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APPENDICES

OF

SLEEPING CABIN

MOVING MOUNTAINS OF EXPECTATIONS



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APPENDIX 1



List of goals

Entrance

		Recommendation Possible small adjustments	
The entrance is not smaller than: 61.5 x 52 cm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The entrance is 64 x 54 cm or bigger.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The entrance is turning on the light at opening.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The entrance is triggering an interaction of movement.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
There will take an interaction place that confirms closure/opening of the entrance.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The way of opening/closing the entrance is providing a more natural experience in comparison to the current entrance.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The entrance has a user-friendly way of opening/closing.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The entrance door feels more luxurious in comparison to the current plastic blinds.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The entrance does not invite unwanted people to open the cabin.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The entrance unlocks (in case it is locked) automatically in case of an emergency.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Sleeping cabin interior

The sleeping cabin is not smaller than the current sleeping cabin, which is 242 x 63 x 106 cm.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sleeping cabin height is at least 85 cm where the upper body is located.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The temperature in the sleeping cabin is controlled between 17.5 and 20.3 degrees Celsius.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The temperature can be adjusted according to personal preference at all time.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The ventilation does not produce any noise in regular state (ON).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The ventilation can be levelled up or down according to personal preference.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The light can be used as direct lightening and indirect (ambient) lightening.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Light is adjustable in brightness.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The light will have a function of waking the driver up.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The light will interact at the moment the door is opened.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The light will provide a relaxed experience.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The light can be adjusted in colour according to RGB.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The smell in the sleeping cabin is providing a fresh experience.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The odour in the sleeping cabin is providing a relaxing experience.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The sleeping cabin is offering the possibility to play own music via the speakers.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The sleeping cabin is providing a "feel like home" experience.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The sleeping cabin is providing a "re-energizing" experience.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
A way of communication to the other crew is present within the sleeping cabin.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The resting driver can follow the trip via live footage recorded by a camera and displayed on the screen in the sleeping cabin.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

		Recommendation Possible small adjustments	
The sleeping cabin can notify the driver in case of an emergency.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The materials, such as side wall carpet, mattress, switches and knobs, in the sleeping cabin are more luxurious in comparison to the materials in the current sleeping cabin.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The mattress is suited for different type of sleepers (side sleepers, back sleepers etc.).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The overall design of the sleeping cabin shows paid attention for the sleeping cabin.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The sleeping cabin offers opportunity to create an own environment in order to have support during sleep.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The buttons/switches are well integrated in the cabin and do not look as aftermarket.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The control panel can be reached from a neutral lying position in the sleeping cabin.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The location of the buttons/switches make sense in relation with the goal and usability of the product.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
An alarm clock is integrated in the sleeping cabin.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The direction in which the driver will lie down can be determined by himself.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Storage possibilities are present in which small items such as glasses, phone, tie etc. can be stored during rest period.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
There are always emergency (two) exists available.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The emergency exist are clearly recognizable as emergency exit.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Cleaning

Cleaning the side walls and ceiling of the sleeping cabin can be done easily by wiping it off with a cloth.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
There are no difficult edges present in which dirt can accumulate.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cleaning the cabin does not take any longer than 5 minutes.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cleaning the floor can be done with a vacuum cleaner.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
There are not any openings where bugs or other dirt can collect.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Manufacturing

Manufacturing will not increase the costs by more than 15% of the sleeping cabin only.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The sleeping cabin will not influence other manufacturing in the coach.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The components should be as accessible as the current components now.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Light will have to be replaceable after X years when it stops working.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

The hatches from outside will not be compromised.

General

The cabin will serve for sleeping mainly.

The cabin contains a USP which might influence VDL's market position positively.

The experience is beyond expectations.

	Recommendation	Possible small adjustments
The hatches from outside will not be compromised.	<input type="checkbox"/>	<input checked="" type="checkbox"/>
The cabin will serve for sleeping mainly.	<input type="checkbox"/>	<input type="checkbox"/>
The cabin contains a USP which might influence VDL's market position positively.	<input type="checkbox"/>	<input type="checkbox"/>
The experience is beyond expectations.	<input type="checkbox"/>	<input type="checkbox"/>

APPENDIX 2

Mock up user test entrance

Entrance simulation with cardboard mock-up

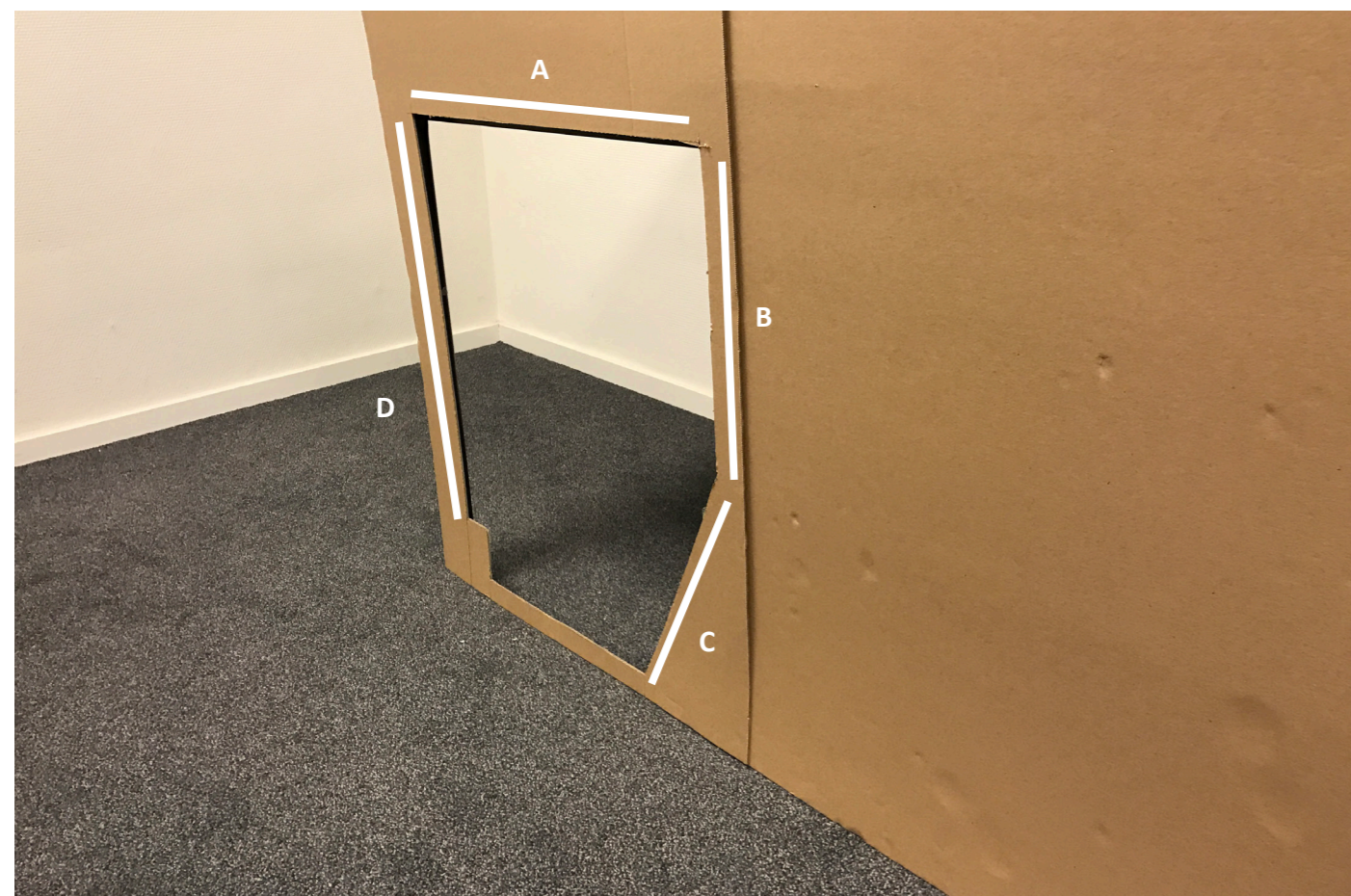
Goal: determine the pain points of the entrance

Expected pain points: too small in general, impossible to get in.

Actions taken: Way of getting in is determined, getting in, getting out

Other comments: It needs to be taken into account that the space around the entrance cannot be compared to a real scenario.

Set up:



Participants have been asked to get through the entrance in order to get some insights of what they experienced as pain points. This mock-up has been used as preparation for the user experience test.

The cardboard makes it possible to adjust the entrance quickly in order to try different sizes or shapes of entrance. If the size or shape needs to be changed will depend on the comfort level of entering and leaving the cabin via this entrance.

As can be seen in the set-up image, the sides have been marked with the letters: A, B, C and D. This will create the opportunity to easily mark the sides that are influencing the way of getting in.

Test in



Evaluation

As can be seen, side A, the top of the entrance, was the most common pain point of the entrance. At getting in as well as getting out. An interesting fact is that there were two different ways between the participants of getting in and out. It needs to be taken into account that the subjects had plenty of space to rotate and move freely around the entrance. In a real scenario, the space is very limited and might affect the way of entering and leaving the sleeping cabin. This could result in different pain points as well. Furthermore, considering that no participant had experience with getting in or out of the sleeping cabin it may be concluded that in this setting it is possible to get in and out. However, as above mentioned, it might differ from a real scenario. Besides, it may be assumed that more experience will lead to one correct way of getting in and out.

APPENDIX 3

FHD user test and user experience

Experiencing the entrance and sleeping cabin in a real FHD.

Goal: 1. determine the pain points of the entrance / 2. experience and explore sleeping cabin

Expected pain points: difficult to get in / Claustrophobic once in

Actions taken: Opening entrance, getting in, experiencing and exploring sleeping cabin, getting out, closing entrance

Other comments: It needs to be taken into account that the available sleeping cabin did not have a mattress.

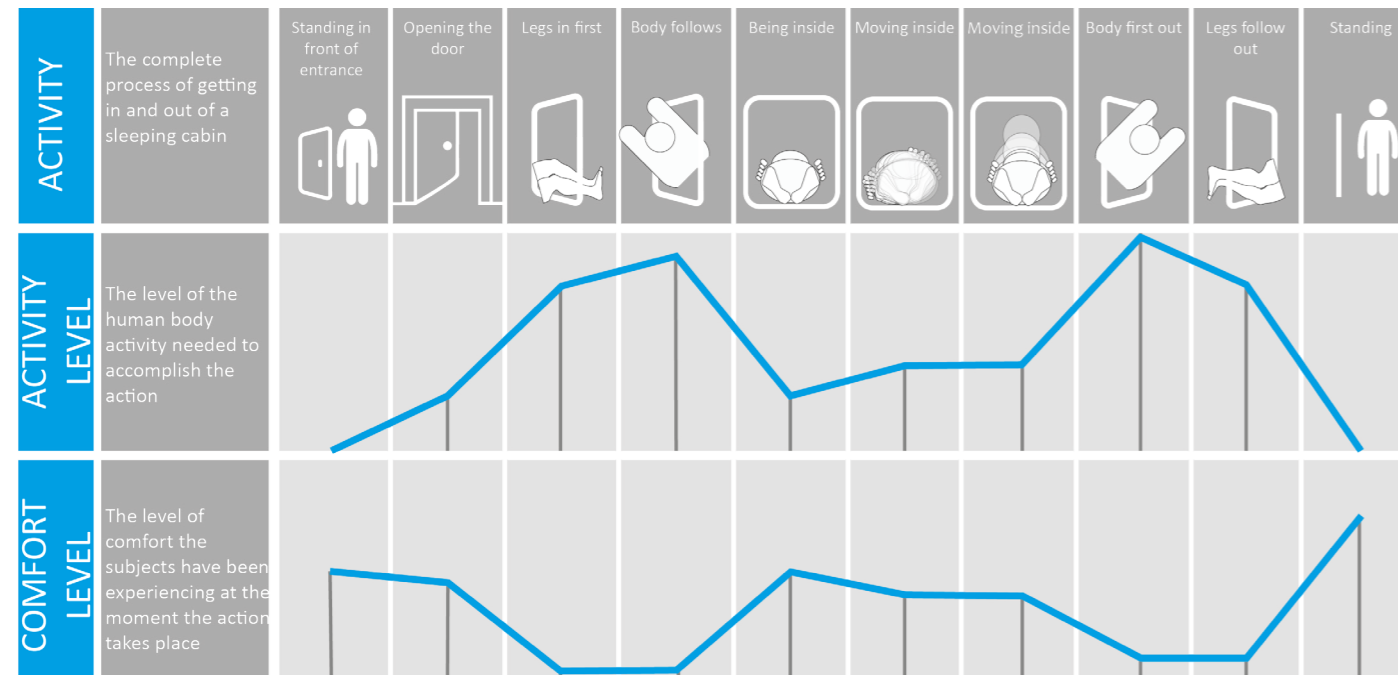
Approach: Provide participants with a camera and ask to think out loud. The participants will have to get in and out with the camera and will record things that pop up their mind, as well as the experience they are experiencing. Besides, the observation from outside of the bus will be recorded as well, which will give more insights in how the subject has entered and left the sleeping cabin.

As can be seen below, in a real scenario there are different pain points present as expected before. The biggest pain point is the limited space to move and the different heights (steps, lower sleeping cabin in comparison to entrance).



An interesting fact that appears now, is that all participants have the same way of getting in and out. Furthermore, one of the participants mentioned the following: "I don't like spending time in the cabin since it makes me feel as a product instead of a human". This emphasizes the experience such a cabin offers.

The entrance of the sleeping cabin has been evaluated with the aid of a comfort scale. The scale is the same as the one that is used during interviews and observations with coach drivers. This will make it possible to compare experienced users with unexperienced ones.

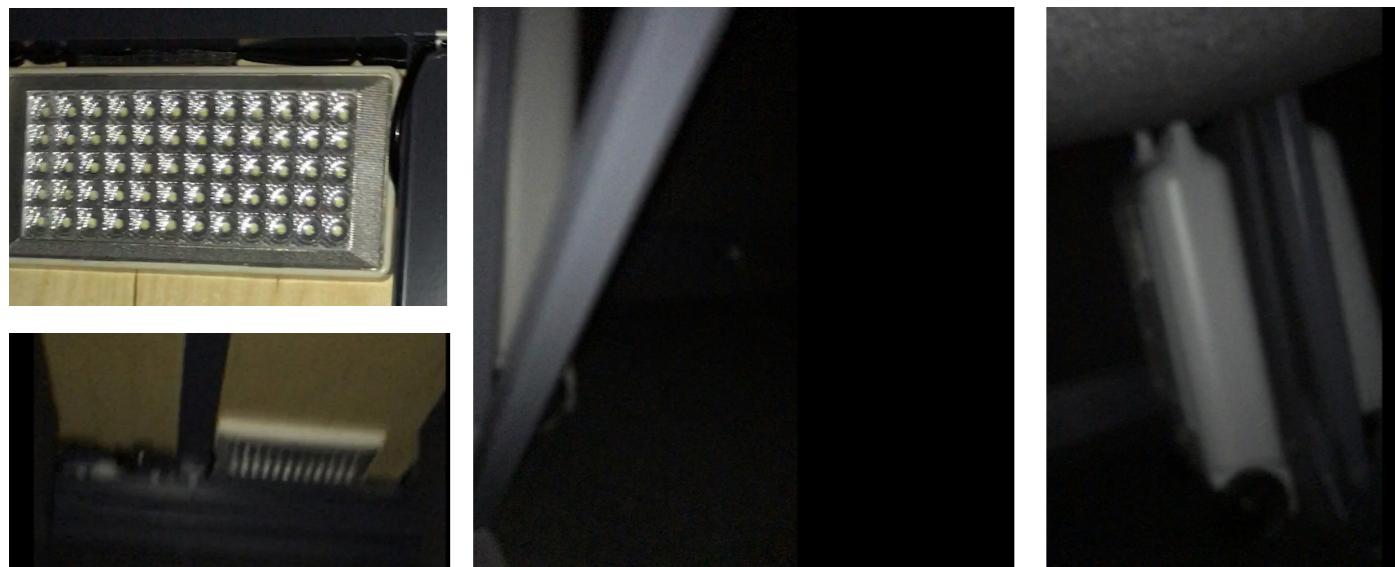


APPENDIX 4

Interviews and observations

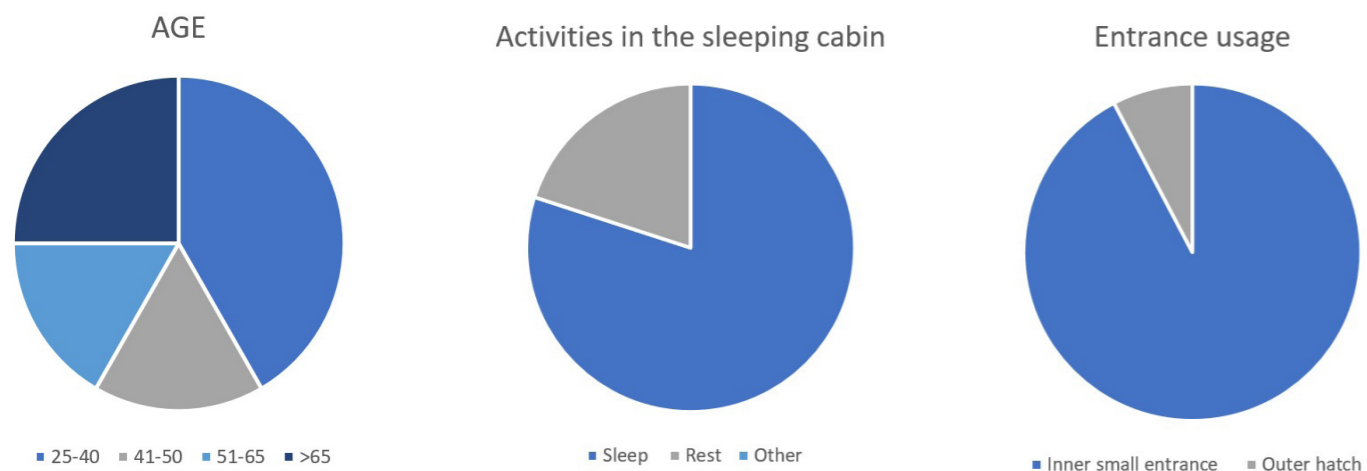
Another goal of the user experience was to experience and explore the sleeping cabin. Observation while being present in the cabin has shown the possibility of light in the cabin. There is a LED matrix available straight above the head location in the cabin. However, there was not a light switch noticed to turn on the light. Furthermore, there were some kind of containers attached to the side wall at the food end. This might provide an insecure experience since it is not known what kind of fluid is present in the container. Another disturbing experience is that the sleeping cabin is open in the middle. The opening is connected to the other baggage department and is "closed" by the chassis.

Note: these findings are based on the sleeping cabin that was present. The sleeping cabins that are sold nowadays differ to some extent. For example: the light matrix is not above the head anymore but on the side wall, the sidewalls are completely closed (not by chassis) and the containers are removed.

