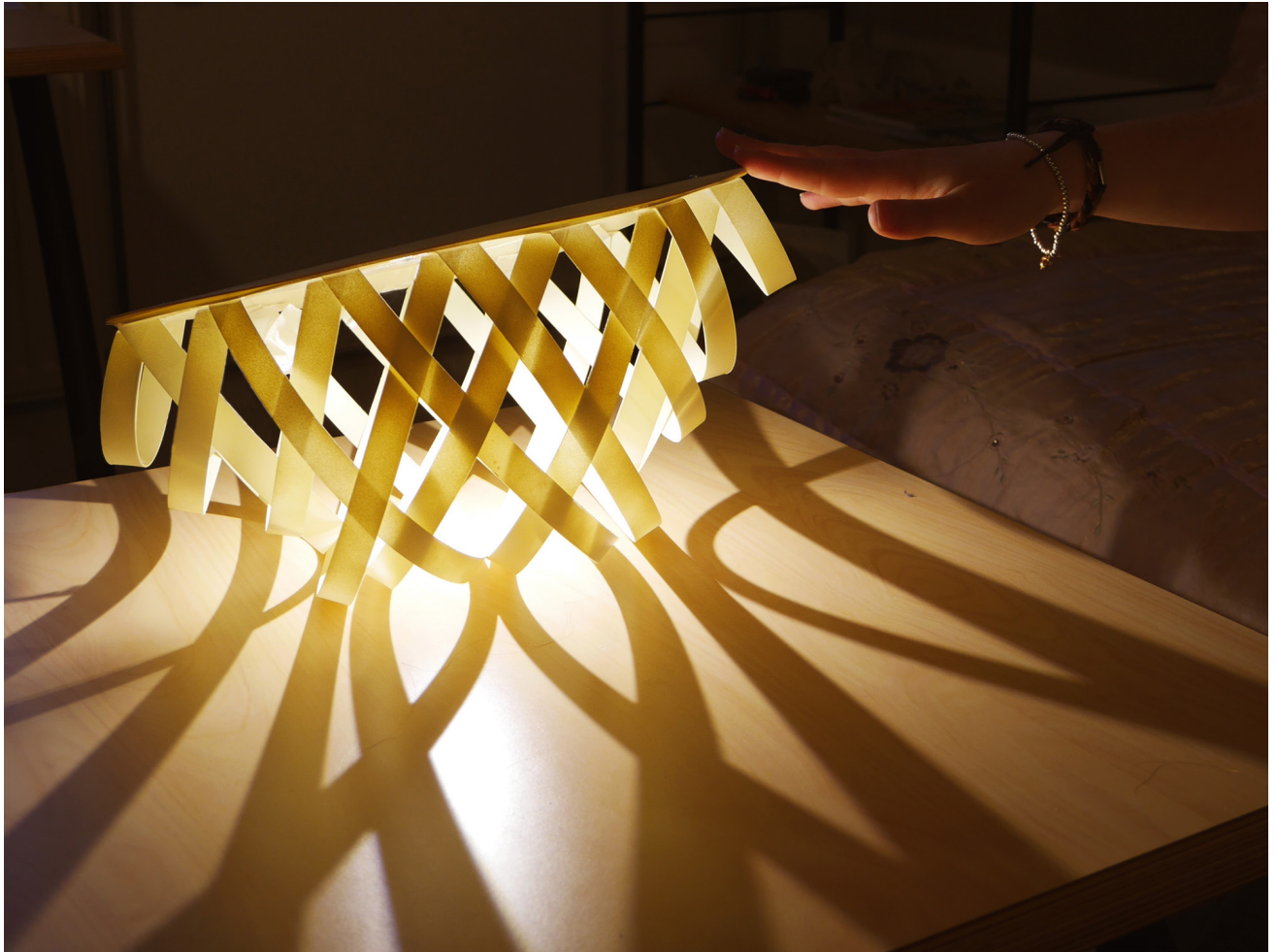
Picture of CAD model, made with CATIA.

After having discovered this, I made a CAD model of the product, and aided by this I was able to make a paper scale model of the final pattern.



Pictures of paper model, scale 1:2.





Final product in its context and use. More photos can be found in the Appendix, section “Photos of product”, p. 26.

“Tilt” is an interactive shadow-casting lamp, made out of 1mm thickness PET sheets, that contains an LED light source. This material was chosen for its suitable properties, as it can be easily bent into the desired shape. It is supposed to be powered by batteries, as a cable would partially impede the movement of the semisphere. Nevertheless, for the event of the exhibition, it will be powered by electricity, due to the inconvenience of having to change the batteries constantly.

As said, the light source is an LED fixture. When this light is on for a period of time, the fixture gets very hot, so there is a need of dissipating the heat in some way. For this purpose, the fixture will be attached to a sheet of aluminum, and thermal paste applied between them. This will distribute the heat along the aluminum sheet. In this way, it will not get too hot or become dangerous. In addition, nuts will be placed in between the aluminum sheet and the plastic top for the hot air to circulate correctly.

A plastic protector ring will be placed on top of the LED fixture due to the risk of electric shock.

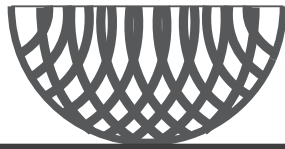
5.2

Product scenario

This lamp's purpose is the simple enjoyment of it, by means of a small shadow-patterning show that the user can experience from his or her own home. In a dark environment, it will create a totally different space that arouses different emotions, and the user becomes the creator of the shadow-movement. In this way, it could create a certain space of intimacy.