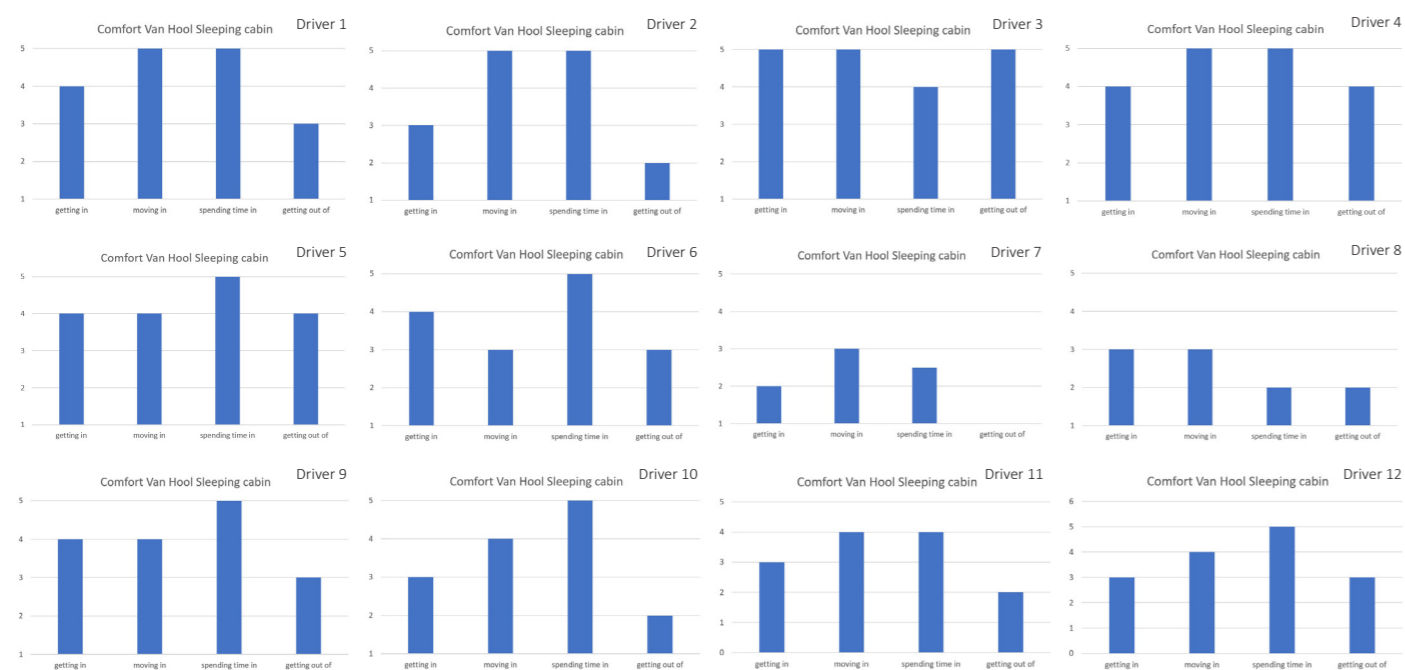
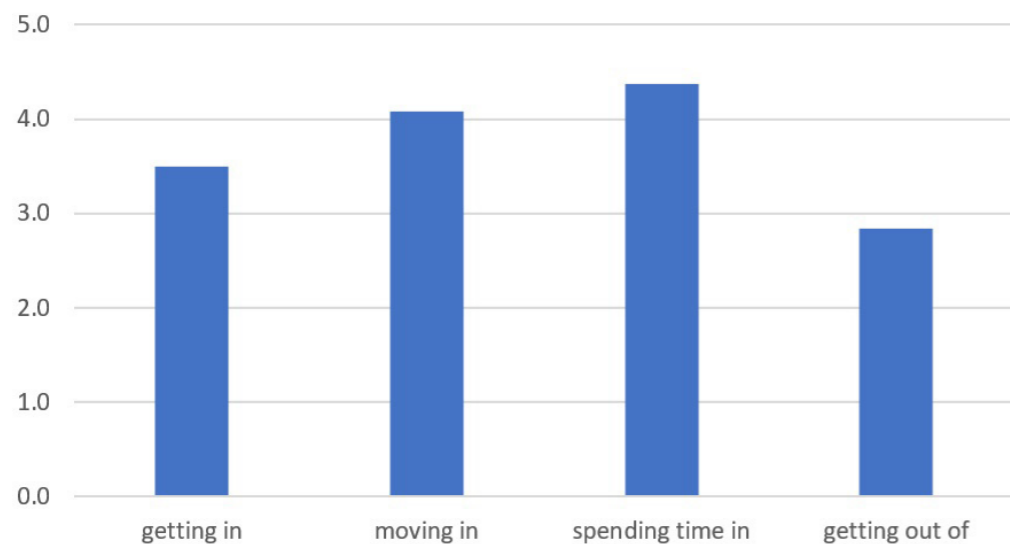


Appendix 4 Results

The results are provided in pie charts and diagrams. The next page will provide an explanation and evaluation. Afterwards each questionnaire that has been used during the interviews will be shown.



Average comfort Van Hool SC



The goal of these interviews was to get insight in the needs, wishes and expectations of coach drivers.

To achieve the aforementioned results, a questionnaire has been prepared (see next page) and it included a part of observation. In this part coach drivers have been asked to get in the sleeping cabin, spent a moment inside and get out (see images below).

The comfort scale that has been used during observation has been based on Vink & Hallbeck (2012). They reference to other work, some of the authors are Helander and Zhang, but also Herzberg. Herzberg has interviewed employees to question what made the employees dissatisfied and what made them satisfied in their jobs. The conclusion was that physical factors are not capable of motivating employees, however if handed properly, they might minimize dissatisfaction. Dissatisfaction has to do with company policies and possibly the salary, while motivators are drivers based on the individual needs. According to Helander and Zhang a similar division can be made in relation to comfort. Comfort will be felt when there is more to experience than expected. This also means that the absence of discomfort, does not result in comfort.

Results

As Helander and Zhang mentioned, the expectations do influence the

comfort. Almost all of the interviewed coach drivers experienced the sleeping cabin as comfortable. However, they admitted that they got used to it and that they had low expectations.

What was surprising is that all the drivers used the entrance inside the coach, only one of the interviewed drivers said he used the outside entrance once.

Besides, the drivers shared some thoughts about their needs and wishes. But once more, they said it would be luxury, since they actually do not need any specific things (low expectations again). Overall, an individual climate control has been mentioned, this can be underpinned by the fact that the age group of drivers is very wide and therefore the preference level is various.

Reflection

Unfortunately it was not possible to observe all the interviewed drivers. The coaches needed to be cleaned and re-filled, so the sleeping cabin was often unavailable. Nevertheless, the drivers are experienced enough to rate the comfort. What needs to be taken into account is that all the drivers are used to the low expectations of the sleeping cabin and therefore judging the comfort relatively high. Comparison to their home environment was not possible since they spend most of their nights in sleeping cabins. Next time a

coach should be arranged by the student in order to observe the drivers. It might provide more insights.



Bus Driver interview

Male / Female

Age: 38 yrs

Years of working experience: 12 yrs

International experience: Yes / No

Long distance (> 9 hrs) international experience: Yes / No

What was your longest ride? _____ hrs

Familiar with sleeping cabin: Yes / No

Spent time in sleeping cabin: Yes / No

If yes, activities in sleeping cabin:

Sleep / rest / movie or television / bored / other: _____

If no, why not?

Not needed / hard to get in or out / claustrophobic / uncomfortable / other: _____

What do you need in a sleeping cabin?

got everything

Do you take any luggage with you? Yes / No

slaapzak kussen

Observation

Could you get in the sleeping cabin?

Observe steps, create timeline. _____

How do you get out of the sleeping cabin?

Observe steps, create timeline and combine with timeline of getting in. _____ Time>>

combine with timeline of getting in.

Questions in relation to observation

If 1 is discomfort, 3 neutral and 5 comfort, how would you rate:

Getting in the sleeping cabin? 1 2 3 4 5

Moving in the sleeping cabin? 1 2 3 4 5

Spending time in the sleeping cabin? 1 2 3 4 5

Getting out of the sleeping cabin? 1 2 3 4 5

What if there is any luggage involved? How would you manage that?

Y-
 ~~BEET~~ PAN
 (VDL = smalle)

 van hool is een van de top
 Airco + ventilatie

LED OM MEE TE kijken

Bus Driver interview

Male / Female

Age: 32 yrs

Years of working experience: 7 yrs

International experience: Yes / No

Long distance (> 9 hrs) international experience: Yes / No

What was your longest ride? 21 hrs

Familiar with sleeping cabin: Yes / No

Spent time in sleeping cabin: Yes / No

If yes, activities in sleeping cabin:

Sleep / rest / movie or television / bored / other: _____

If no, why not?

Not needed / hard to get in or out / claustrophobic / uncomfortable / other: _____

What do you need in a sleeping cabin?

TV

Do you take any luggage with you? Yes / No

dekbed / kussen

Observation

Could you get in the sleeping cabin?

Observe steps, create timeline. _____

How do you get out of the sleeping cabin?

Observe steps, create timeline and combine with timeline of getting in. _____ Time>>

combine with timeline of getting in.

Questions in relation to observation

If 1 is discomfort, 3 neutral and 5 comfort, how would you rate:

Getting in the sleeping cabin? 1 2 3 4 5

Moving in the sleeping cabin? 1 2 3 4 5

Spending time in the sleeping cabin? 1 2 3 4 5

Getting out of the sleeping cabin? 1 2 3 4 5

What if there is any luggage involved? How would you manage that?

van hool is echt goed.

Bus Driver interview

Male / Female

Age: 60 yrs

Years of working experience: 23 yrs

International experience: Yes / No

Long distance (> 9 hrs) international experience: Yes / No

What was your longest ride? 23 hrs

Familiar with sleeping cabin: Yes / No

Spent time in sleeping cabin: Yes / No

If yes, activities in sleeping cabin:

Sleep / rest / movie or television / bored / other:

If no, why not?

Not needed / hard to get in or out / claustrophobic / uncomfortable / other:

What do you need in a sleeping cabin?

individual A/C

Do you take any luggage with you? Yes / No

toilet paper

Observation

Could you get in the sleeping cabin?

Observe steps, create timeline.

How do you get out of the sleeping cabin?

Observe steps, create timeline and combine with timeline of getting in.

Time>>

Questions in relation to observation

If 1 is discomfort, 3 neutral and 5 comfort, how would you rate:

Getting in the sleeping cabin? 1 2 3 4 5

Moving in the sleeping cabin? 1 2 3 4 5

Spending time in the sleeping cabin? 1 2 3 4 5

Getting out of the sleeping cabin? 1 2 3 4 5

What if there is any luggage involved? How would you manage that?

Bus Driver interview

Male / Female

Age: 30 yrs

Years of working experience: 12 yrs

International experience: Yes / No

Long distance (> 9 hrs) international experience: Yes / No

What was your longest ride? 21 hrs

Familiar with sleeping cabin: Yes / No

Spent time in sleeping cabin: Yes / No

If yes, activities in sleeping cabin:

Sleep / rest / movie or television / bored / other:

If no, why not?

Not needed / hard to get in or out / claustrophobic / uncomfortable / other:

What do you need in a sleeping cabin?

A/C

Do you take any luggage with you? Yes / No

Observation

Could you get in the sleeping cabin?

Observe steps, create timeline.

How do you get out of the sleeping cabin?

Observe steps, create timeline and combine with timeline of getting in.

Time>>

Questions in relation to observation

If 1 is discomfort, 3 neutral and 5 comfort, how would you rate:

Getting in the sleeping cabin? 1 2 3 4 5

Moving in the sleeping cabin? 1 2 3 4 5

Spending time in the sleeping cabin? 1 2 3 4 5

Getting out of the sleeping cabin? 1 2 3 4 5

What if there is any luggage involved? How would you manage that?

entirely different
greater.

Bus Driver interview

Male / Female

Age: 34 yrs

Years of working experience: 16 yrs

International experience: Yes / No

Long distance (> 9 hrs) international experience: Yes / No

What was your longest ride? 21 hrs

Familiar with sleeping cabin: Yes / No

Spent time in sleeping cabin: Yes / No

If yes, activities in sleeping cabin:

Sleep / rest / movie or television / bored / other: _____

If no, why not?

Not needed / hard to get in or out / claustrophobic / uncomfortable / other: _____

What do you need in a sleeping cabin?

MATRAS, verduking = goed, temp. individueel!

Do you take any luggage with you? Yes / No

Observation

Could you get in the sleeping cabin?

Observe steps, create timeline.

How do you get out of the sleeping cabin?

Observe steps, create timeline and combine with timeline of getting in.

Questions in relation to observation

If 1 is discomfort, 3 neutral and 5 comfort, how would you rate:

Getting in the sleeping cabin? 1 2 3 4 5

Moving in the sleeping cabin? 1 2 3 4 5

Spending time in the sleeping cabin? 1 2 3 4 5

Getting out of the sleeping cabin? 1 2 3 4 5

What if there is any luggage involved? How would you manage that?

Bus Driver interview

Male / Female

Age: 66 yrs

Years of working experience: 43 yrs

International experience: Yes / No

Long distance (> 9 hrs) international experience: Yes / No

What was your longest ride? 50 hrs

Familiar with sleeping cabin: Yes / No

Spent time in sleeping cabin: Yes / No

If yes, activities in sleeping cabin:

Sleep / rest / movie or television / bored / other: _____

If no, why not?

Not needed / hard to get in or out / claustrophobic / uncomfortable / other: _____

What do you need in a sleeping cabin?

Do you take any luggage with you? Yes / No

Observation

Could you get in the sleeping cabin?

Observe steps, create timeline.

How do you get out of the sleeping cabin?

Observe steps, create timeline and combine with timeline of getting in.

Questions in relation to observation

If 1 is discomfort, 3 neutral and 5 comfort, how would you rate:

Getting in the sleeping cabin? 1 2 3 4 5

Moving in the sleeping cabin? 1 2 3 4 5

Spending time in the sleeping cabin? 1 2 3 4 5

Getting out of the sleeping cabin? 1 2 3 4 5

What if there is any luggage involved? How would you manage that?

Verduking
6 vs 7 in bus slapen.

enkel ook binnenben
→ kassig doriem
→ west lidreem
i.v.m. rich.

2 chauffeurs moeten
samenby blijven.
→ mag niet
slapen.

onaangenaam
in knipen.

in Duitsland mag
je geen gebreuk
maken van de
veiligheids gordels

Bus Driver interview

Male / Female

Age: 68 yrs

Years of working experience: 7 yrs

International experience: Yes / No

Long distance (> 9 hrs) international experience: Yes / No

What was your longest ride? _____ hrs

Familiar with sleeping cabin: Yes / No

Spent time in sleeping cabin: Yes / No

If yes, activities in sleeping cabin:

Sleep / rest / movie or television / bored / other: _____

If no, why not?

Not needed / hard to get in or out / claustrophobic / uncomfortable / other: _____

What do you need in a sleeping cabin?

Do you take any luggage with you? Yes / No

Observation

Could you get in the sleeping cabin?

Observe steps, create timeline.

How do you get out of the sleeping cabin?

Observe steps, create timeline and
combine with timeline of getting in.

Time>>

Questions in relation to observation

If 1 is discomfort, 3 neutral and 5 comfort, how would you rate:

Getting in the sleeping cabin? 1 2 3 4 5

Moving in the sleeping cabin? 1 2 3 4 5

Spending time in the sleeping cabin? 1 2 3 4 5

Getting out of the sleeping cabin? 1 2 3 4 5

What if there is any luggage involved? How would you manage that?

Bus Driver interview

Male / Female

Age: 68 yrs

Years of working experience: 10 yrs

International experience: Yes / No

Long distance (> 9 hrs) international experience: Yes / No

What was your longest ride? _____ hrs

Familiar with sleeping cabin: Yes / No

Spent time in sleeping cabin: Yes / No

If yes, activities in sleeping cabin:

Sleep / rest / movie or television / bored / other: _____

If no, why not?

Not needed / hard to get in or out / claustrophobic / uncomfortable / other: _____

What do you need in a sleeping cabin?

nee, want transport is veel beter.

Do you take any luggage with you? Yes / No

Observation

Could you get in the sleeping cabin?

Observe steps, create timeline.

How do you get out of the sleeping cabin?

Observe steps, create timeline and
combine with timeline of getting in.

Time>>

Questions in relation to observation

If 1 is discomfort, 3 neutral and 5 comfort, how would you rate:

Getting in the sleeping cabin? 1 2 3 4 5

Moving in the sleeping cabin? 1 2 3 4 5

Spending time in the sleeping cabin? 1 2 3 4 5

Getting out of the sleeping cabin? 1 2 3 4 5

What if there is any luggage involved? How would you manage that?

Pens

+10 vrechtwagen.

missie bleed om
achter gordijnen om te
slapen in cabine

→ indien nodig

miss op stelen -
achterover.
benamwo gewel
binnen?

Bus Driver interview

Male / Female

Age: 59 yrs

Years of working experience: 12 yrs

International experience: Yes / No

Long distance (> 9 hrs) international experience: Yes / No

What was your longest ride? 20 hrs

Familiar with sleeping cabin: Yes / No

Spent time in sleeping cabin: Yes / No

If yes, activities in sleeping cabin:

Sleep / rest / movie or television / bored / other: _____

If no, why not?

Not needed / hard to get in or out / claustrophobic / uncomfortable / other: _____

What do you need in a sleeping cabin?

fresh air

Do you take any luggage with you? Yes / No

Observation

Could you get in the sleeping cabin?

Observe steps, create timeline. _____

How do you get out of the sleeping cabin? _____

Time>>

Observe steps, create timeline and
combine with timeline of getting in.

Questions in relation to observation

If 1 is discomfort, 3 neutral and 5 comfort, how would you rate:

Getting in the sleeping cabin? 1 2 3 4 5

Moving in the sleeping cabin? 1 2 3 4 5

Spending time in the sleeping cabin? 1 2 3 4 5

Getting out of the sleeping cabin? 1 2 3 4 5

What if there is any luggage involved? How would you manage that?

Bus Driver interview

Male / Female

Age: 30 yrs

Years of working experience: 8 yrs

International experience: Yes / No 2

Long distance (> 9 hrs) international experience: Yes / No

What was your longest ride? 20 hrs

Familiar with sleeping cabin: Yes / No

Spent time in sleeping cabin: Yes / No

If yes, activities in sleeping cabin:

Sleep / rest / movie or television / bored / other: _____

If no, why not?

Not needed / hard to get in or out / claustrophobic / uncomfortable / other: _____

What do you need in a sleeping cabin?

kind softness of bedding

Do you take any luggage with you? Yes / No

Observation

Could you get in the sleeping cabin?

Observe steps, create timeline. _____

How do you get out of the sleeping cabin? _____

Time>>

Observe steps, create timeline and
combine with timeline of getting in.

Questions in relation to observation

If 1 is discomfort, 3 neutral and 5 comfort, how would you rate:

Getting in the sleeping cabin? 1 2 3 4 5

Moving in the sleeping cabin? 1 2 3 4 5

Spending time in the sleeping cabin? 1 2 3 4 5

Getting out of the sleeping cabin? 1 2 3 4 5

What if there is any luggage involved? How would you manage that?

*VDL erhal
koukust.*

*hit is harder
than in.*

*veel geluid
niet te vergeten.*

Bus Driver interview

Male / Female

Age: 44 yrs

Years of working experience: 17 yrs

International experience: Yes / No

Long distance (> 9 hrs) international experience: Yes / No

What was your longest ride? 24 hrs

Familiar with sleeping cabin: Yes / No

Spent time in sleeping cabin: Yes / No

If yes, activities in sleeping cabin:

Sleep / rest / movie or television / bored / other: _____

If no, why not?

Not needed / hard to get in or out / claustrophobic / uncomfortable / other: _____

What do you need in a sleeping cabin?

mattress temperature

Do you take any luggage with you? Yes / No

Observation

Could you get in the sleeping cabin?

Observe steps, create timeline. _____

How do you get out of the sleeping cabin? _____

Time>>

Observe steps, create timeline and

combine with timeline of getting in. _____

Questions in relation to observation

If 1 is discomfort, 3 neutral and 5 comfort, how would you rate:

Getting in the sleeping cabin? 1 2 3 4 5

Moving in the sleeping cabin? 1 2 3 4 5

Spending time in the sleeping cabin? 1 2 3 4 5

Getting out of the sleeping cabin? 1 2 3 4 5

What if there is any luggage involved? How would you manage that?

Because I have to, got used to it but no fan of it

Bus Driver interview

Male / Female

Age: 51 yrs

Years of working experience: 21 yrs

International experience: Yes / No

Long distance (> 9 hrs) international experience: Yes / No

What was your longest ride? 23 hrs

Familiar with sleeping cabin: Yes / No

Spent time in sleeping cabin: Yes / No

If yes, activities in sleeping cabin:

Sleep / rest / movie or television / bored / other: _____

If no, why not?

Not needed / hard to get in or out / claustrophobic / uncomfortable / other: _____

What do you need in a sleeping cabin?

quiet

Do you take any luggage with you? Yes / No

Observation

Could you get in the sleeping cabin?

Observe steps, create timeline. _____

How do you get out of the sleeping cabin? _____

Time>>

Observe steps, create timeline and

combine with timeline of getting in. _____

Questions in relation to observation

If 1 is discomfort, 3 neutral and 5 comfort, how would you rate:

Getting in the sleeping cabin? 1 2 3 4 5

Moving in the sleeping cabin? 1 2 3 4 5

Spending time in the sleeping cabin? 1 2 3 4 5

Getting out of the sleeping cabin? 1 2 3 4 5

What if there is any luggage involved? How would you manage that?

central erin is her she is slapping on prima in.

APPENDIX 5

Drive experience - Sleeping cabin

Being present in a complete sleeping cabin while the bus is driven around.

Bus used: DD

Sleeping cabin of bus: Smaller than HD, see image below.

Goal: determine the sleep cabin's pain points while bus is driven.

Expected pain points: sound, vibration

Actions taken:

Open door, get in (this was hard).. Body in first, sit down, try to get legs in while bended forward since ceiling was too low, once legs were inside door was closed, lay down, measure decibels/look around, open door, get up (sitting), body out first, grab handle outside, lift myself up on my feet.

Why did I make those decisions?

Body in first? Since the entrance is on the top of the first steps. It is more natural/intuitive to get in like that.

Close door before laying down? The bus was driving and the door did not have an automatic stop/brake so it was slamming.

Body out first? It was easiest and most preferable as well, because if legs would go first, I would have to rotate inside the cabin and I would not have any sight of what is happening outside of the cabin. This could result in a passenger stepping on my foot, falling or something else.

Other comments:

The light is very bad (not much light, bad distributed)

Ventilation makes noise (can be heard working)

Window cannot be "closed"

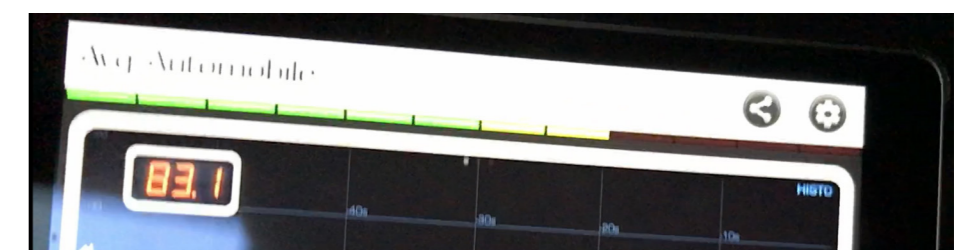
Vehicle speed and roads experienced:

0 – 30 km/h - 74 dB

30 – 70 km/h - 83 dB

> 70 km/h - 87 dB

Decibel peak at accelerating for highway speed – 91 dB



Evaluation

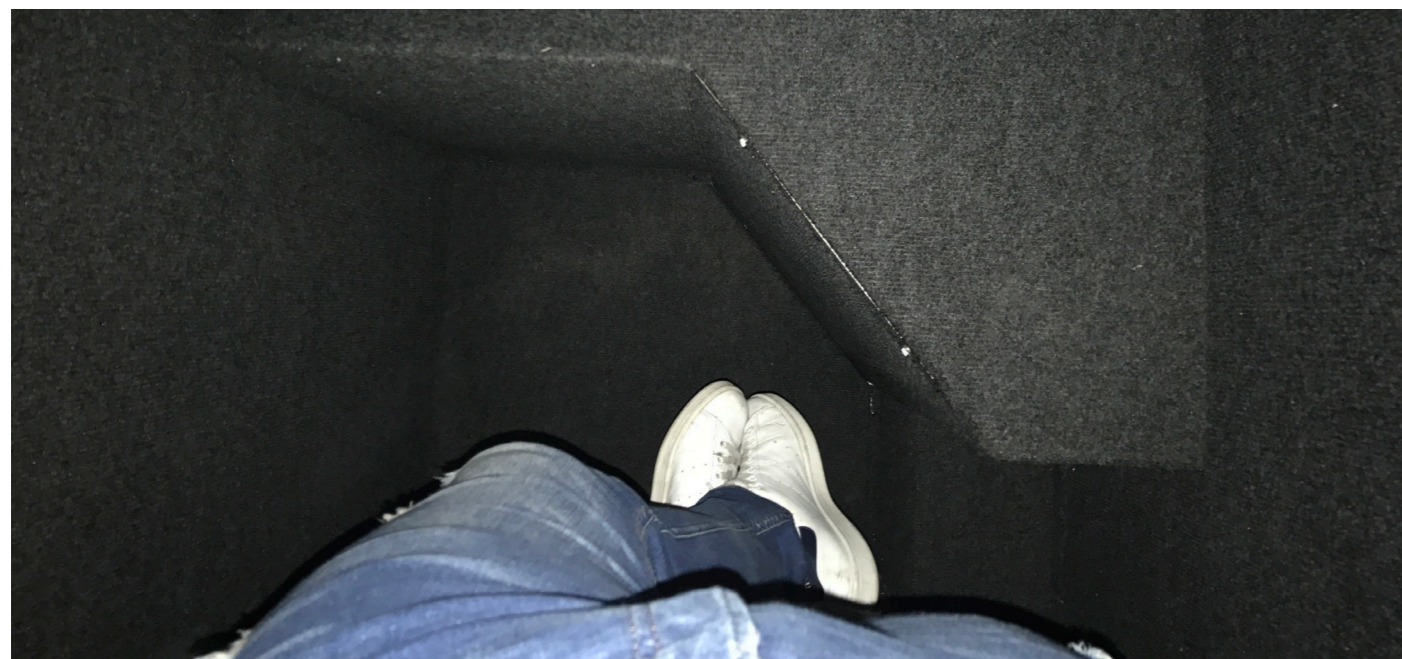
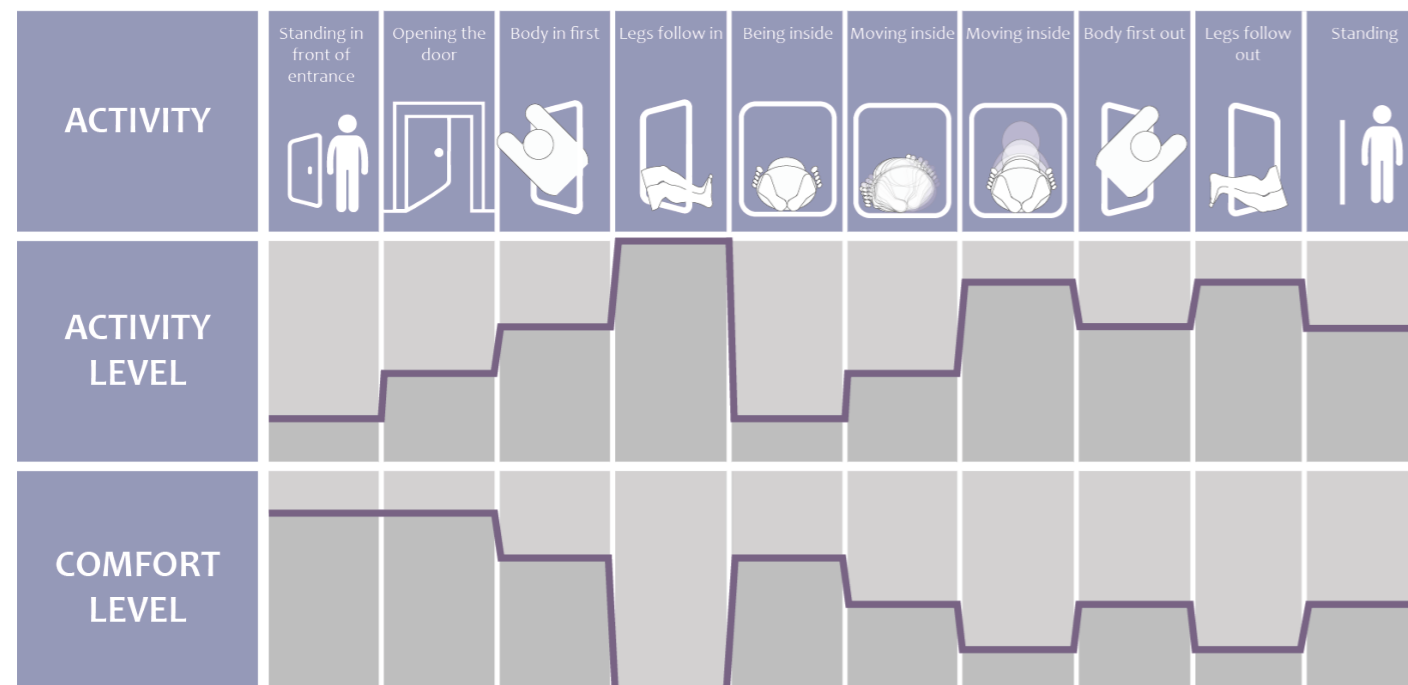
Getting inside the cabin was the hardest part, once inside it is okay. Not luxurious but not uncomfortable. The expected pain points are present, but are not the main ones. The room in the cabin is limited and therefore almost unable to get in. Once lying down it is okay. However, the small window produces noise at higher speeds. This noise does not provide a comfortable and/or pleasurable experience.

Conclusion:

The sound and vibration is not the biggest problem of the sleeping cabin. It is the perceived comfort and experience of comfort and pleasure while being present in the sleeping cabin. The materials used and interactions are not satisfying at all and show evidence of lack of attention in regard to the sleeping cabin. Reducing the noise to a level of dB that is wished for sleeping might not be reachable. The interior, to which has been paid a lot of attention, reaches a noise level of maximum 71 dB. Therefore, the attention should be paid on the experience and comfort of how to get in, how to reduce the noise to some extent and on how to create a higher comfort level in the cabin.

APPENDIX 6

Bouba-Kiki principle user test



Bouba-Kiki principle user test

This user test has been done in order to validate the possibility of experiencing friendlier shapes. It is known in general that round shapes are offering a friendlier experience than sharp edged shapes.

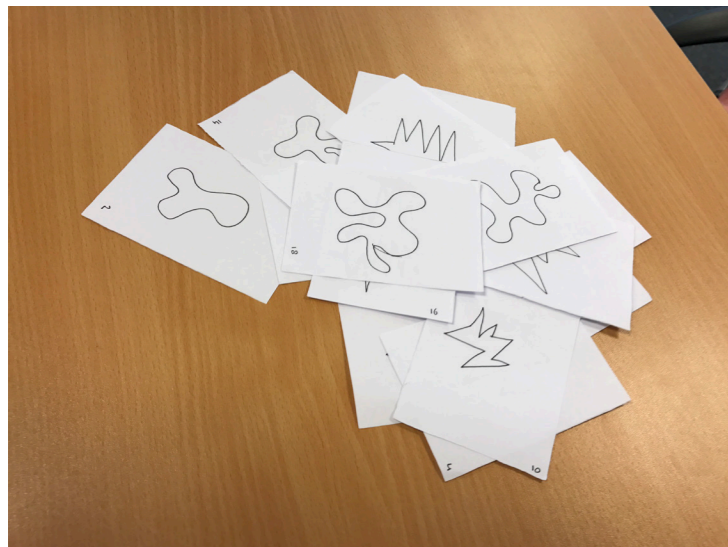
A test has been set up as followed:

18 sheets of paper have been used and images have been drawn on them. 9 got round shaped images, while 9 got sharp edged images (as can be seen below) The participants (N=7) were asked to name every sheet of paper either Bouba or Kiki, without knowing what it means (it actually does not mean anything since the words have been made up). Assuming that the participants would name the round shaped images Bouba, this has been considered as correct, however there is no correct or wrong answer. The results were that all participants were able to get a 100% score based on the assumption that Bouba would be the friendlier shape.

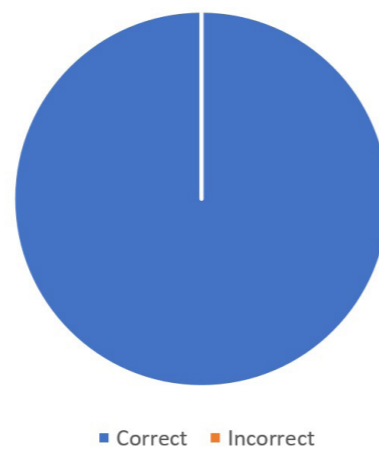
Therefore, it may be concluded that round shaped objects have a friendlier appearance than edged shaped objects.

APPENDIX 7

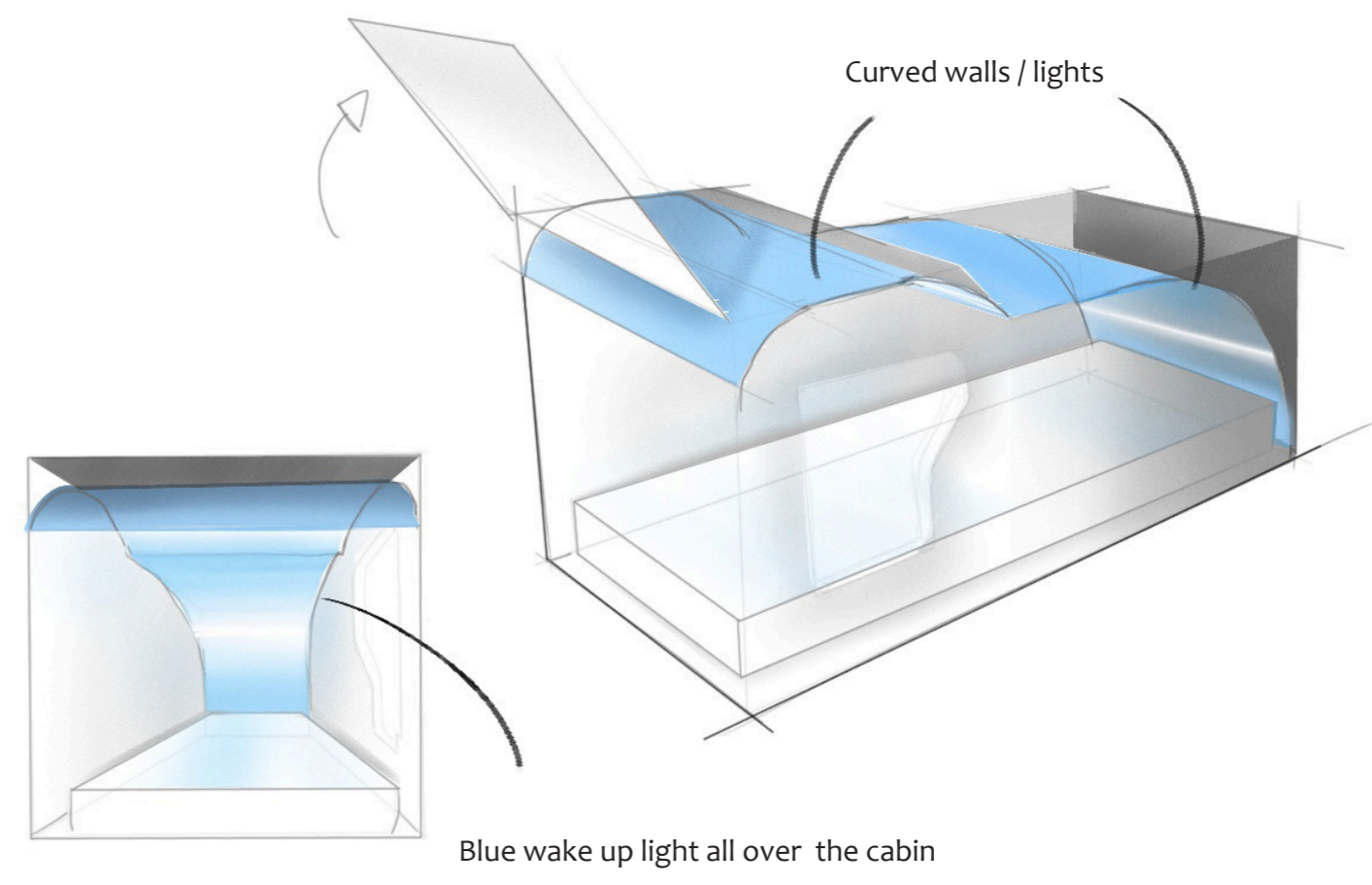
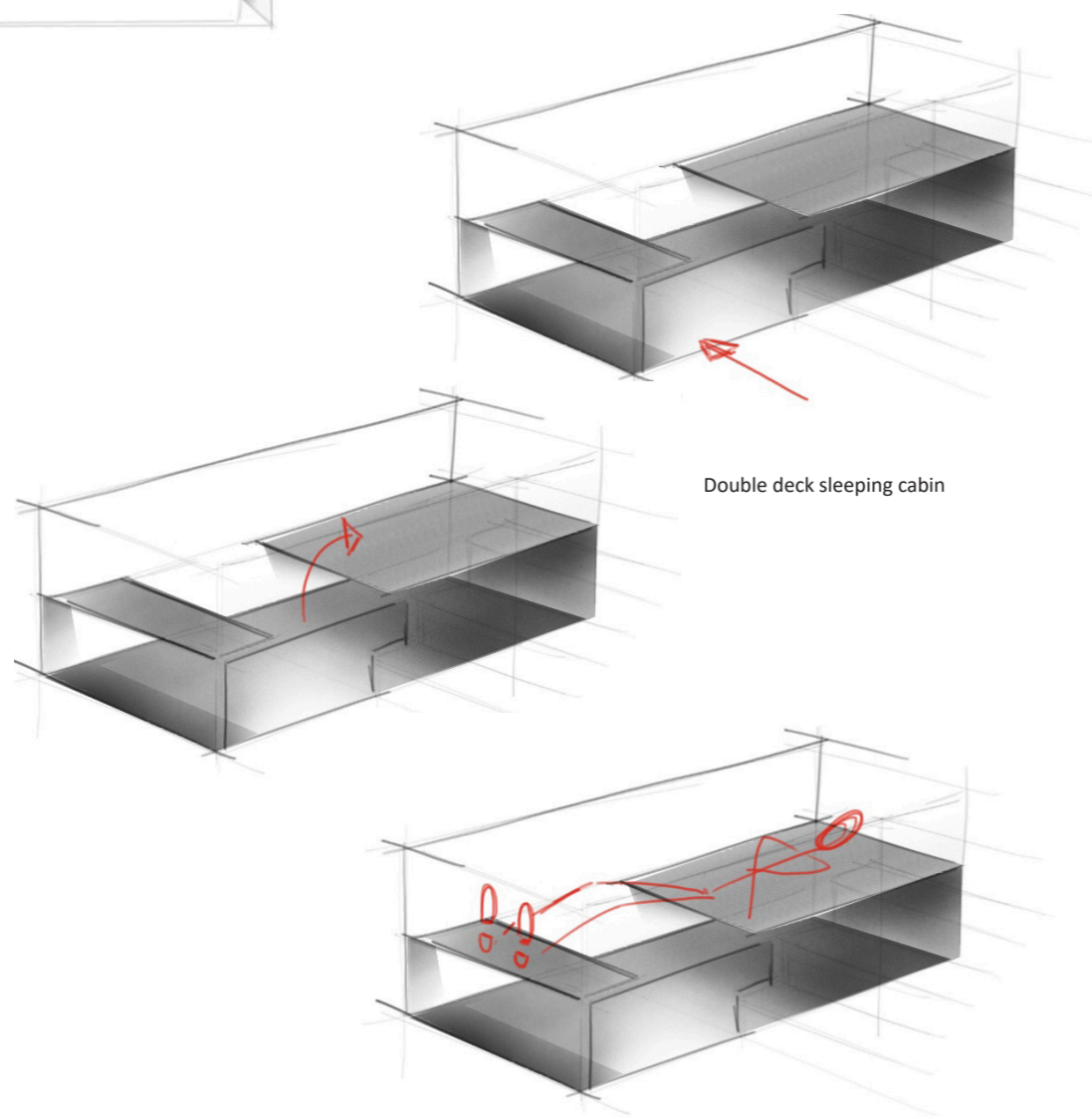
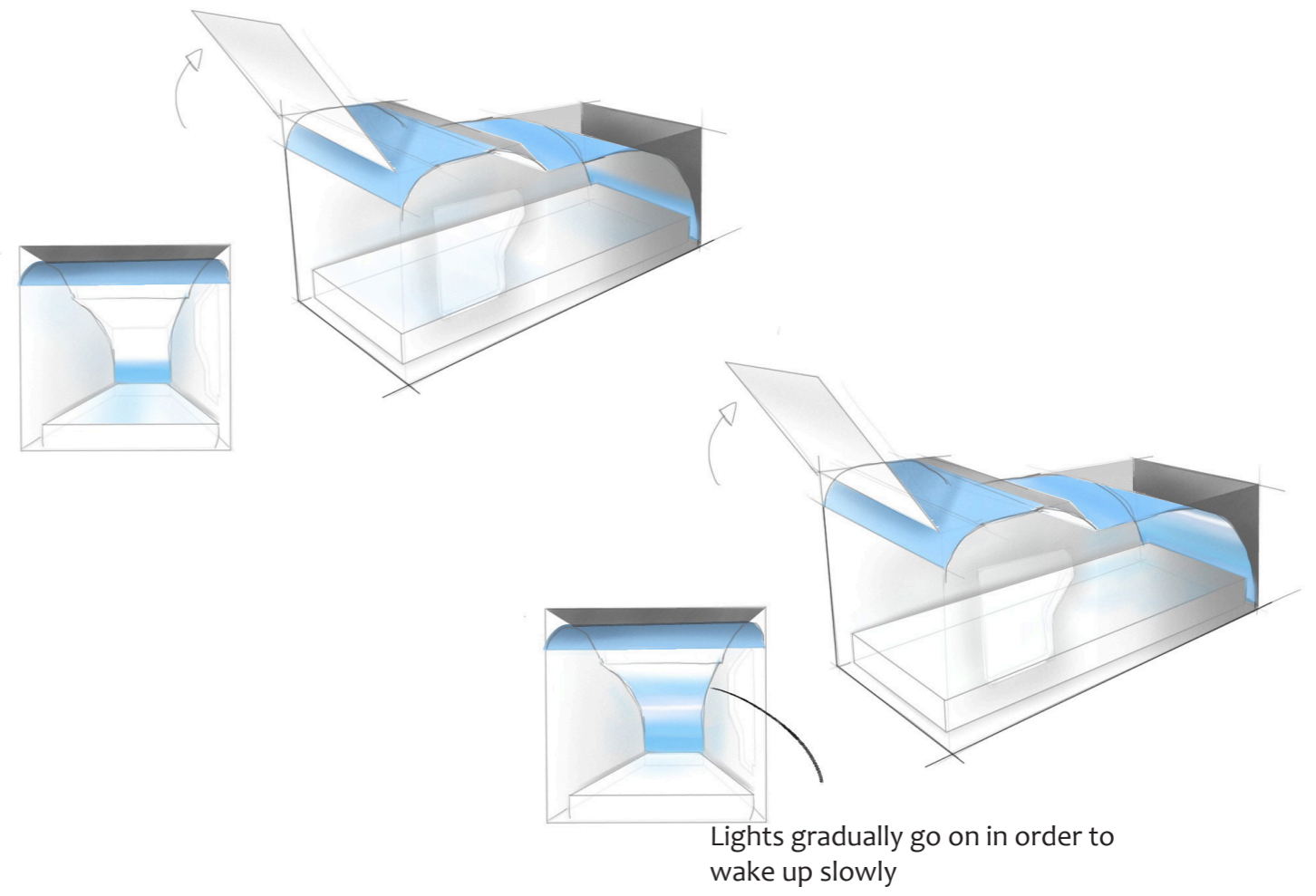
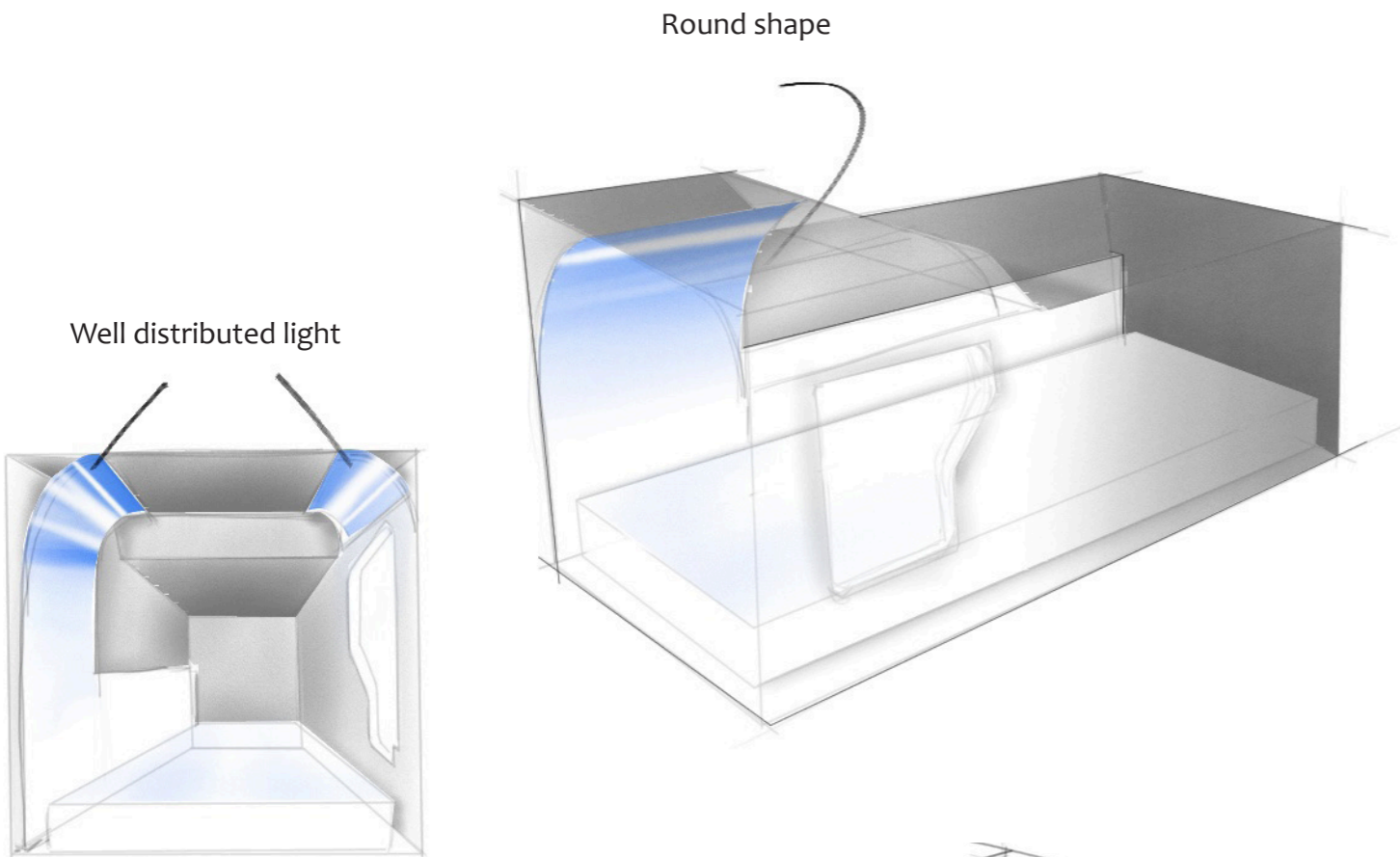
Ideation