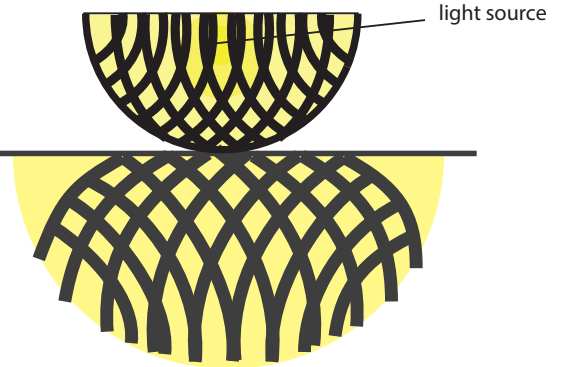
This is how the product will be used:

LAMP UNLIT



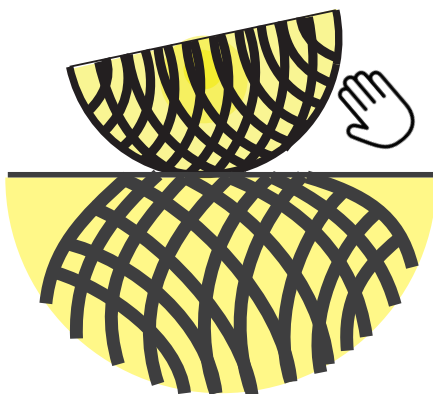
LAMP LIT

The shadow patterning makes the context change



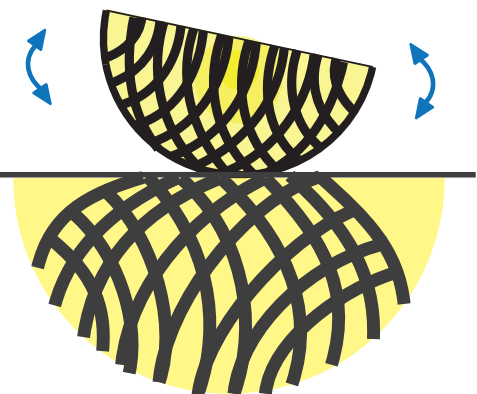
USER INTERACTION

The user tilts the sphere



MOVEMENT

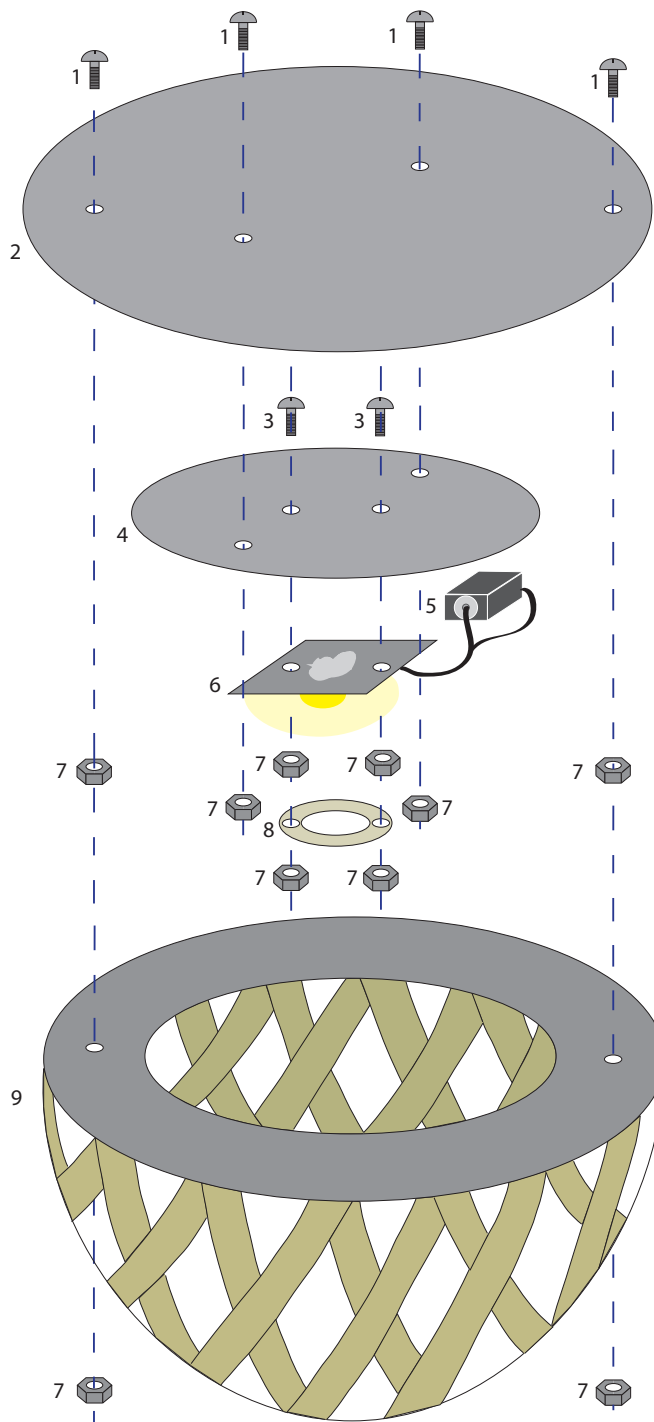
Once the user tilts the lamp, he activates its swinging movement, creating moving shadows



5.3

Explosion drawing

The lamp will feature the following components:

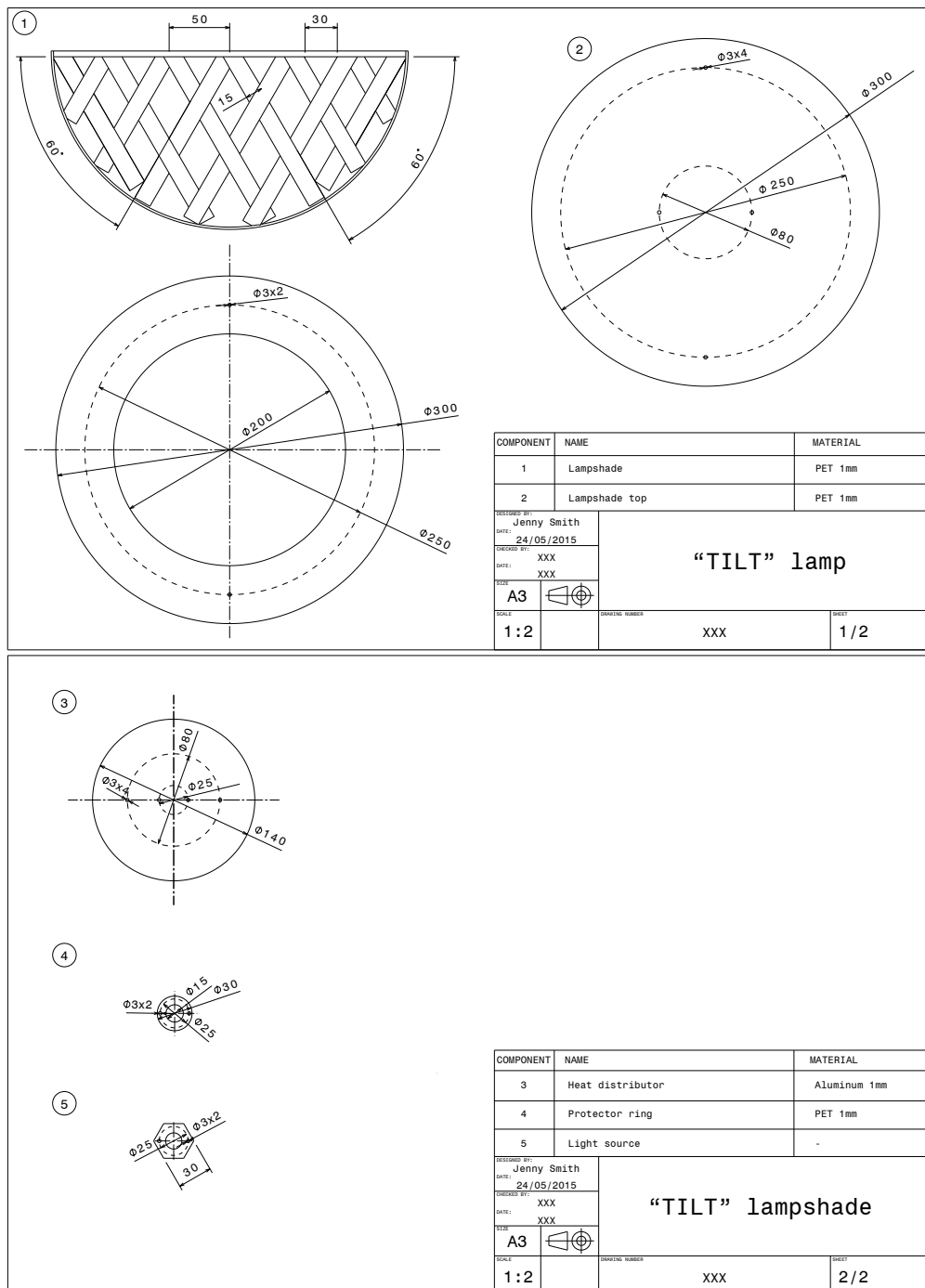


- 1- M3X8 bolts x4
- 2- Circular top, PET 1mm
- 3- M3X12 bolts x4
- 4- Circular Aluminum Sheet
- 5- Battery
- 6- LED light, with thermal paste
- 7- M3 nuts x10
- 8- PET 1mm protector ring
- 9- Lamp shade, PET 1mm

5.4

Technical drawing

Technical drawing of the product's components' most important measurements.



Representation of technical drawings. The real ones can be found in "Technical drawings", p. 28.

Production method

The production of this product is part machine-aided, and part hand-made. The material needed is:

- Sheet of PET of 1mm thickness
- Aluminum sheet, 1mm thickness

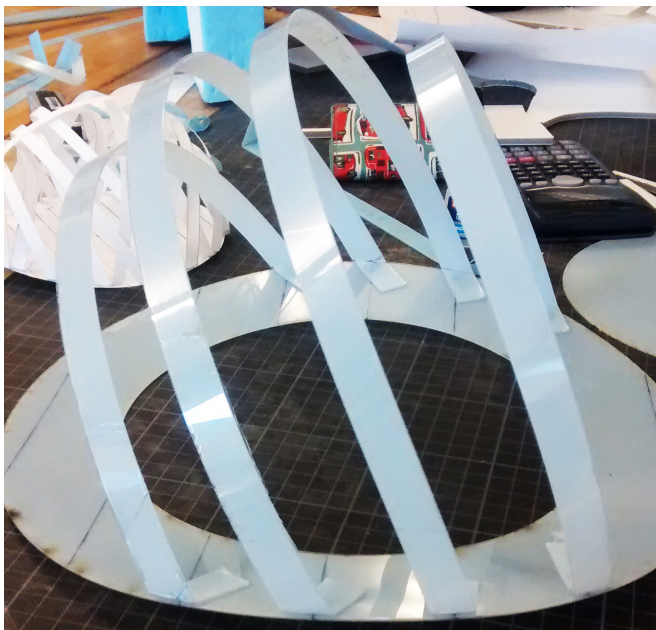
Three machines are involved:

- Sheet shear
- Laser-cutting machine
- Drill press

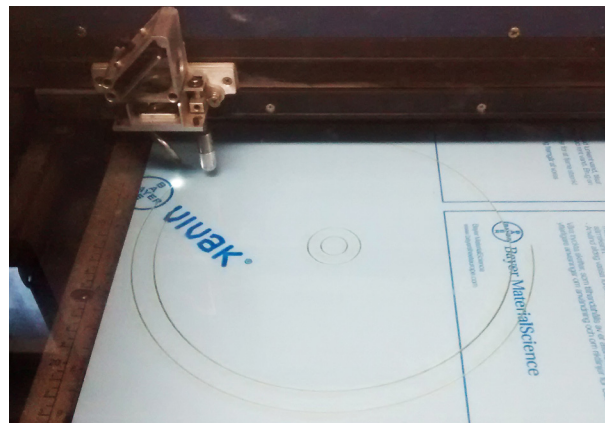
The sheet shear is employed to cut the strips that will be used to create the spherical shape and the pattern. The laser machine will cut the plastic circles and rings needed. For this, an Illustrator file of the drawing to be cut must be made. The drill press will be used to make the necessary holes for the screws.

The lampshade is made by hand. The PET strips are stuck with strong adhesive to a plastic ring which has a 300mm diameter. The strips are stuck at opposite sides of the ring, in a way that they form an angle of 60° with the horizontal. They are bent so they create a spherical shape, as can be seen in the image below.

In my case the PET sheet was transparent, so the material had to be spray-painted. To make the process simpler, the ideal thing would be having pre-coloured PET.



Process of making the lampshade with PET strips



Laser cutting machine cutting PET rings

After the completion of this project and the production of the product, all our class members exhibited their designs at the Norwegian Centre for Design and Architecture, DogA, in Oslo. The exhibition was called “lux”, and it was about light, culture and milieu. We were in charge of organizing the space in the exhibition centre and the graphics of the exhibition, as well as the setting up of the whole thing. In other words, we were fully in charge and responsible for our exhibition.