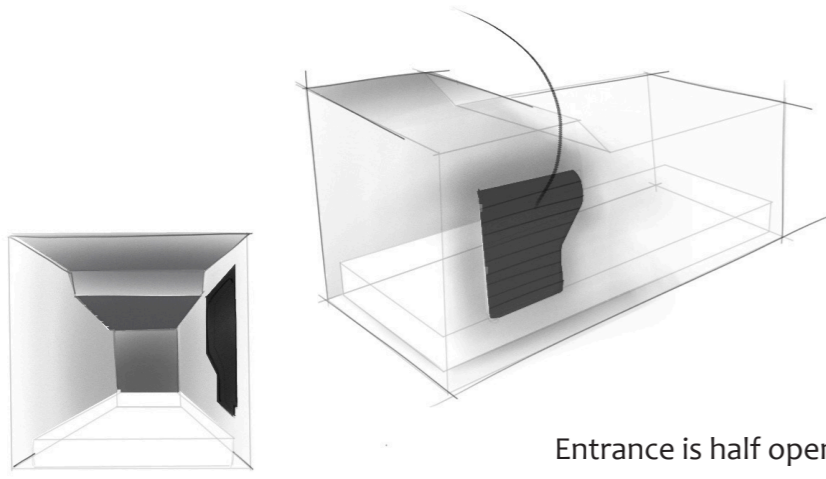
Bouba-Kiki Principle test



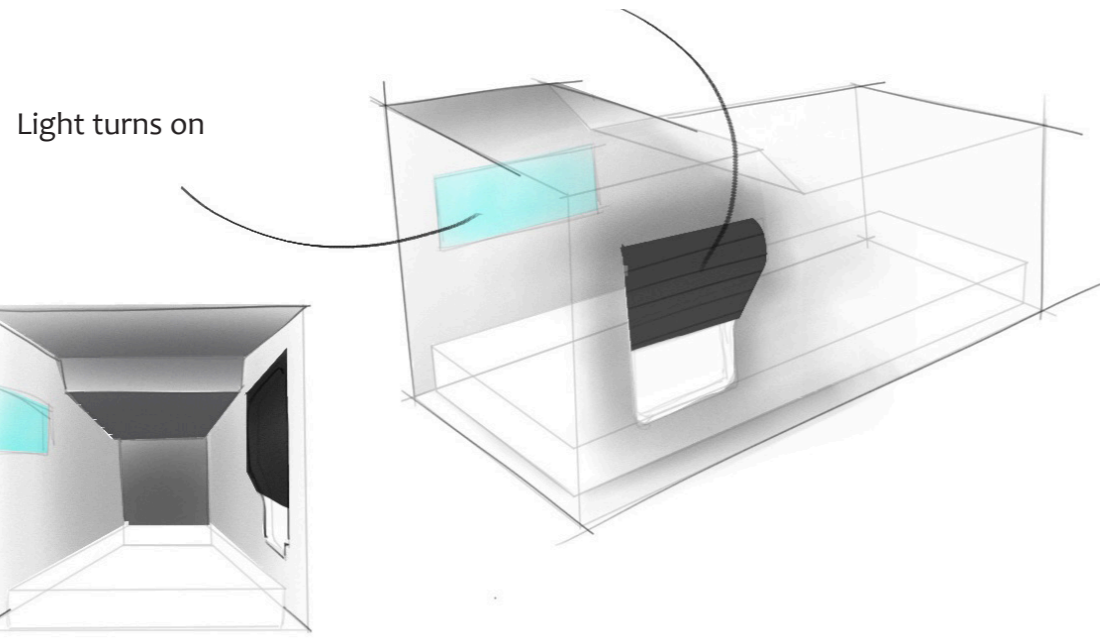
18 index cards	Participant 1	Participant 2	Participant 3	Participant 4	Participant 5	Participant 6	Participant 7
1 Kiki	Correct	Correct	Correct	Correct	Correct	Correct	Correct
2 Bouba	Correct	Correct	Correct	Correct	Correct	Correct	Correct
3 Bouba	Correct	Correct	Correct	Correct	Correct	Correct	Correct
4 Kiki	Correct	Correct	Correct	Correct	Correct	Correct	Correct
5 Bouba	Correct	Correct	Correct	Correct	Correct	Correct	Correct
6 Kiki	Correct	Correct	Correct	Correct	Correct	Correct	Correct
7 Kiki	Correct	Correct	Correct	Correct	Correct	Correct	Correct
8 Kiki	Correct	Correct	Correct	Correct	Correct	Correct	Correct
9 Bouba	Correct	Correct	Correct	Correct	Correct	Correct	Correct
10 Kiki	Correct	Correct	Correct	Correct	Correct	Correct	Correct
11 Bouba	Correct	Correct	Correct	Correct	Correct	Correct	Correct
12 Bouba	Correct	Correct	Correct	Correct	Correct	Correct	Correct
13 Kiki	Correct	Correct	Correct	Correct	Correct	Correct	Correct
14 Bouba	Correct	Correct	Correct	Correct	Correct	Correct	Correct
15 Kiki	Correct	Correct	Correct	Correct	Correct	Correct	Correct
16 Kiki	Correct	Correct	Correct	Correct	Correct	Correct	Correct
17 Bouba	Correct	Correct	Correct	Correct	Correct	Correct	Correct
18 Bouba	Correct	Correct	Correct	Correct	Correct	Correct	Correct



Closed entrance



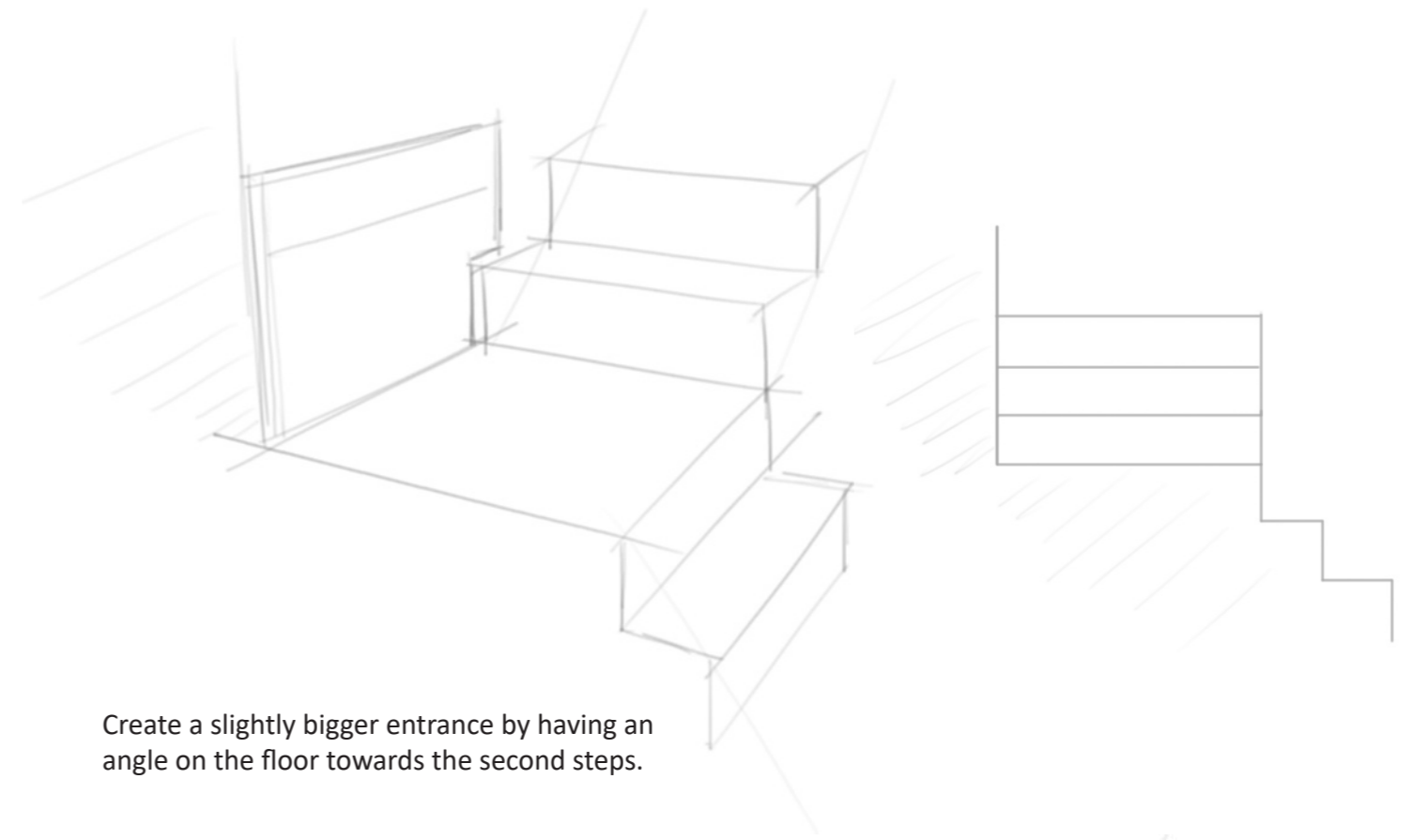
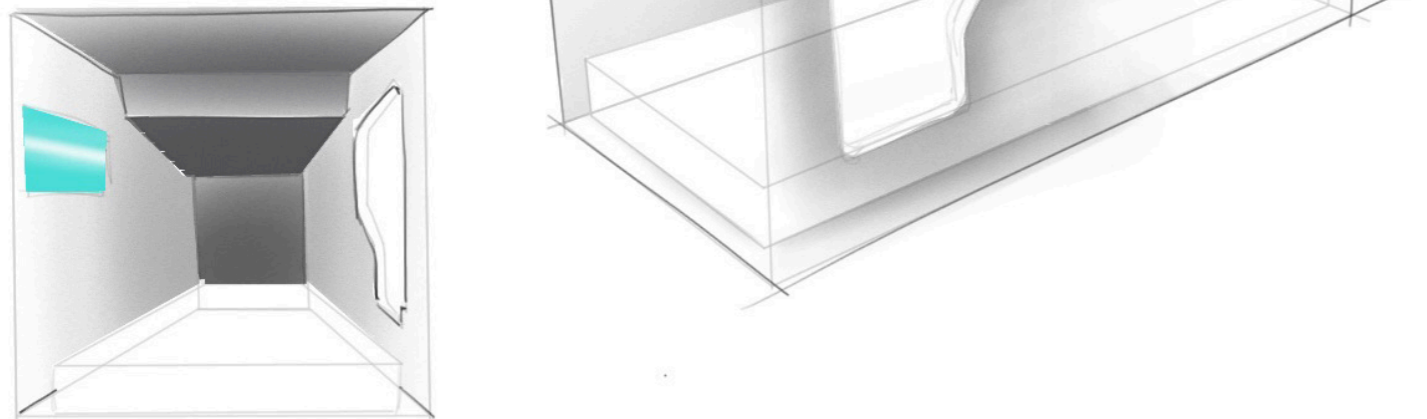
Entrance is half open



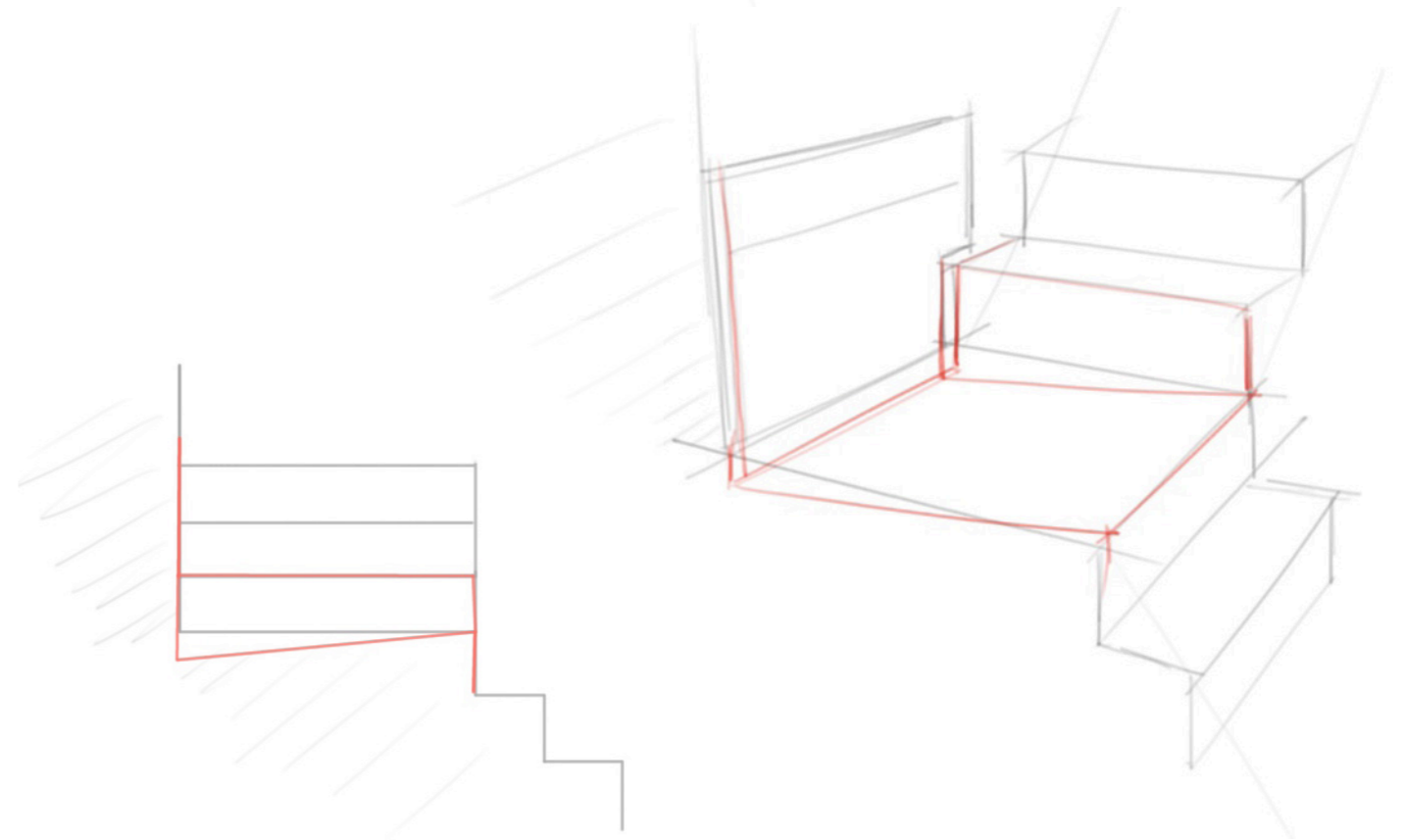
Light turns on

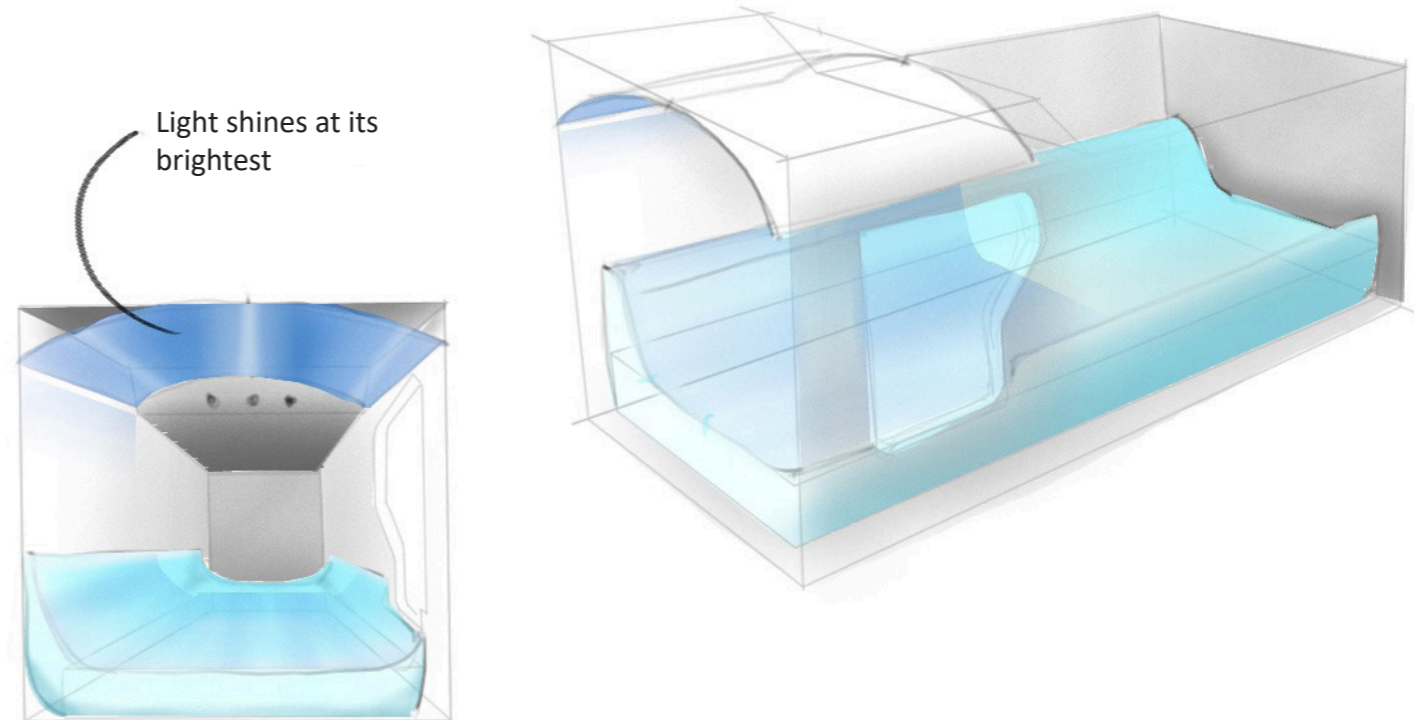
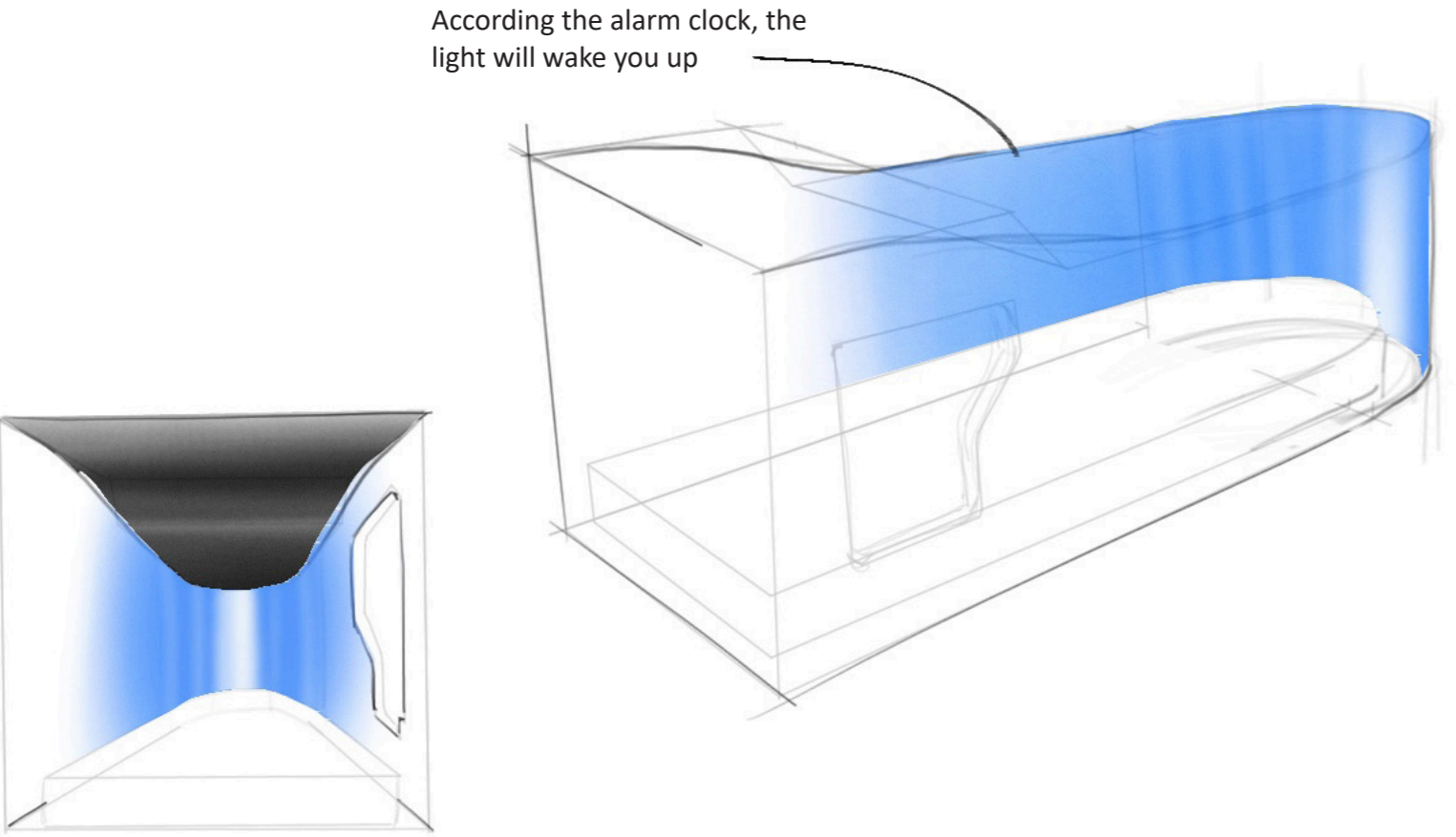
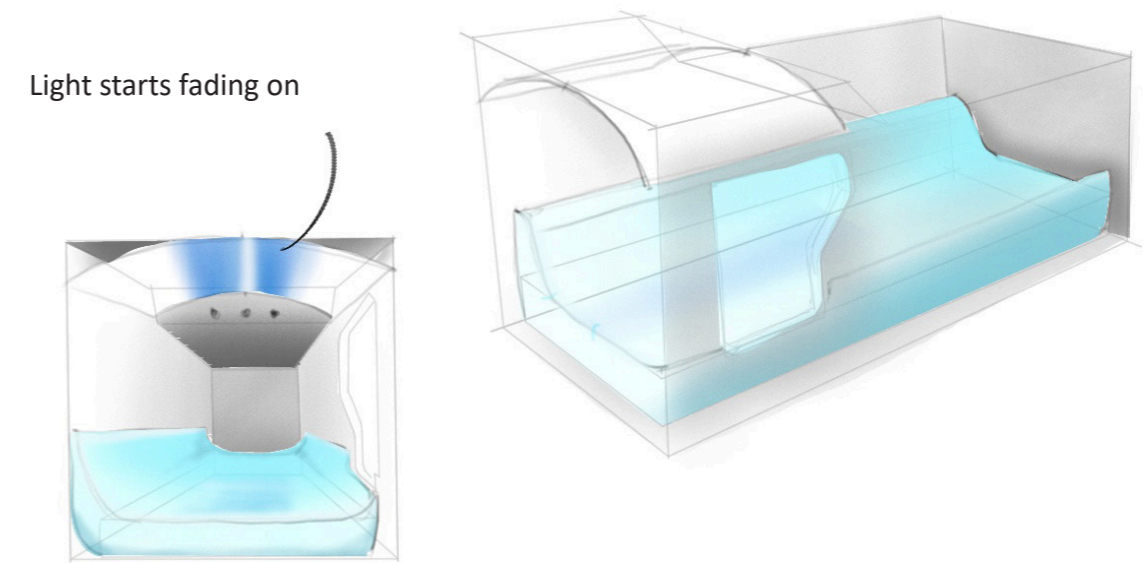
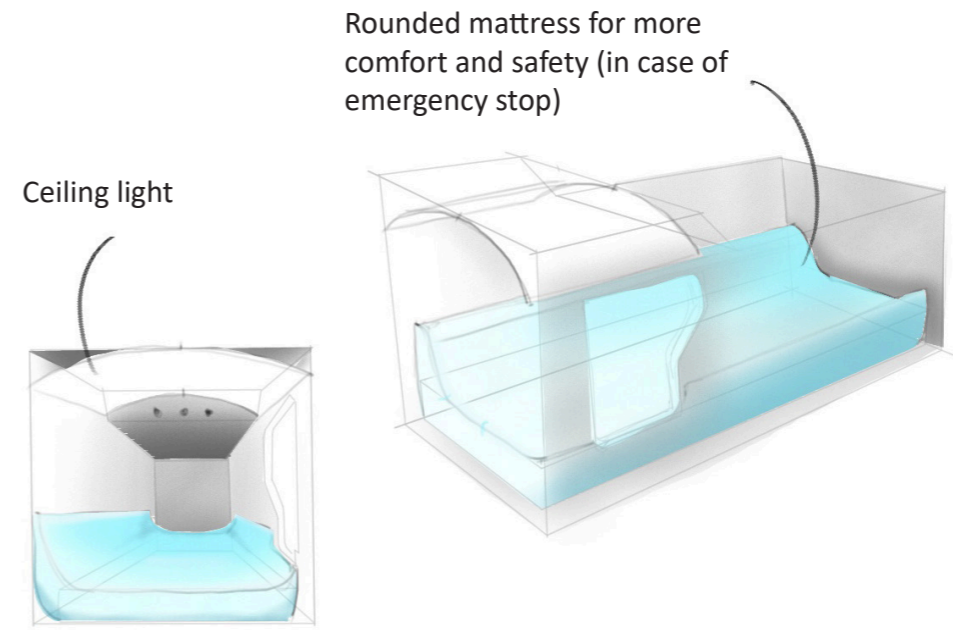
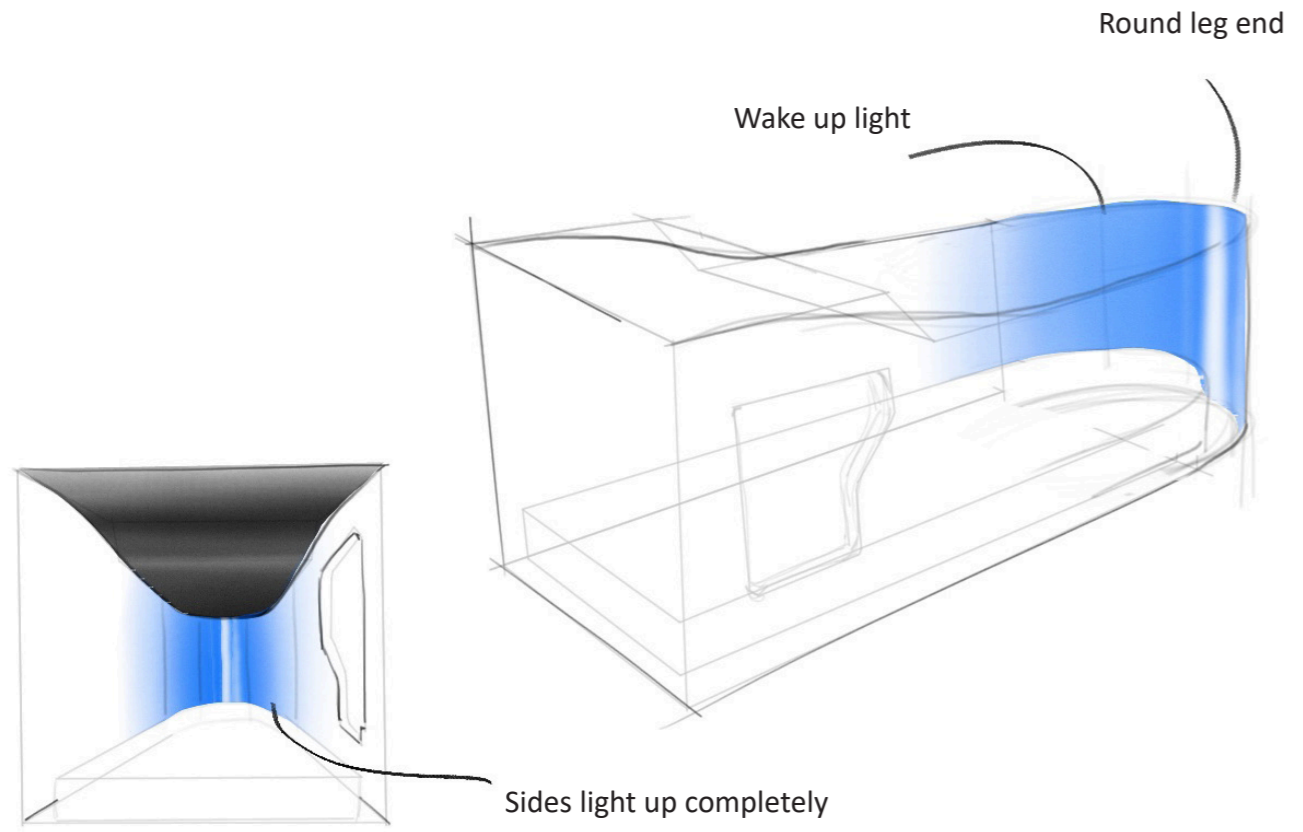
Entrance completely open

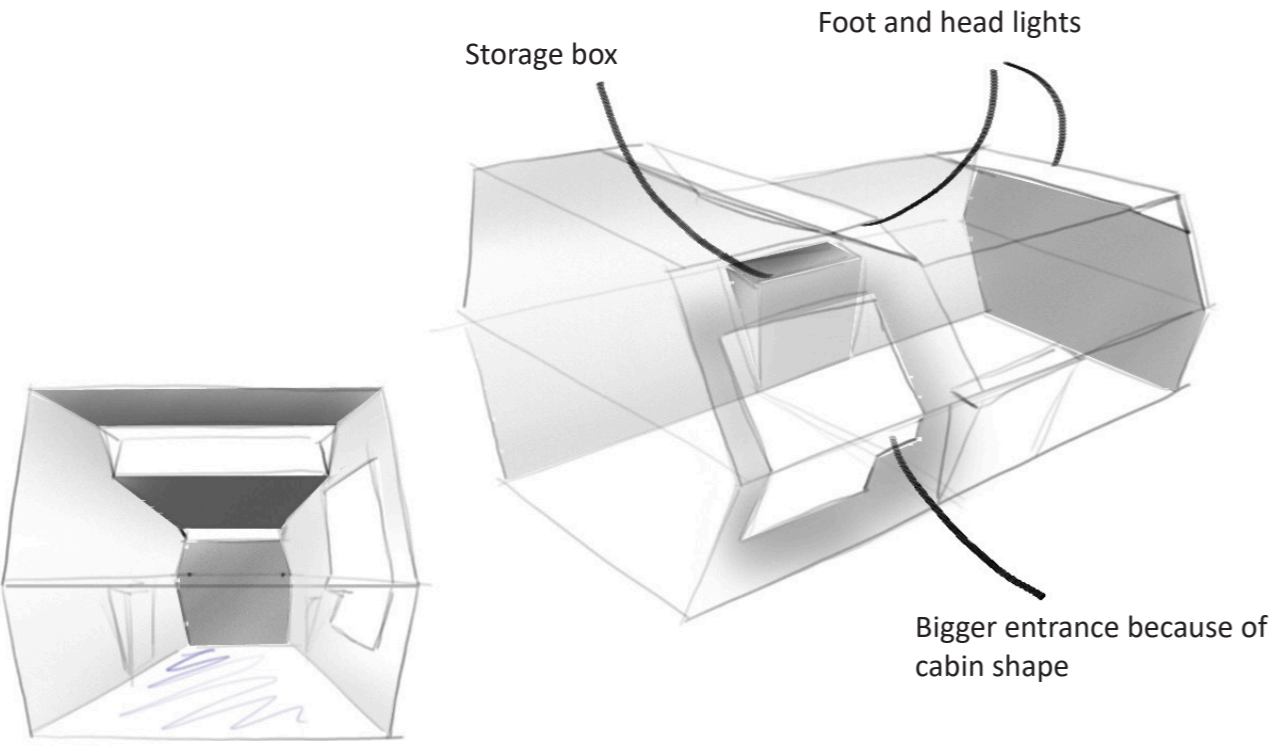
Some kind of welcome interaction such as this LED sign below



Create a slightly bigger entrance by having an angle on the floor towards the second steps.



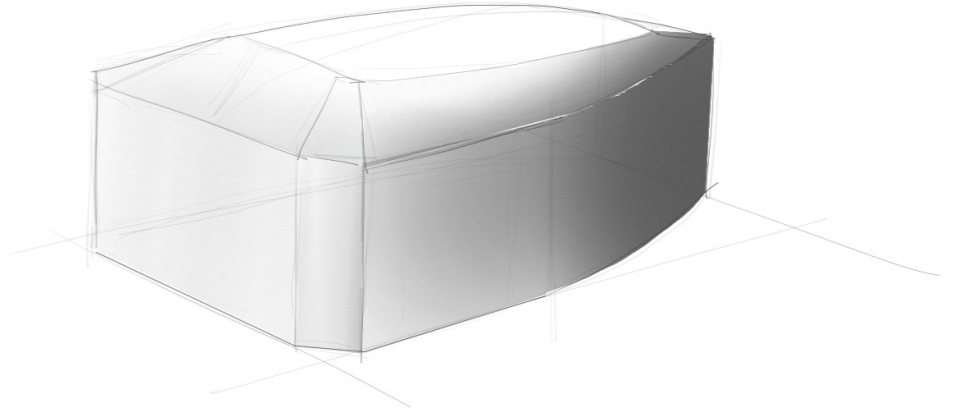
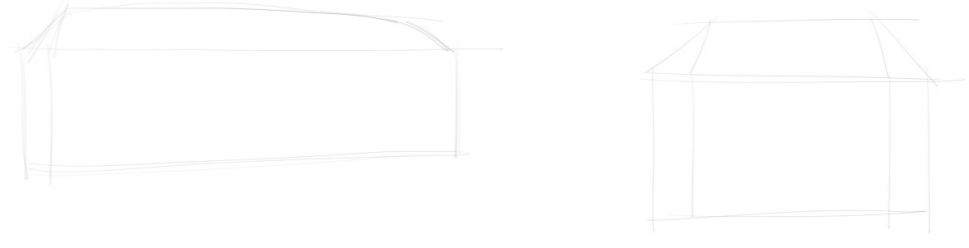




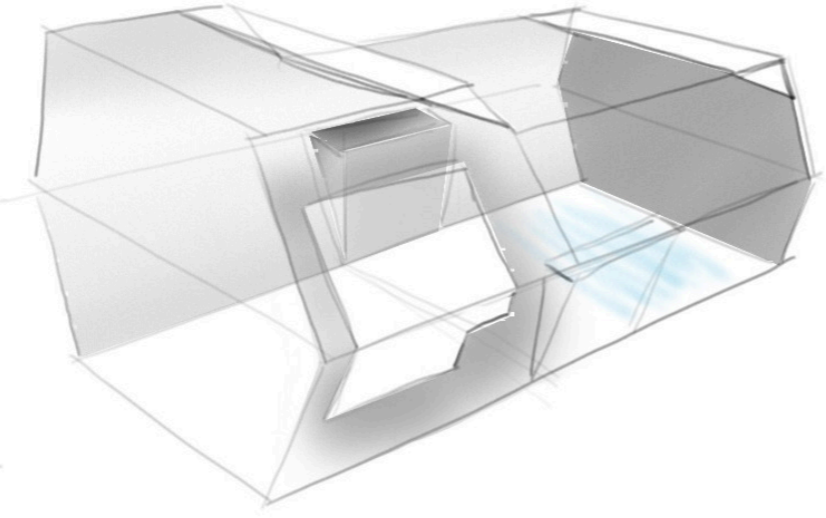
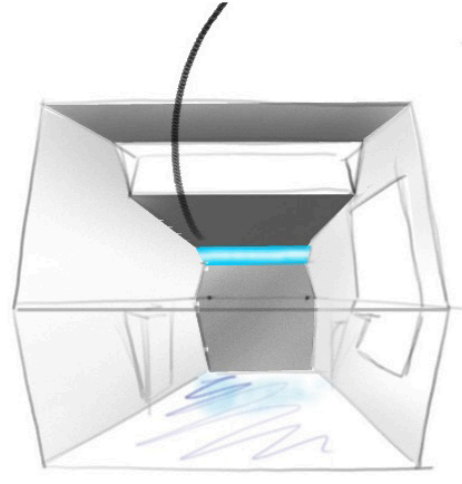
Storage box