It was a success: the opening night was very crowded, and teachers as well as visitors congratulated us all on our hard work. We all had a very good time, and also, we learnt a lot. It gave me valuable experience on handling exhibitions, and on presenting and explaining products in an appealing way.



In the course of this assignment I have been able to comprehend the effects of light on human behaviour. Light has a great impact on our mood, more than we might think, and an adequate lighting for each situation is quite important. Darkness, in general, evokes negative connotations, as the investigation into Film Noir has proven. This is clearly due to our cultural context, that makes us associate darkness with crime, danger and insecurity.

I have learnt a lot about how to connect research results with the outcome of a product, and about how important it is to back up every design decision. The fact that I chose two topics I was very interested in made the whole design process smoother and easier to overcome. This made me want to investigate in more depth, providing me with fruitful results.

Throughout this project, I have been able to achieve the task of actually producing my design. In my case, I am quite proud of the fact that my product actually works, as I am not used to building my designs and I have little workshop training and experience. This is due to the fact that my home university does not prioritize student's workshop training. Although I was dreading this process at the beginning, it went quite well with the help of teachers and colleagues.

My final product might not have turned out exactly how I imagined it, but I can say that I have learnt a lot about how to plan a building process and what points to take into account before making a product. I have also learnt that, even though I was not used to doing this, making multiple scale-models is also a very helpful way to determine how to produce the product, as each model teaches you something. This is the reason why in the future, I will get used to making test-models before starting to produce the final product, as it decreases the percentage of error and saves a lot of time.



Reflection note

As I knew that for the course of this assignment a lot of research had to be done, I chose two topics that I am very interested in. The first one was The Oslo Opera House, which fascinated me from the moment I got to Oslo and even before arriving to Norway, as it is an internationally recognized building. The second topic I chose was Film Noir, a film genre I am particularly interested as light becomes symbol of different feelings. The fact that I chose two topics I am very inquisitive about made me want to research them in more depth, providing me with fruitful results and making the whole writing and design process smoother and easier to overcome.

In this course, I have learnt a lot about how to connect research results with the outcome of a product, and about how important it is to back up every design decision. The product becomes much more interesting if it has a story behind it. In the early stages of my design process, I did not realise how essential it is to create this story, and consequently, I had to go back on myself many times in the process. Nevertheless, with the help of my written assignment, I was able to connect my product with the story behind the Oslo Opera House and Film Noir. Due to this, the use of my product actually tells this story, even if it is in an abstract way.

Throughout this project, I have been able to achieve the task of actually producing my design, which in my case, was quite a challenge. I am quite proud of the fact that my product actually works, as I am not used to building my designs and I have little workshop training and experience. This is due to the fact that my home university does not prioritize student's workshop training, and we have little responsibility in the workshop. Although I was dreading this process at the beginning, it went quite well with the help of teachers and colleagues.

My final product might not have turned out exactly how I imagined it, but I can say that I have learnt a lot about how to plan a building process and what points to take into account before making a product. I have also learnt that, even though I was not used to doing this, making multiple scale-models is also a very helpful way to actually visualize the shape and to determine how to produce the product, as each model teaches you something. This is the reason why in the future, I will get used to making test-models before starting to produce the final product, as it decreases the percentage of error and saves a lot of time.

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All images that are not referred to by reference number belong to, and were taken by the author.

tilt

appendix

A.1

Film photograms and their meaning

MALTESE FALCON - John Huston, 1941



6

Contrast between positive/negative letters. First one, shadow of window, second one, dark night.



7



8

Unbalanced composition: creates stress.



9

Shadow suggesting her destiny: prison.

DOUBLE INDEMNITY - Billy Wilder, 1944



10

Illuminated face: confession, sheds light on the truth.



11

Illuminated face of satisfaction: realisation of murder.



12

Shadow projected: dark side appearing, evil plans.



13

Smoke that adds texture to light- mysterious look.

THE KILLING - Stanley Kubrick, 1956



14

Light at lower angle: menacing look, planning evil.



15

Light at high angle: mysterious look.

SEVENTH SEAL - Ingmar Bergman, 1957



16

Hiding eyes in shadow, hiding identity.