Foot and head lights

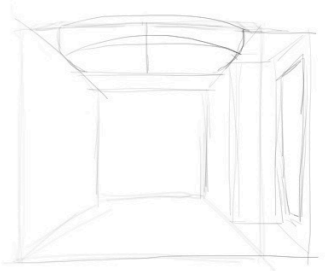
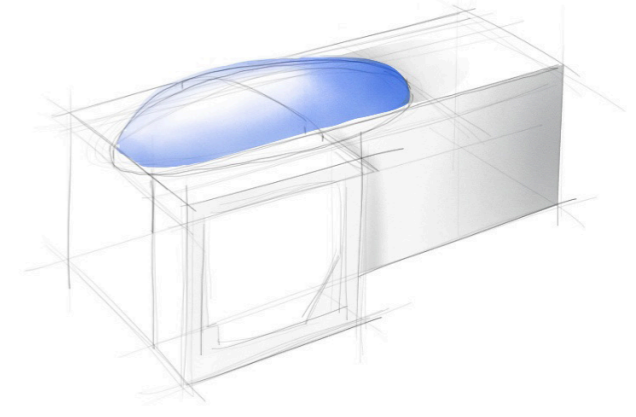
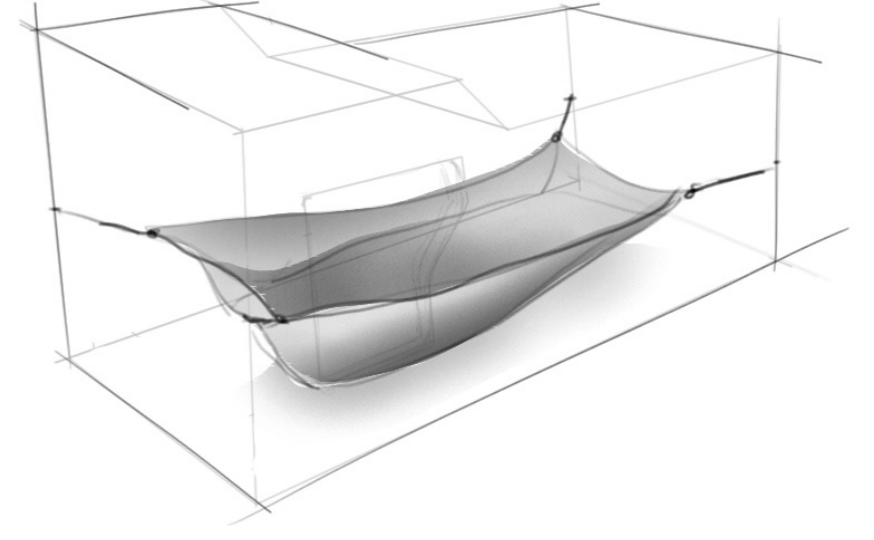
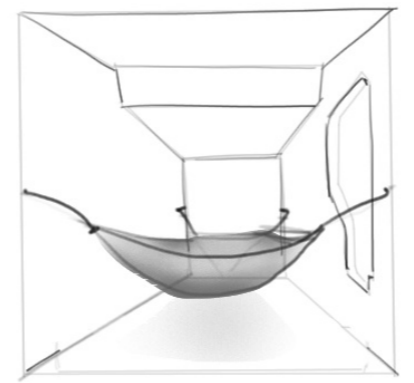
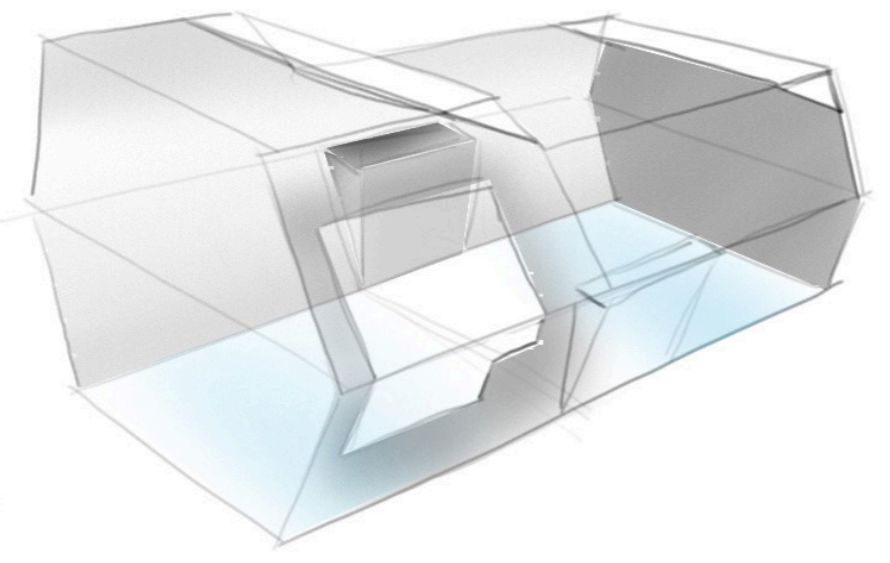
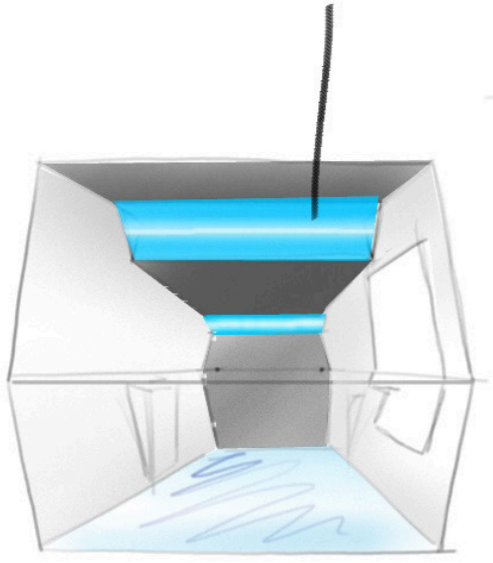
Bigger entrance because of cabin shape

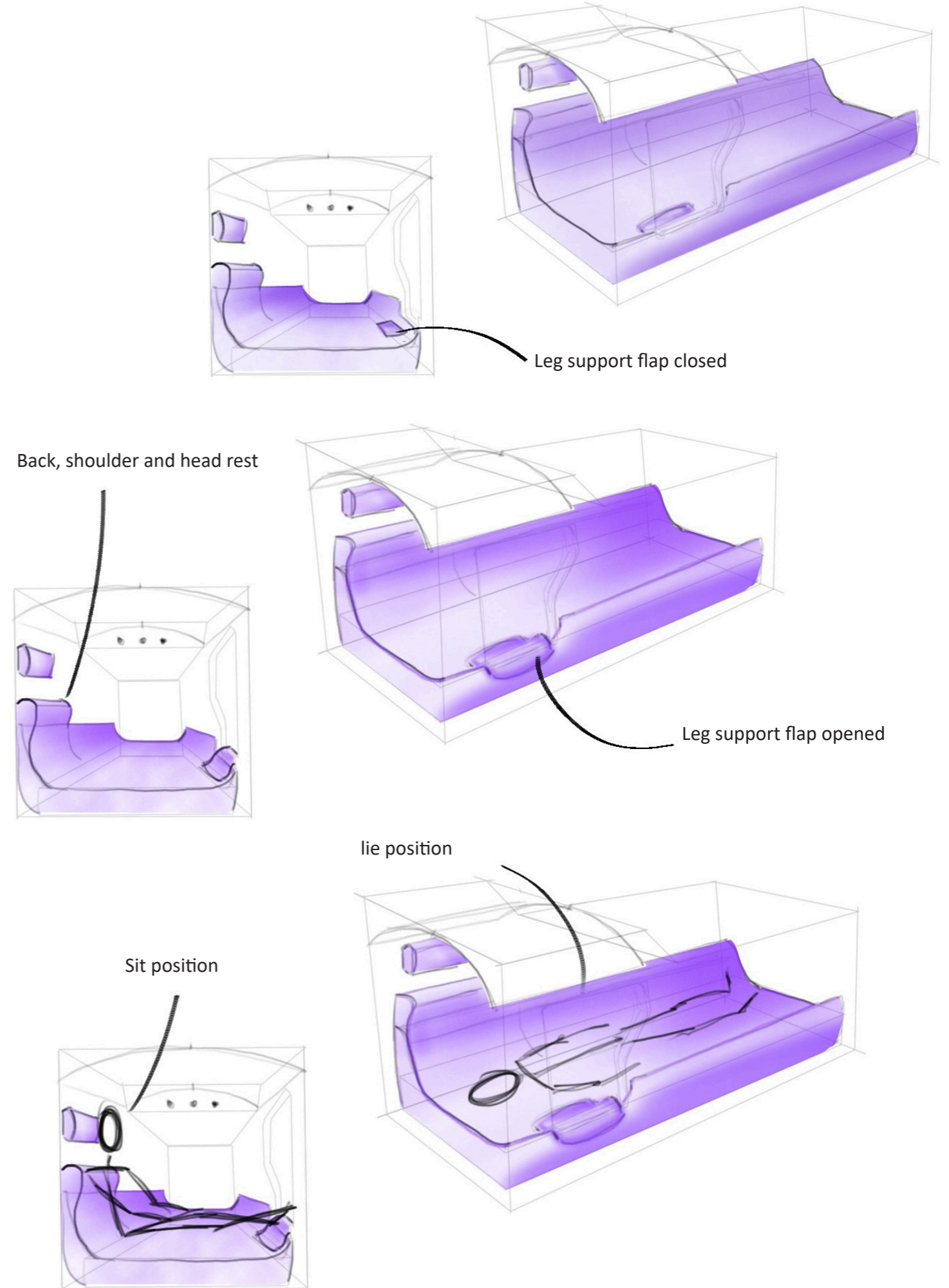
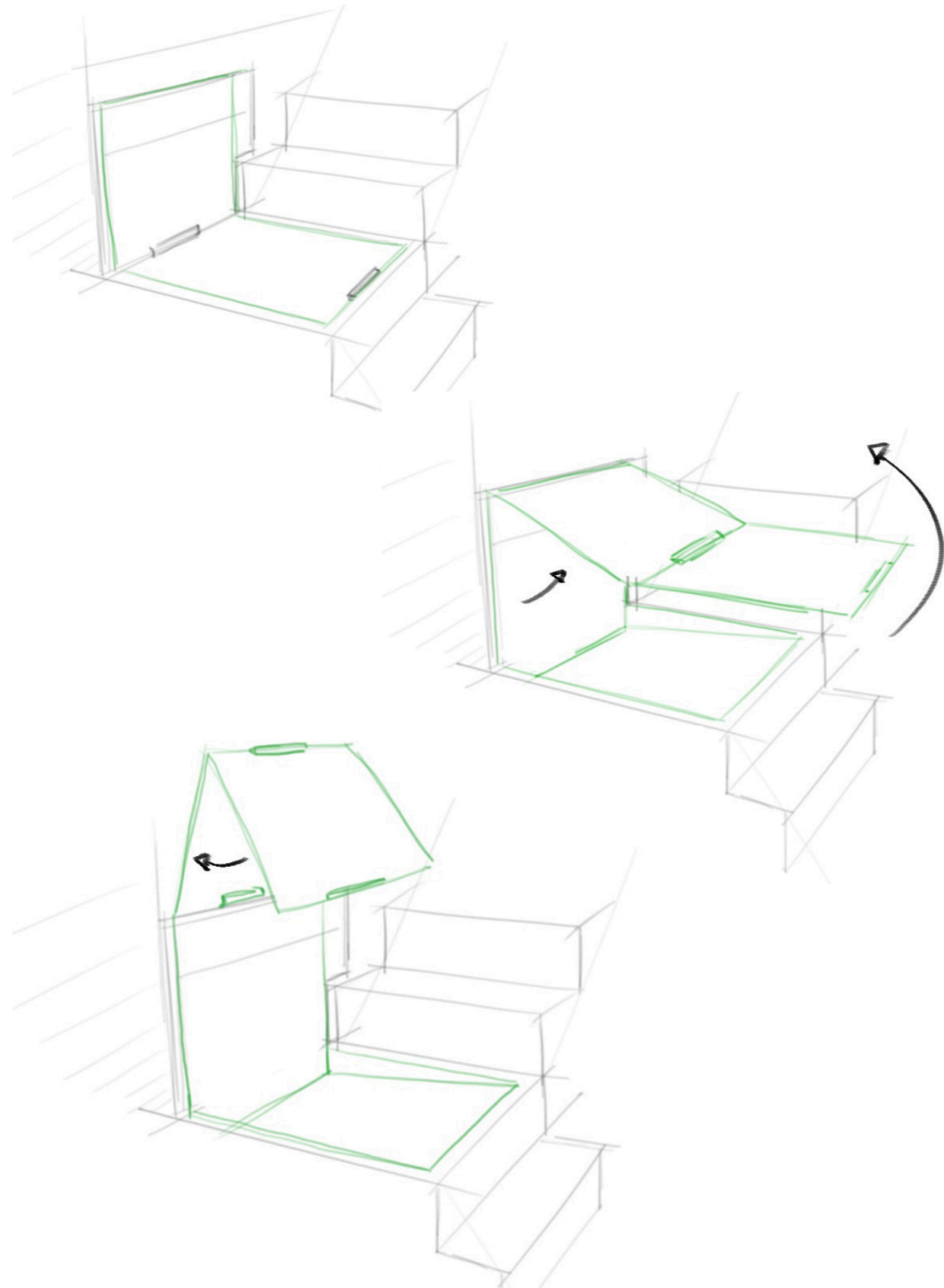


Foot light turns on to wake you up



Head light turns on to make you feel more energetic





APPENDIX 8

Co-creation session

Co-creation session idea generation

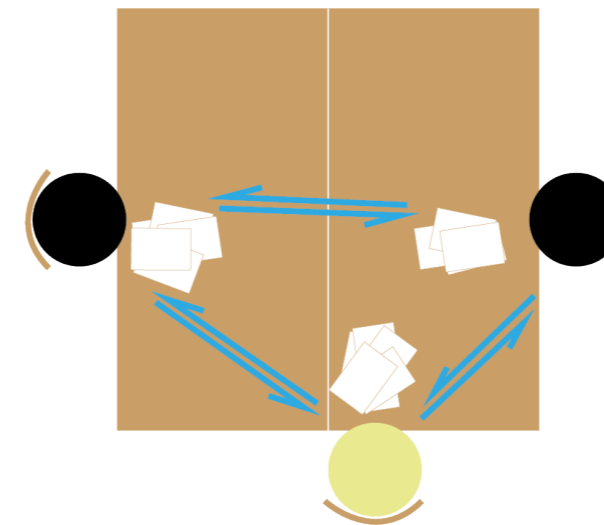
The co-creation session was organized in order to get more insights and inspiration at the end of the ideation phase. This will result in some final ideas before going in the conceptualisation phase. The session will be done with 3 persons and the designer (n=4) that will “grade” all the ideas individually. Afterwards there will be time for some comments and sparring.

Set up

All the ideas have been printed, one idea per A4. This offers plenty of white space on papers to write comments or elaborations. N=4 as aforementioned. All the persons were sitting in one space, relatively close to each other. The designer was present and walking around for any questions, checking the progress and to spar directly in order to generate more concrete feedback.

Evaluation

Since the designer was present all the questions could be answered at spot. This offered possibilities sparring between the participants and the designer. However, as the session was led by the designer, it was asked to spar on paper between the participants. Comment on each other’s ideas in order to see what might be the outcome. The outcome will be important for the designer because new ideas might be generated with the aid of the feedback and spar session.



Set up of co creation

Conclusion

The discussion topics and comments have been summarized and written down in bullet points. They are displayed below:

Research related

- Prof. Anya Hurlbert – gave light symposium. She hates blue colour. Check more colour studies
- How much light does a person need to wake up?
- Take a look into: lightening design topics: chromaticity of daylight curve & high melanopic light & adaptation state light.

Design related

- Changing intensity of light instead of moving light
- Watch out that people don’t wake up to early because of the light.
- Let the support cushions be fully movable. Drivers will be able to personalize their sleeping environment. (home feeling – cushions)
- Give the drivers interaction preferences
- Is it possible to create a certain sit position in order to watch tv?
- Use light to create big curves. Physical forms may take too much space
- Inflatable support cushions

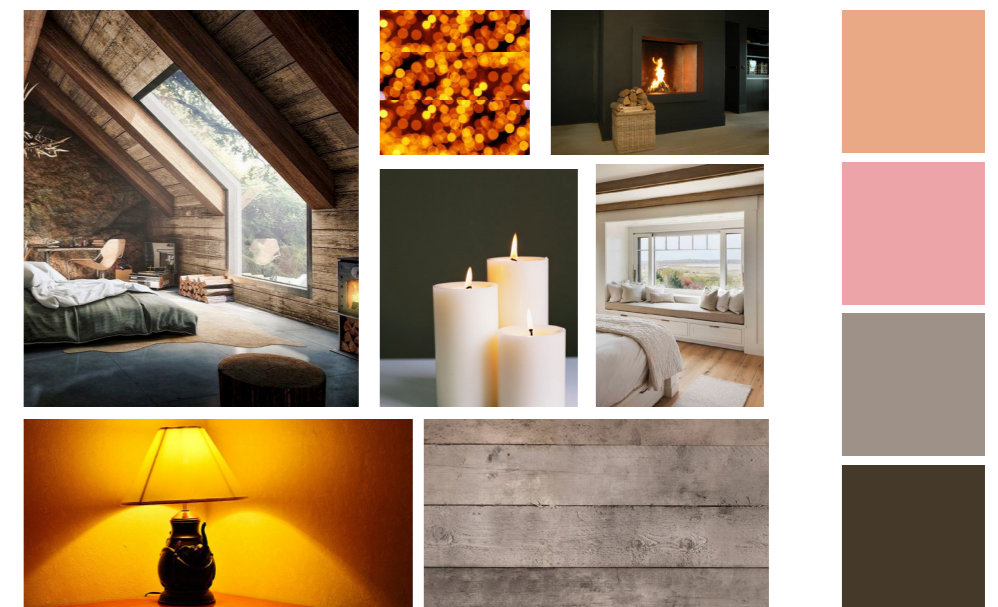
APPENDIX 9

Conceptualisation

Concepts have been based on ideation (appendix X), research and user (driver) wishes (appendix X). These three aspects led to two quite similar concepts in relation to shape. However, the experience would be completely different, as well as the appearance and one “out of the box” concept.

The last mentioned “out of the box” concept was in relation to the shape. It would be a challenge to change the size and shape of the sleeping cabin since the cabin is based on the chassis, a frame and a lot of engineering work. After a discussion with people from VDL it has been chosen to eliminate this concept. However, the design style that was suited for this concept has been taken into consideration with the other two concepts.

In order to communicate the three concepts, it has been chosen to create three design style boards.



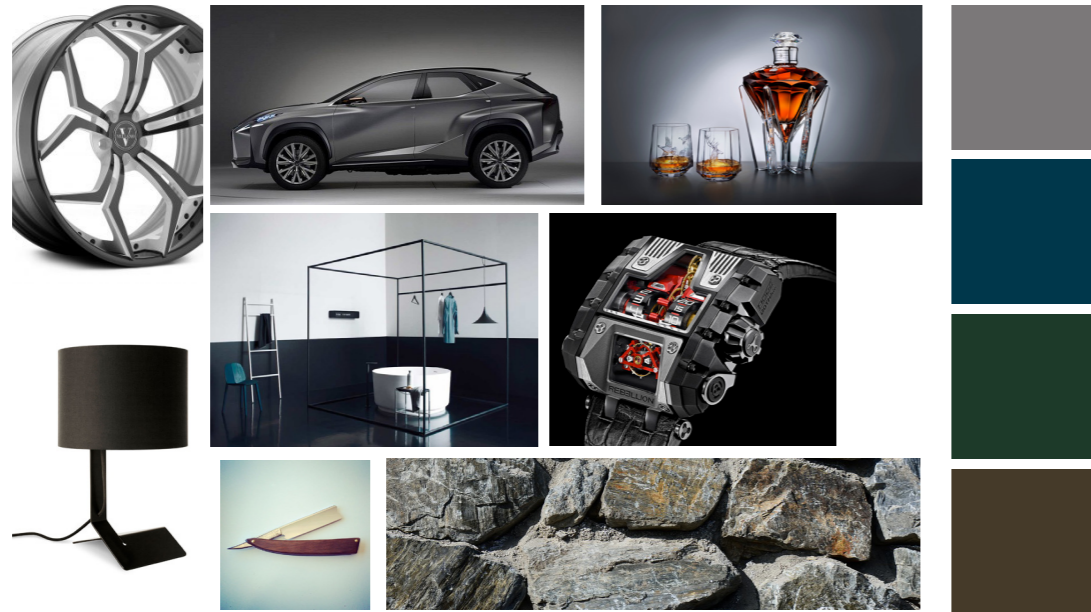
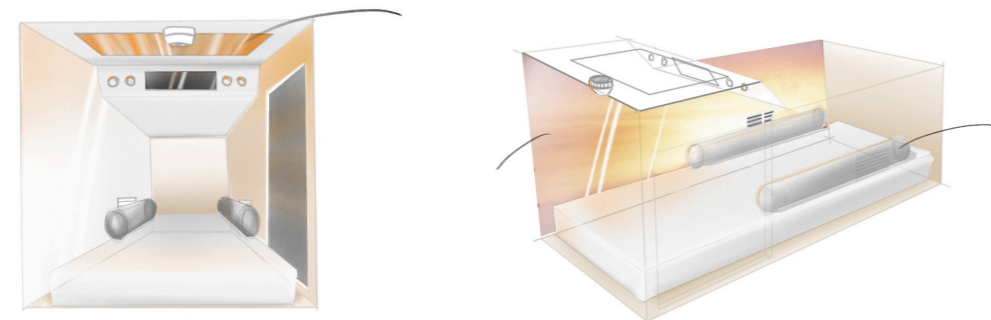
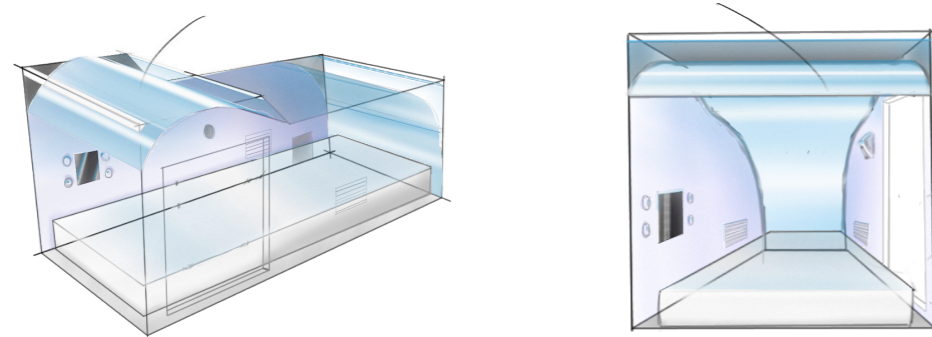


Image
Design style
boards three
concepts

As can be seen the clean style has been presented, followed by a home environment and final a masculine design. The masculine design used to be the one with extraordinary shapes, however the shapes have not been taken into consideration as aforementioned.

Some sketches followed to provide the first impressions, these sketches and the list of goals (appendix 1) have been used in order to determine the final concept. However, the sketches were not communicating clearly what was meant. Therefore, some quick renders were made hoping that it would become clearer.

Unfortunately it didn't. This was an important learning moment in relation to how to present work. Other renders have been made after the concept was chosen.

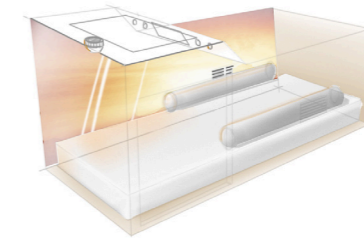


CONCEPT EVALUATION

How is the final concept created?
GOAL LIST - 2 CONCEPTS

Concept 1 - Home

Concept 2 - Re-energizing



Entrance

The entrance is not smaller than: 61.5 x 52 cm



The entrance is 64 x 54 cm or bigger.



The entrance is turning on the light at opening.



The entrance is triggering an interaction of movement.



There will take an interaction place that confirms closure/opening of the entrance.



The way of opening/closing the entrance is providing a more natural experience in comparison to the current entrance.



The entrance has a user-friendly way of opening/closing.



The entrance door feels more luxurious in comparison to the current plastic blinds.



The entrance does not invite unwanted people to open the cabin.



The entrance unlocks (in case it is locked) automatically in case of an emergency.



Sleeping cabin interior

	--	-	+	++	--	-	+	++
The sleeping cabin is not smaller than the current sleeping cabin, which is 242 x 63 x 106 cm.	Grey	Grey	Green	Green	Grey	Grey	Green	Green
Sleeping cabin height is at least 85 cm where the upper body is located.	Grey	Grey	Green	Green	Grey	Grey	Green	Grey
The temperature in the sleeping cabin is controlled between 17.5 and 20.3 degrees Celsius.	Grey	Grey	Green	Grey	Grey	Grey	Green	Grey
The temperature can be adjusted according to personal preference at all time.	Grey	Grey	Green	Grey	Grey	Grey	Green	Grey
The ventilation does not produce any noise in regular state (ON).	Grey	Red	Grey	Grey	Grey	Red	Grey	Grey
The ventilation can be levelled up or down according to personal preference.	Grey	Grey	Green	Grey	Grey	Grey	Green	Grey
The light can be used as direct lightening and indirect (ambient) lightening.	Grey	Grey	Green	Green	Grey	Grey	Green	Grey
Light is adjustable in brightness.	Grey	Grey	Green	Grey	Grey	Grey	Green	Green
The light will have a function of waking the driver up.	Grey	Grey	Green	Grey	Grey	Grey	Green	Green
The light will interact at the moment the door is opened.	Grey	Grey	Green	Grey	Grey	Grey	Green	Grey
The light will provide a relaxed experience.	Grey	Grey	Green	Grey	Grey	Grey	Green	Green
The light can be adjusted in colour according to RGB.	Grey	Red	Grey	Grey	Grey	Grey	Green	Grey
The smell in the sleeping cabin is providing a fresh experience.	Grey	Grey	Green	Grey	Grey	Grey	Green	Grey
The odour in the sleeping cabin is providing a relaxing experience.	Grey	Red	Grey	Grey	Grey	Grey	Green	Green

	--	-	+	++	--	-	+	++
The sleeping cabin is offering the possibility to play own music via the speakers.	Grey	Red	Grey	Grey	Grey	Red	Grey	Grey
The sleeping cabin is providing a “feel like home” experience.	Grey	Grey	Green	Green	Grey	Red	Grey	Grey
The sleeping cabin is providing a “re-energizing” experience.	Grey	Red	Grey	Grey	Grey	Grey	Green	Green
A way of communication to the other crew is present within the sleeping cabin.	Grey	Grey	Green	Green	Grey	Grey	Green	Green
The resting driver can follow the trip via live footage recorded by a camera and displayed on the screen in the sleeping cabin.	Grey	Grey	Green	Green	Grey	Grey	Green	Green
The sleeping cabin can notify the driver in case of an emergency.	Grey	Grey	Green	Grey	Grey	Grey	Green	Grey
The materials, such as side wall carpet, mattress, switches and knobs, in the sleeping cabin are more luxurious in comparison to the materials in the current sleeping cabin.	Grey	Grey	Green	Grey	Grey	Grey	Green	Grey
The mattress is suited for different type of sleepers (side sleepers, back sleepers etc.).	Red	Red	Grey	Grey	Red	Red	Grey	Grey
The overall design of the sleeping cabin shows paid attention for the sleeping cabin.	Grey	Grey	Green	Grey	Grey	Grey	Green	Green
The sleeping cabin offers opportunity to create an own environment in order to have support during sleep.	Grey	Grey	Green	Green	Grey	Red	Grey	Grey
The buttons/switches are well integrated in the cabin and do not look as aftermarket.	Grey	Grey	Green	Green	Grey	Grey	Green	Grey
The control panel can be reached from a neutral lying position in the sleeping cabin.	Grey	Grey	Green	Green	Grey	Grey	Green	Grey
The location of the buttons/switches make sense in relation with the goal and usability of the	Grey	Grey	Green	Green	Grey	Grey	Green	Grey

product.

An alarm clock is integrated in the sleeping cabin. -- - + ++
-- - + ++

The direction in which the driver will lie down can be determined by him- or herself. -- - + ++
-- - + ++

Storage possibilities are present in which small items such as glasses, phone, tie etc. can be stored during rest period. -- - + ++
-- - + ++

There are always emergency (two) exits available. -- - + ++
-- - + ++

The emergency exits are clearly recognizable as emergency exits. -- - + ++
-- - + ++

Cleaning

Cleaning the side walls and ceiling of the sleeping cabin can be done easily by wiping it off with a cloth. -- - + ++
-- - + ++

There are no difficult edges present in which dirt can accumulate. -- - + ++
-- - + ++

Cleaning the cabin does not take any longer than 5 minutes. -- - + ++
-- - + ++

Cleaning the floor can be done with a vacuum cleaner. -- - + ++
-- - + ++

There are not any openings where bugs or other dirt can collect. -- - + ++
-- - + ++

Manufacturing

Manufacturing will not increase the costs by more than 15% of the sleeping cabin only. -- - + ++
-- - + ++

The sleeping cabin will not influence other manufacturing in the coach. -- - + ++
-- - + ++

The components should be as accessible as the current components now. -- - + ++
-- - + ++

Light will have to be replaceable after X years when it stops working. -- - + ++
-- - + ++

The hatches from outside will not be compromised. -- - + ++
-- - + ++

General

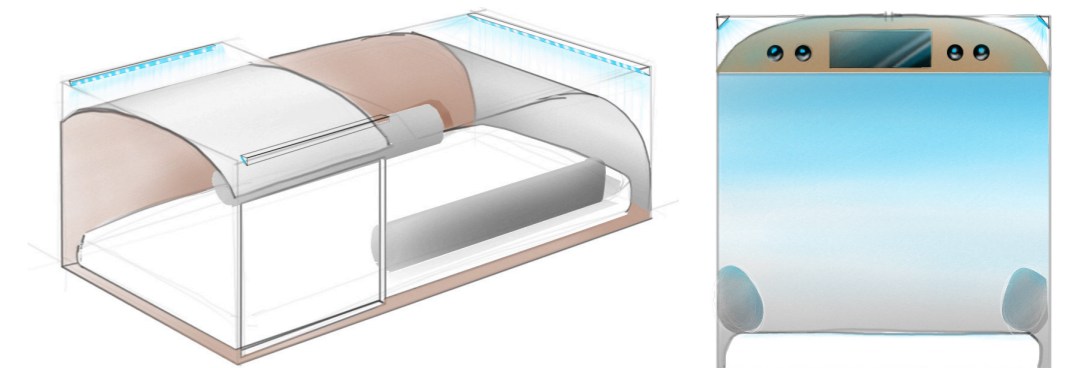
The cabin will serve for sleeping mainly. -- - + ++
-- - + ++

The cabin contains a USP which might influence VDL's market position positively. -- - + ++
-- - + ++

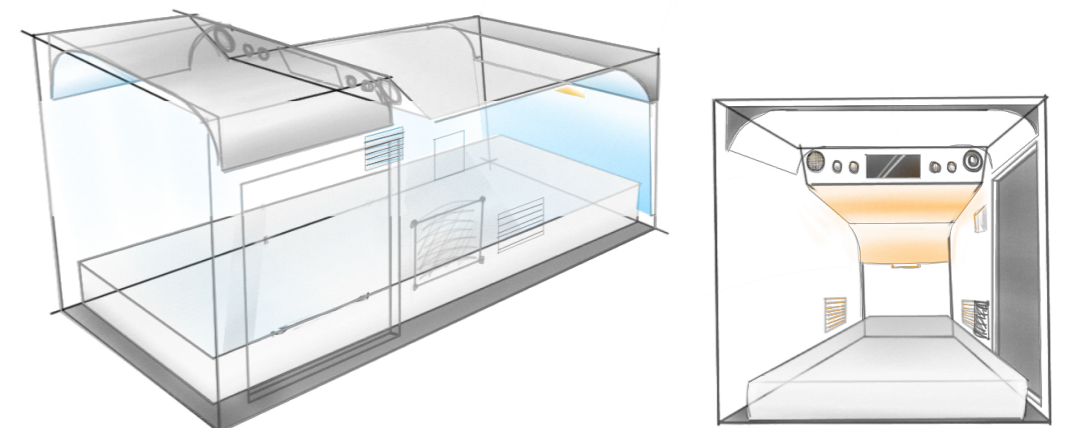
The experience is beyond expectations. -- - + ++
-- - + ++

Since both concepts have their strong aspects and weaknesses, it has been chosen to combine these concepts in one that will cover most of the wishes. The wishes that are not covered will be explained below.

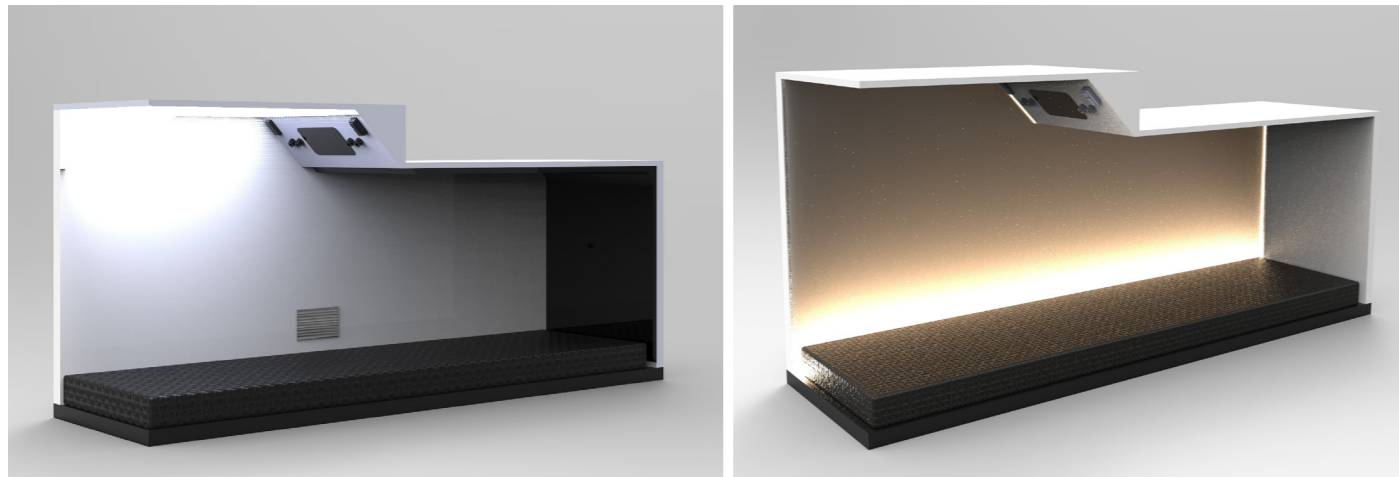
Expectation



Final concept



- 1) The entrance does not invite unwanted people to open the cabin. It is hard to camouflage the entrance in order to not be seen as an entrance. It may be assumed that most of the people will not open a cabin without a valid reason.
- 2) The ventilation does not produce any noise in regular state (ON). A rotating fan produces always a certain noise. However, this noise needs to be minimized as much as possible.
- 3) The direction in which the driver will lie down can be determined by him- or herself. There is only one correct position in which one may lie down (because of control panel and light). However, if the driver wishes differently, it is possible but the controls will be impossible to control.

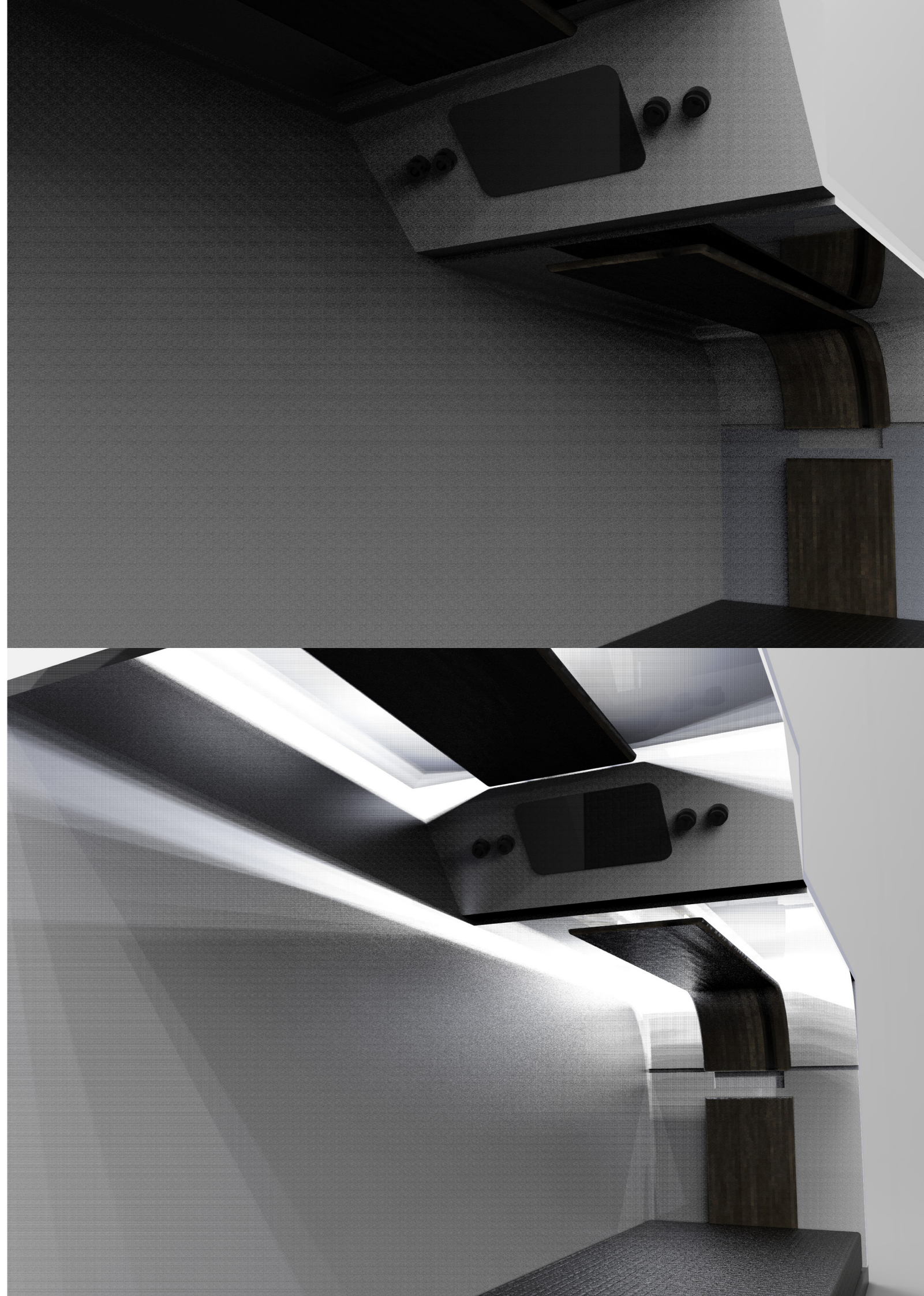
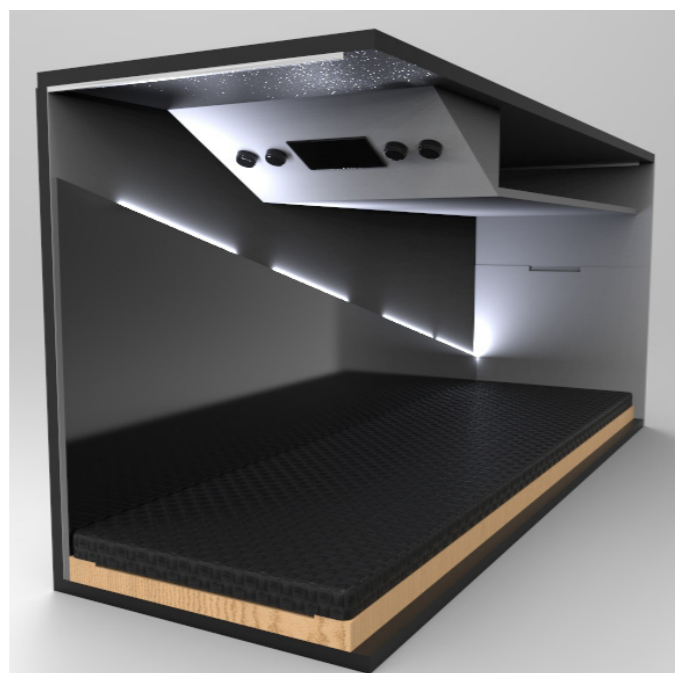


The renders above were the ones that were created quickly in order to communicate the concept. However it did not work out that well as mentioned already. The renders below have been created after a redesign based on the design styles that are already showed.



As can be seen, the top two are eventually used for the final concept. However, there were some choices that needed to be made (e.g. where to integrate the wood? What size should it have?) The render on the right was representing masculinity. Materials such as metal, light from top to bottom with interruptions in between in order to create "virtual" vertical lines.

The final concept, as it was at this stage has been presented on the next page.

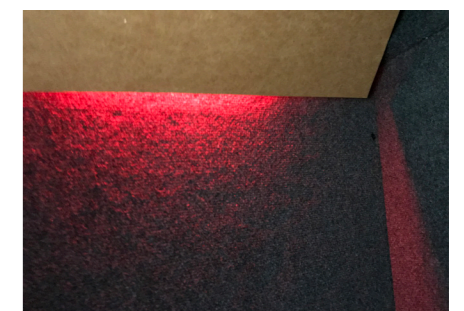
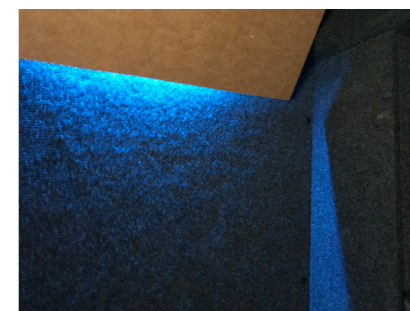
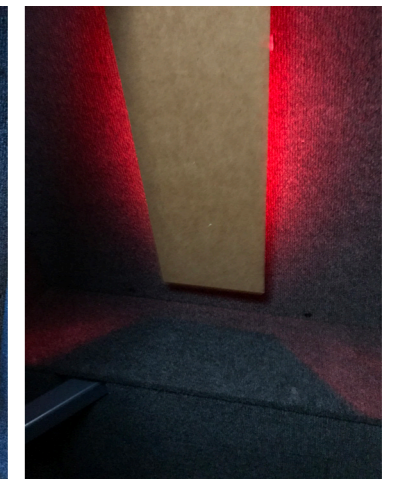
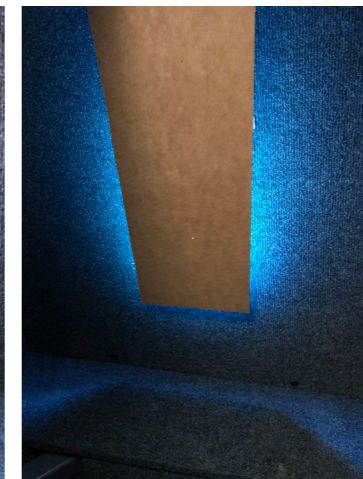
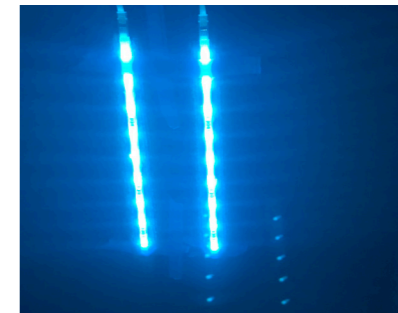


APPENDIX 10

Exploration light and validation control panel angle

This appendix will discuss the light explorations that have been done in order to define the position of the led strips and the way ambient lightening would be created. Two possibilities have been tested, inspired by the Dreamliner and a modern train interior, both displayed on the right. The third possibility was direct lightening, this one has been explored to experience the light "loss" of each ambient light method.