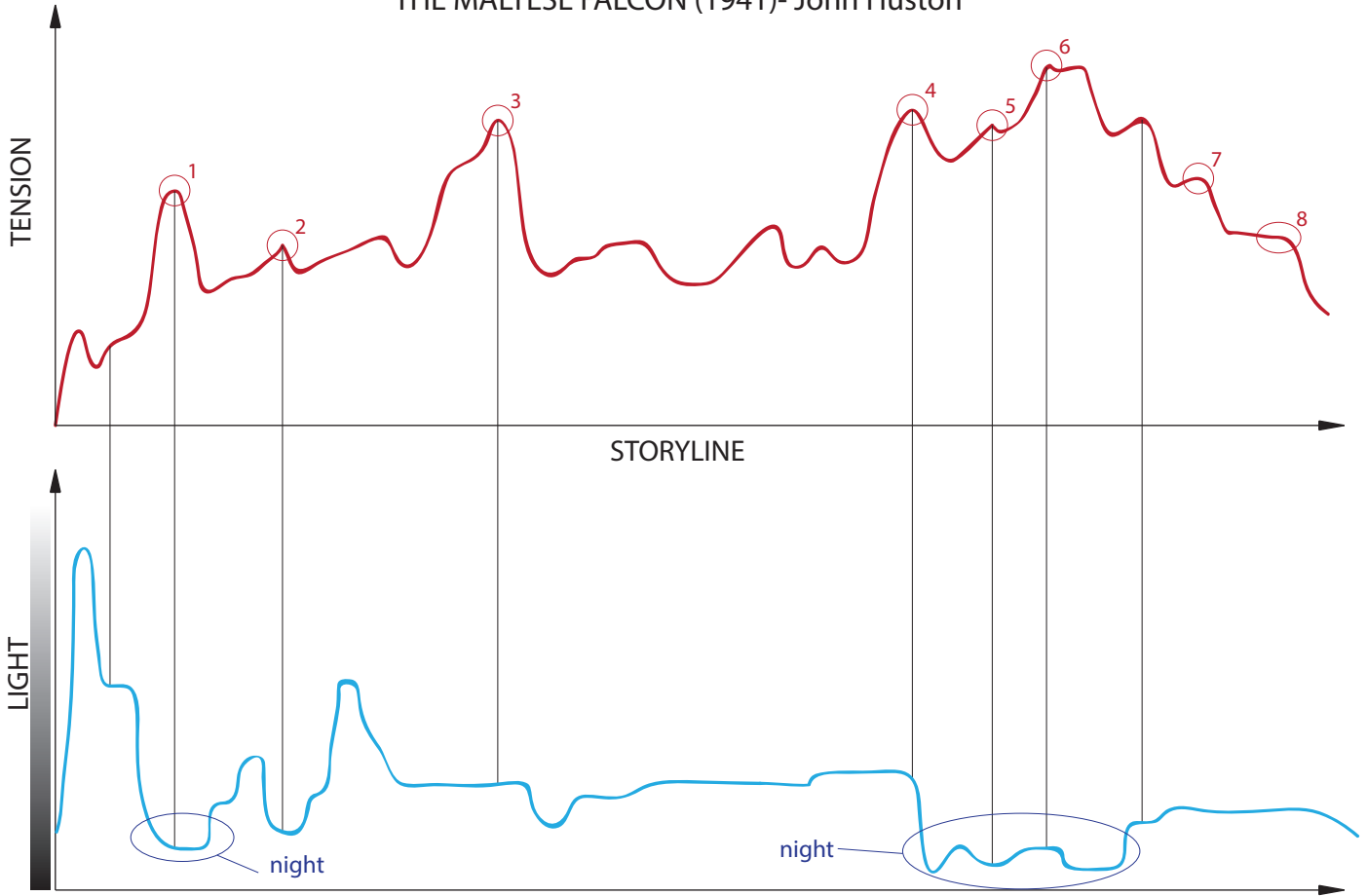
17

Light reveals a face, the face of God that looks over silently.

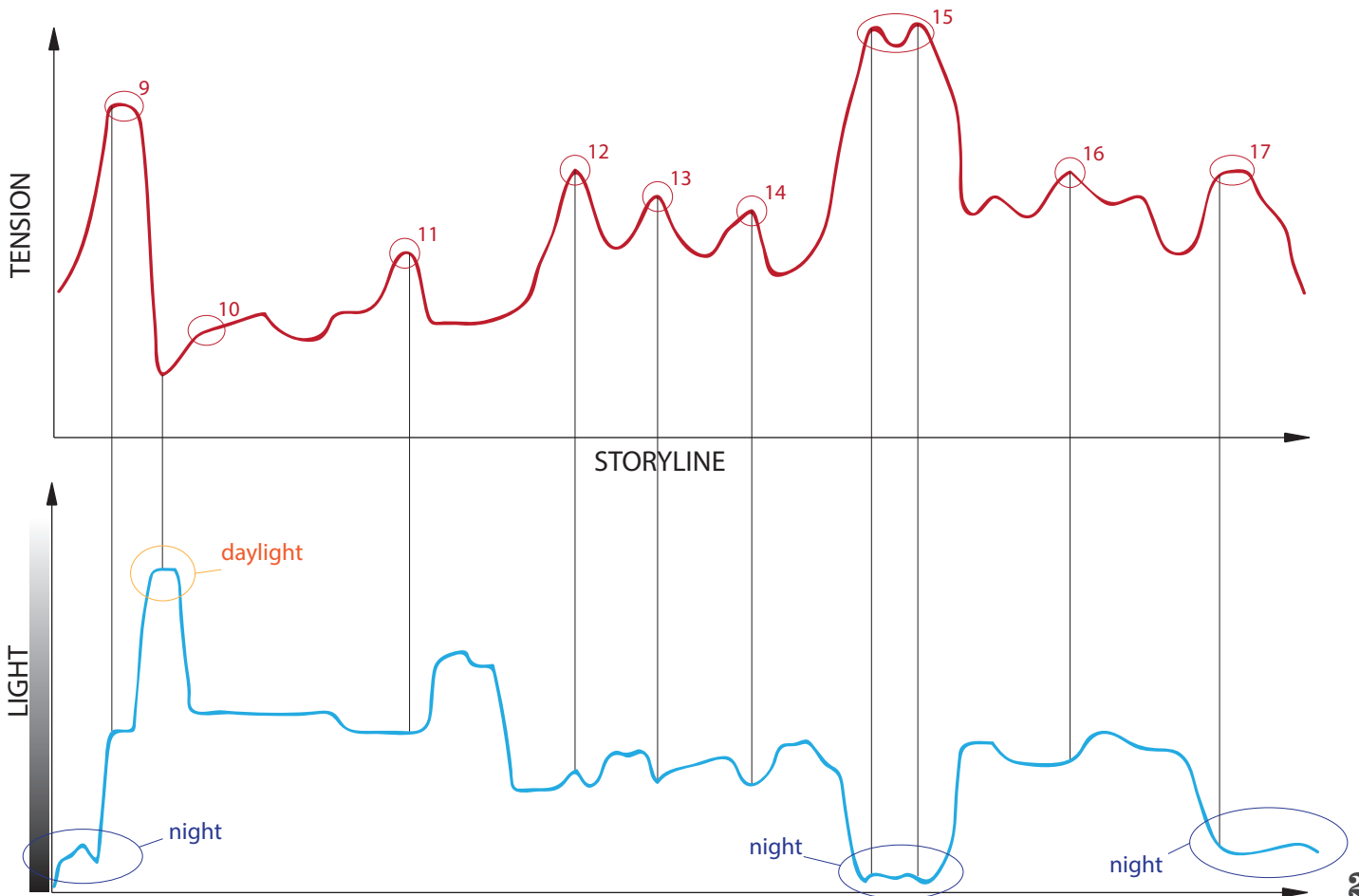
A.2

Tension and light graphics

THE MALTESE FALCON (1941)- John Huston



DOUBLE INDEMNITY (1944)- Billy Wilder

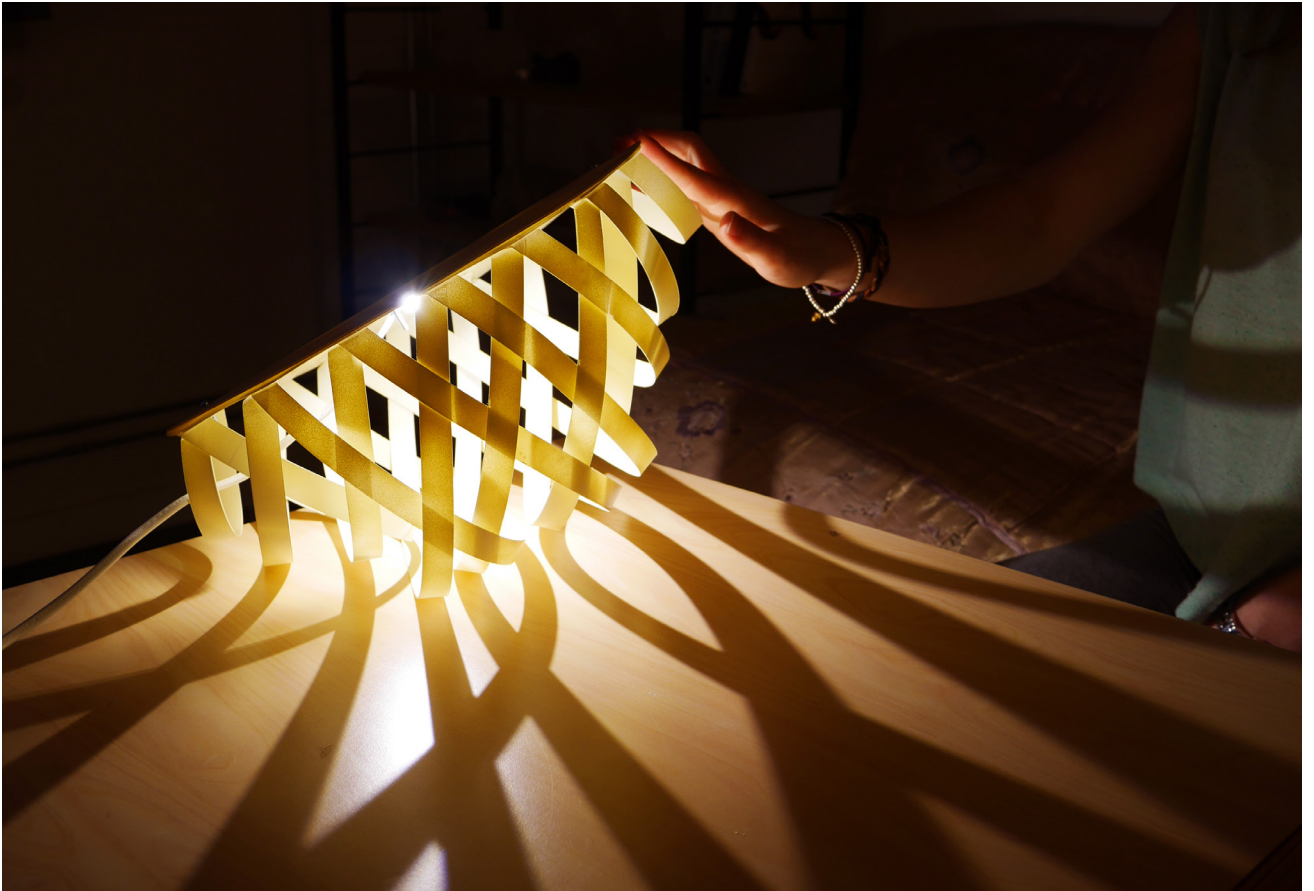


NOTES

- 1 A man is shot
- 2 Another man is killed
- 3 Gun is pointed at protagonist
- 4 Protagonist's drink is spiked
- 5 "La Paloma" ship arrives, where the Maltese Falcon is supposed to be
- 6 Captain of ship arrives with falcon, but he collapses as he has been shot
- 7 They discover that the Falcon is a fake
- 8 They discover that the woman is the killer

- 9 Confession
- 10 Protagonist meets attractive woman
- 11 Woman asks for accident insurance without husband knowing
- 12 Woman appears at protagonist's apartment
- 13 They decide to kill her husband to get the double indemnity
- 14 Husband signs accident insurance
- 15 Killing of husband
- 16 They suspect murder
- 17 Woman shoots protagonist and then he kills her

A.3 *Photos of product*

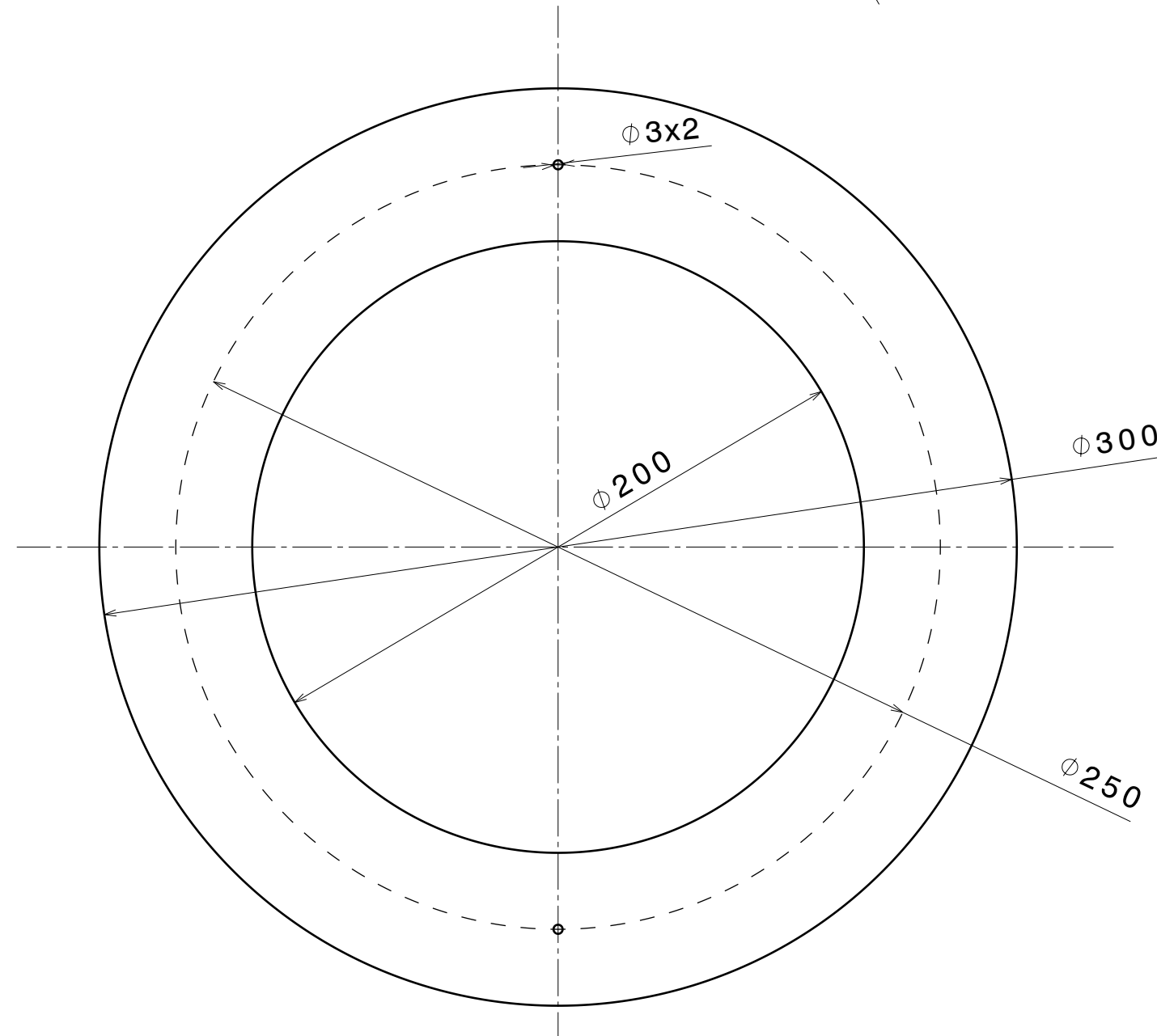
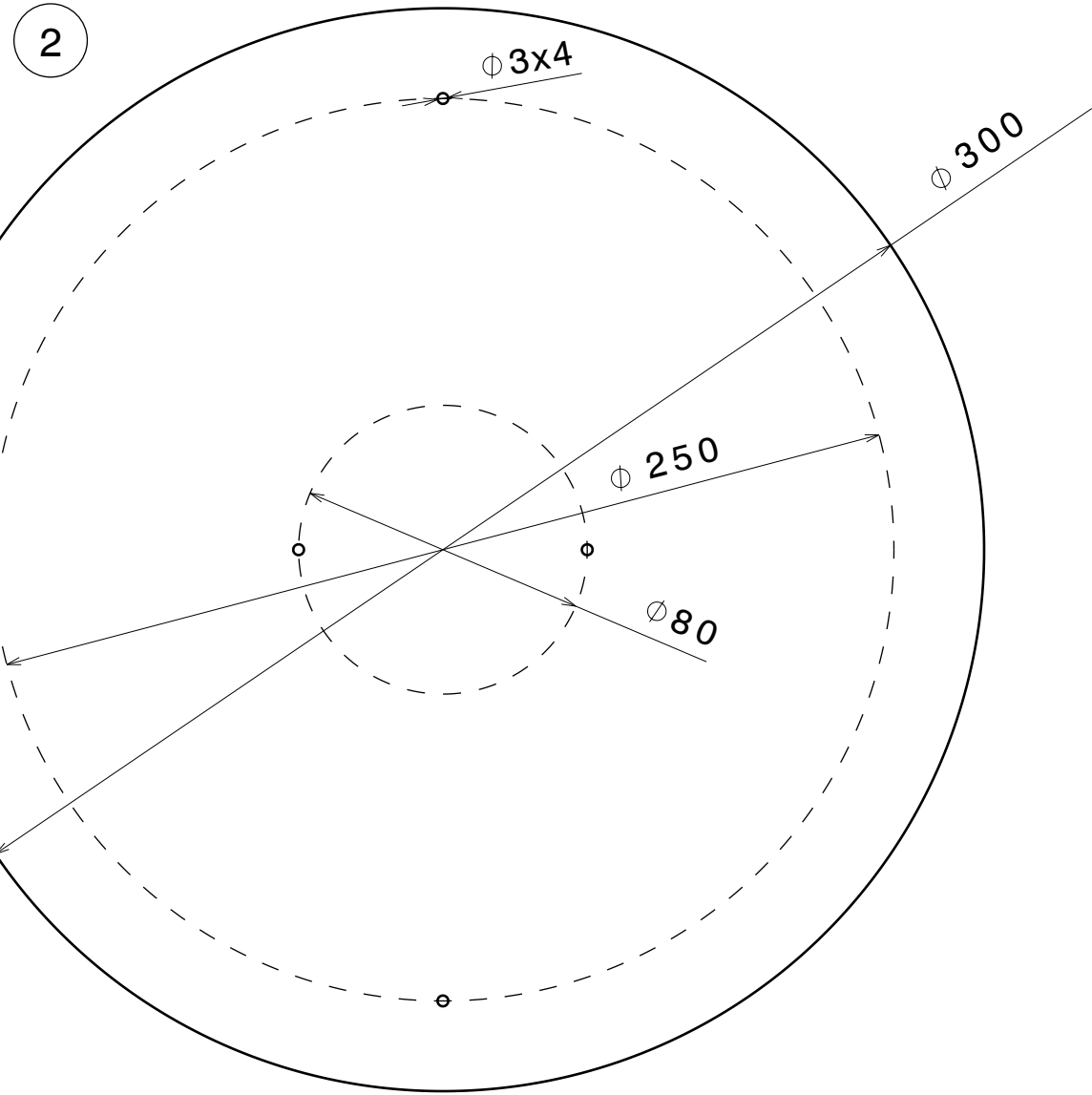
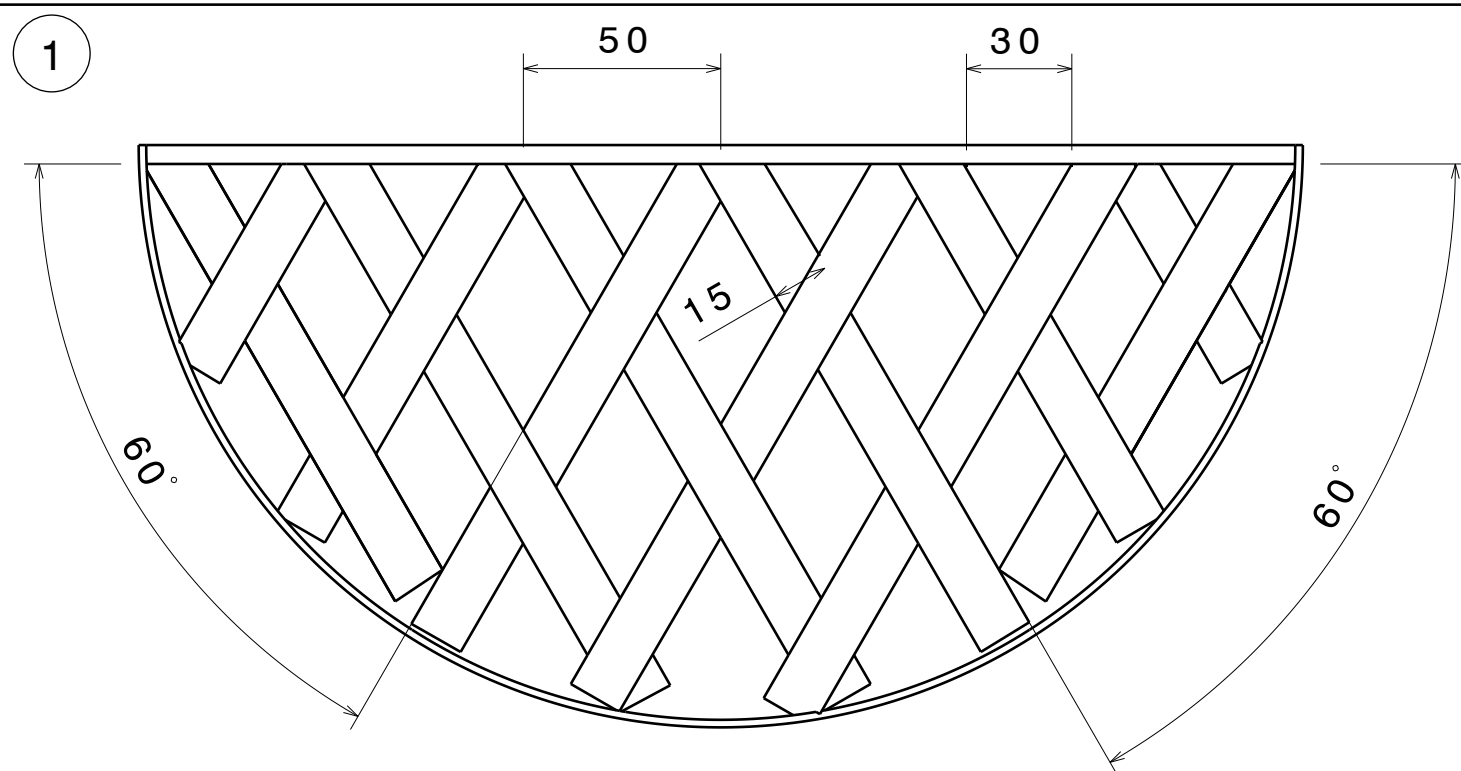


A.3 *Photos of product*



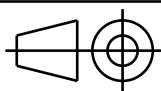
tilt

technical drawings



COMPONENT	NAME	MATERIAL
1	Lampshade	PET 1mm
2	Lampshade top	PET 1mm

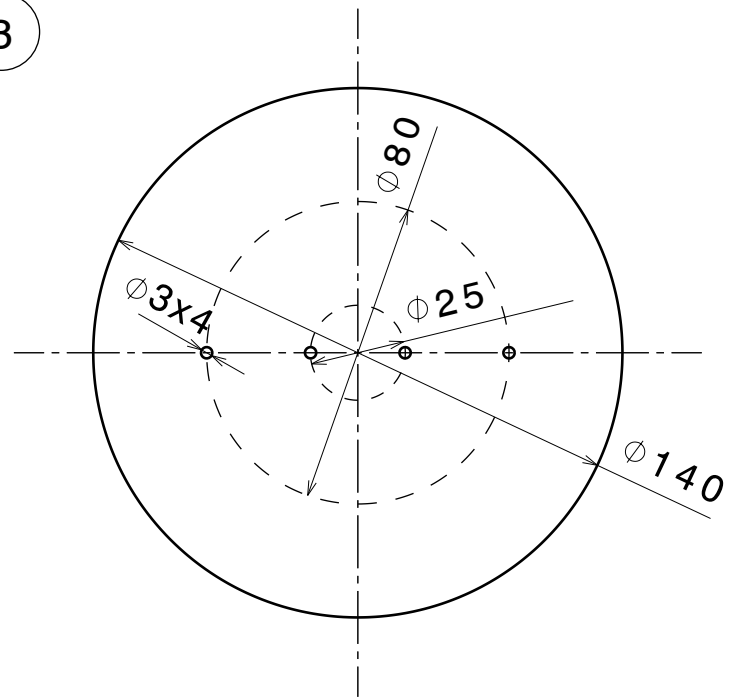
DESIGNED BY:
Jenny Smith
 DATE:
24/05/2015
 CHECKED BY:
XXX
 DATE:
XXX
 SIZE
A3



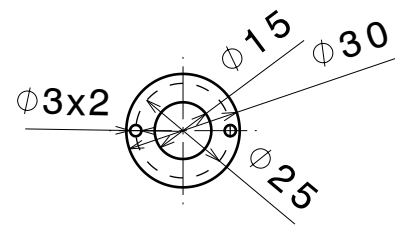
"TILT" lamp

SCALE	DRAWING NUMBER	SHEET
1:2	XXX	1/2

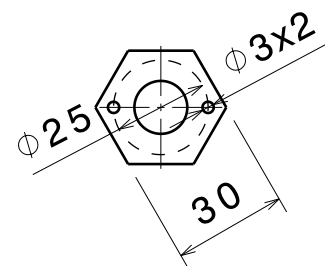
3



4



5



COMPONENT	NAME	MATERIAL
3	Heat distributor	Aluminum 1mm
4	Protector ring	PET 1mm
5	Light source	-

DESIGNED BY:
Jenny Smith

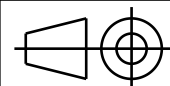
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SCALE

1:2

DRAWING NUMBER

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SHEET

2/2

“TILT” lampshade