Furthermore, different colours have been applied in order to see if that made any difference, but also to experience if any change in ambient appears. The different explorations have been shown below, as well as the different ambient lightening methods.



Based on the exploration it has been chosen to create a double ceiling as inspired by the modern train interior and which has been displayed in the second row of images on the previous page. The reason was that the light distribution was best and that there was no possibility for direct light. Using the other ambient light possibility (inspired by the Dreamliner and the third row of images), would create a possibility to have disturbing and direct lightening.



The chosen light design has been explored once more with another "ceiling material". The carpet that is standard in the sleeping cabin has been covered with white paper sheets in order to see the effect. The white paper resulted in a better distributed light and therefore more light.

Goal: determine the correct angle for the control panel

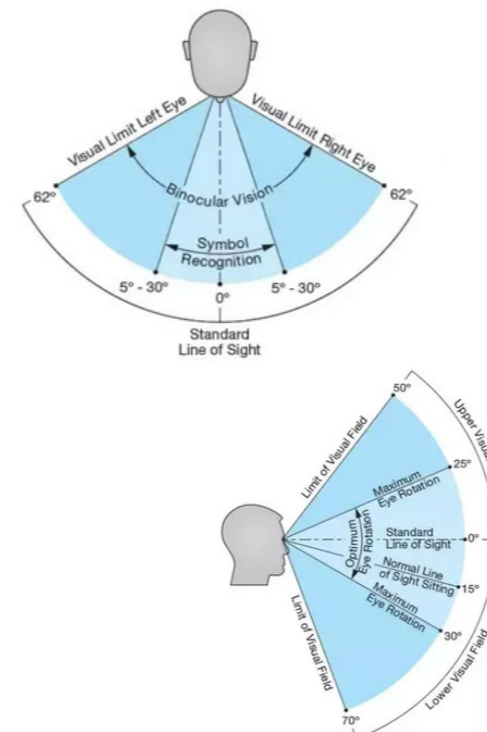
Expected result: 60 degrees angle, based on drawings and literature

Set up:

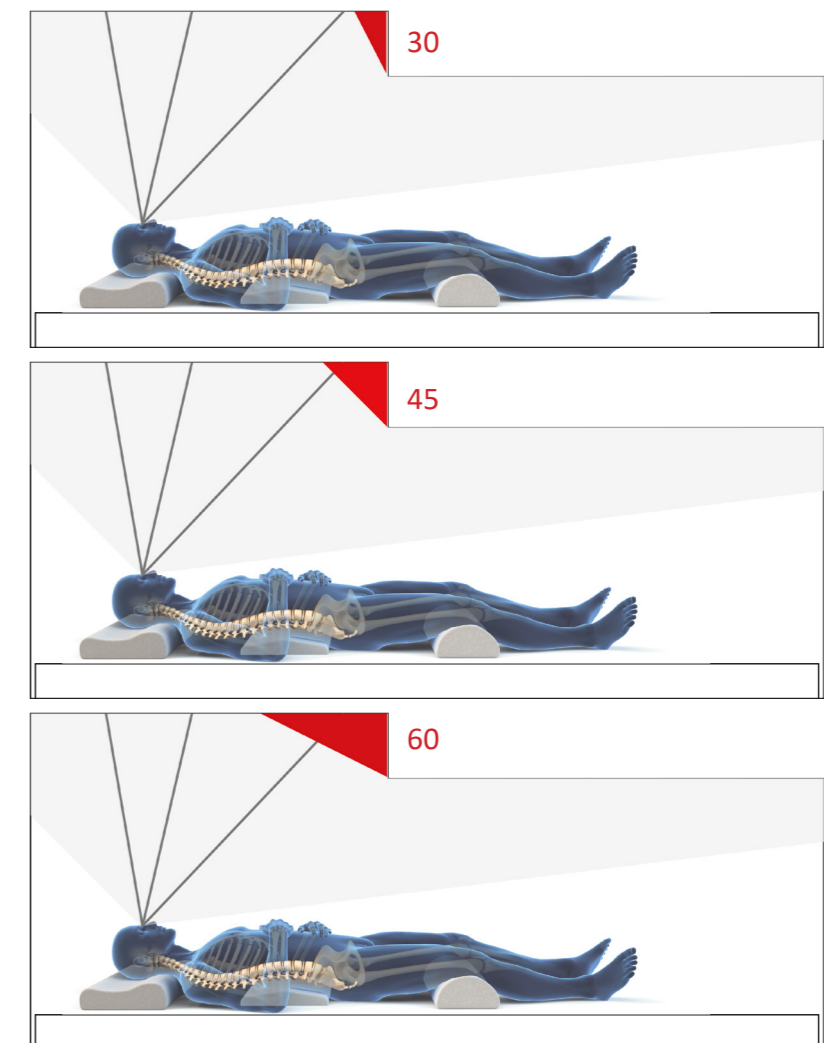


The above shown panel has been made in order to do a quick test and validation in relation to the control panel. According to Daniel Georgiev, who is a found of Iris, the human field of vision is approximately 120 degrees. This has been used in drawings, drawn in correct dimensions as can see below. The expected result has been based on the given illustrations.

As can be seen on the right, the grey area is the total field of sight, while the black lines indicate the maximum eye rotation. Therefore, the 60 degrees angle has been assumed to be best.



Source: <https://www.quora.com/What-is-the-maximum-human-field-of-vision>



First, the designer himself participated in the small validation test. Afterwards four other persons have been asked to compare 4 angles. 0, 30, 45 and 60 degrees angles. As soon as the designer himself as one other participant figured out, the 0 and 30 degrees angles were not suitable. Therefore, the final two participants have been asked to compare the 45 and 60 degrees angle.



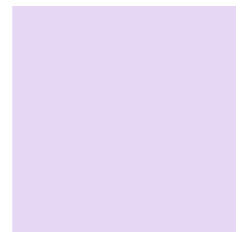
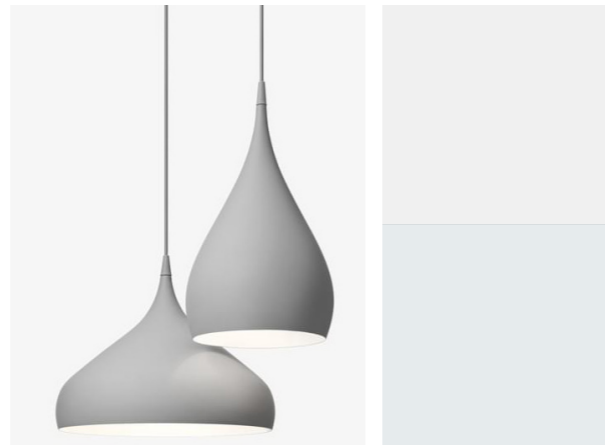
As can be seen above, a touchscreen could be a possibility as well. However, rotation knobs would be more user friendly since no menus would have to be passed in order to adjust the brightness of the light, or set an alarm clock.

Results

All participants have shared their preference to the 60 degrees angled control panel. However, two of them doubted between the 45 and 60 degrees angle. 45 would be possible according to them, however it would be depending of the mattress height.

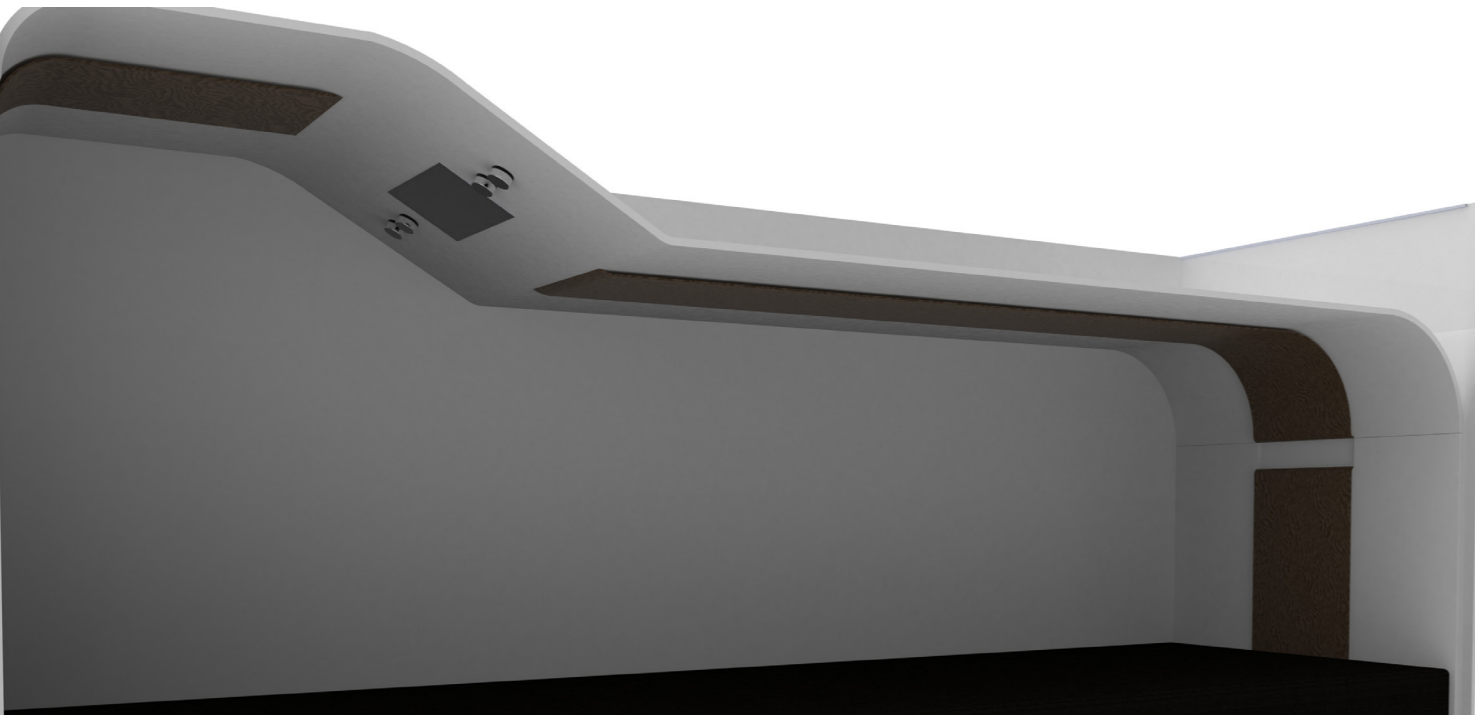
APPENDIX 11

Design style final design



APPENDIX 12

Mock up process

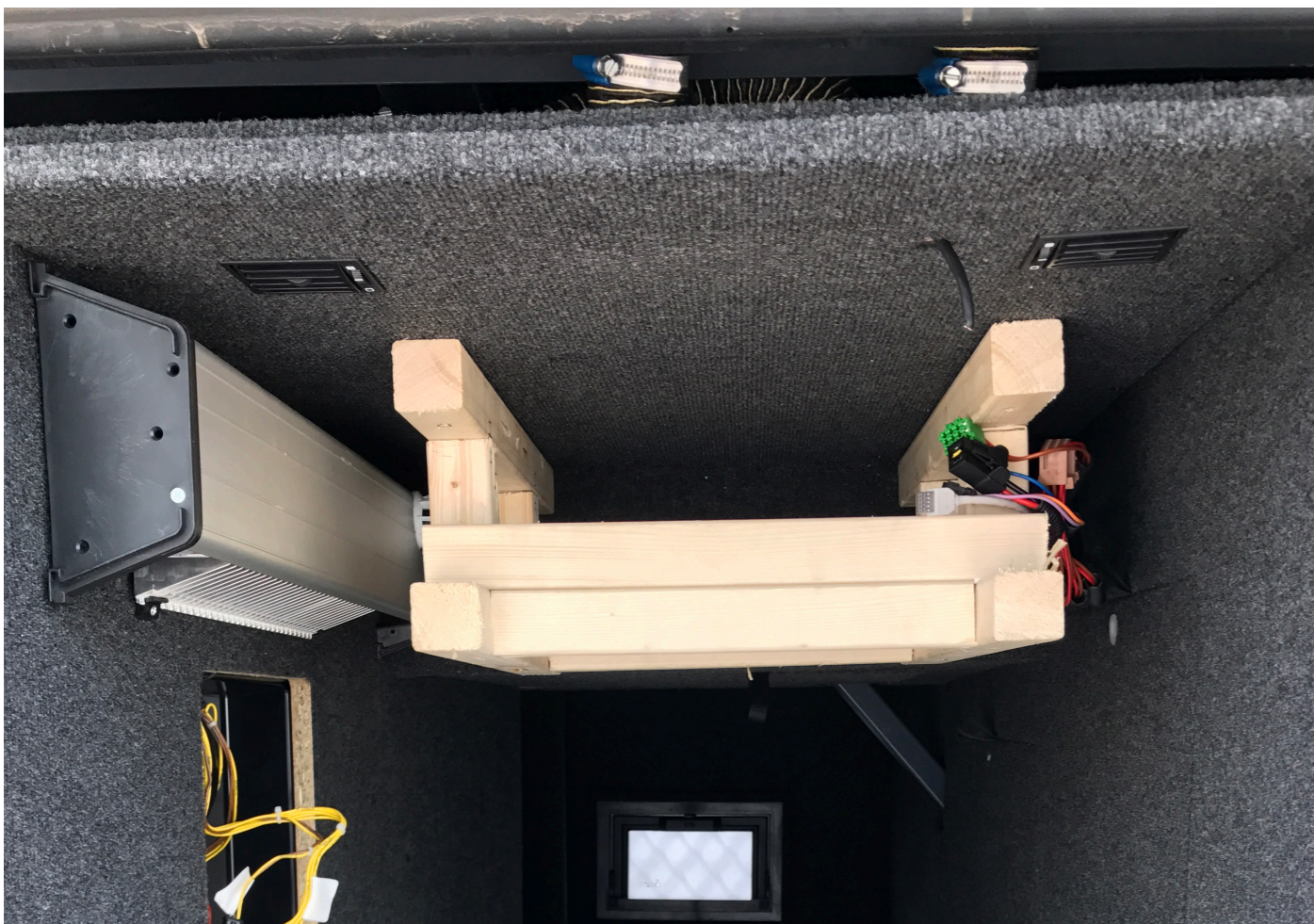
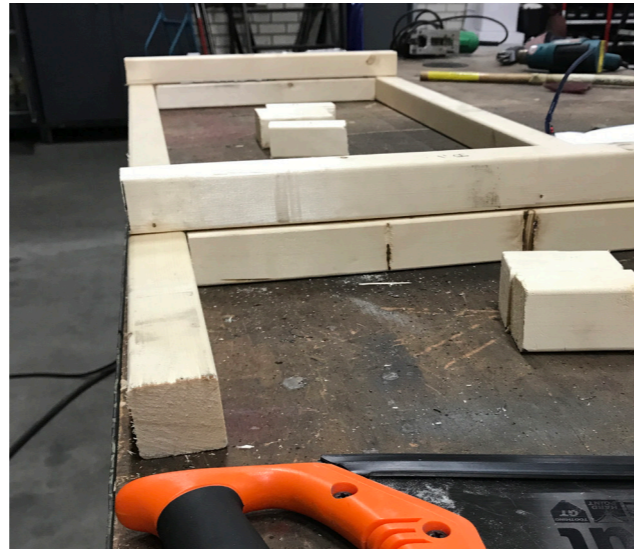




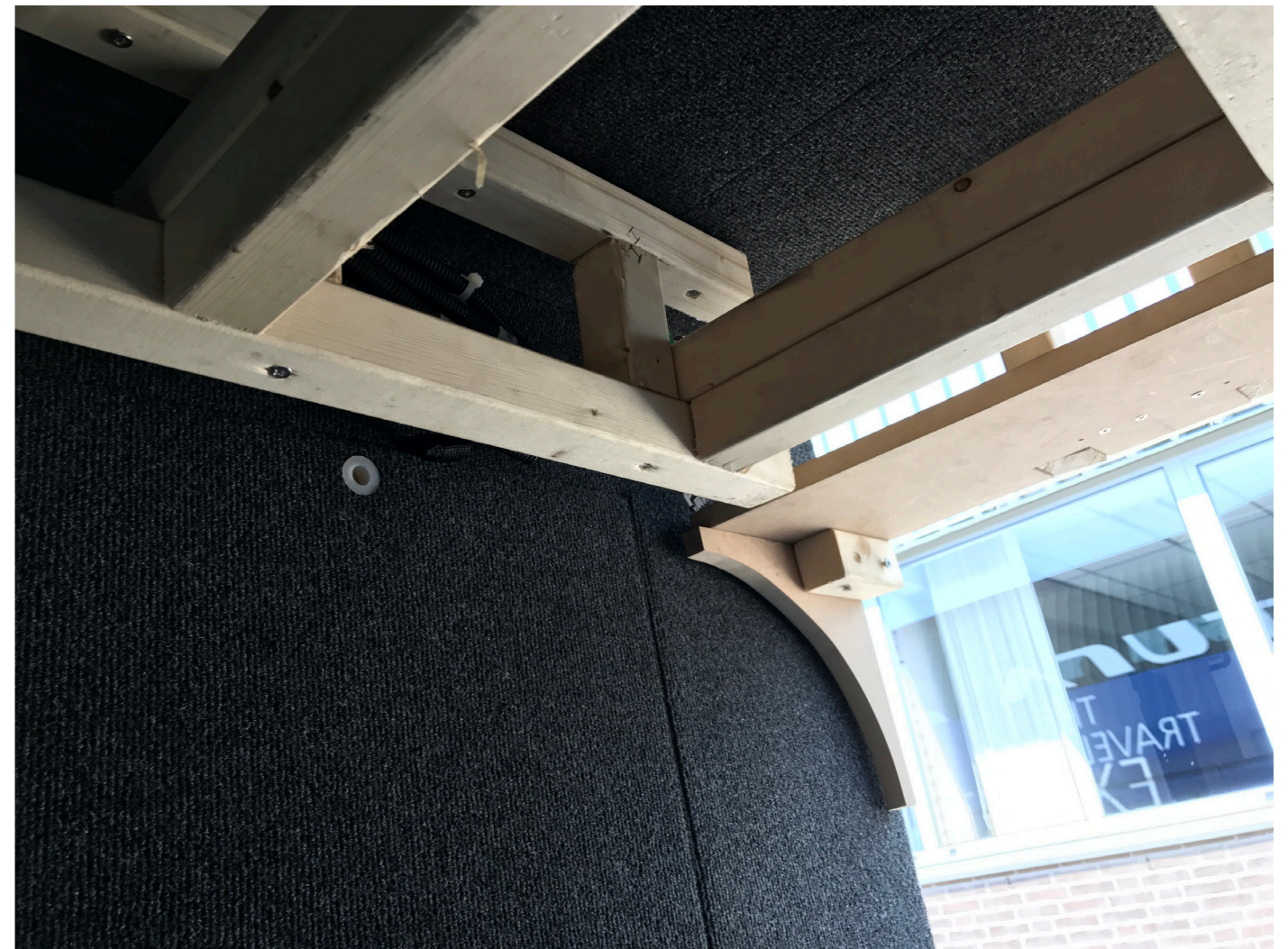
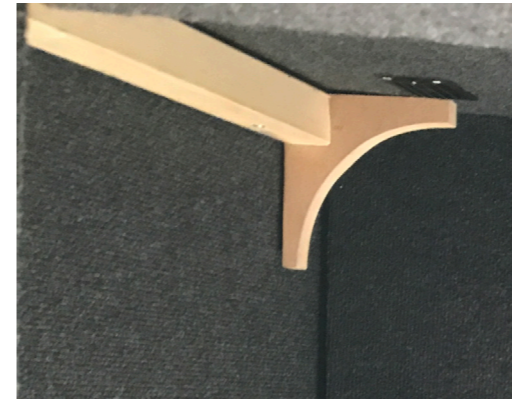
Mock up process

As can be seen on the left, the sleeping cabin has been stripped completely first. Only the heating could not be taken out. However, this would not be any problem since the ceiling would be lowered at this side.

The second step was the frame that needed to be created. The photos can be found below. This frame would serve as base for the lower ceiling.



MDF has been used to create the curves. The MDF has been cut with a jigsaw after the curves have been drawn. Eventually it has been sanded in order to create two identical curves (opposite sides).



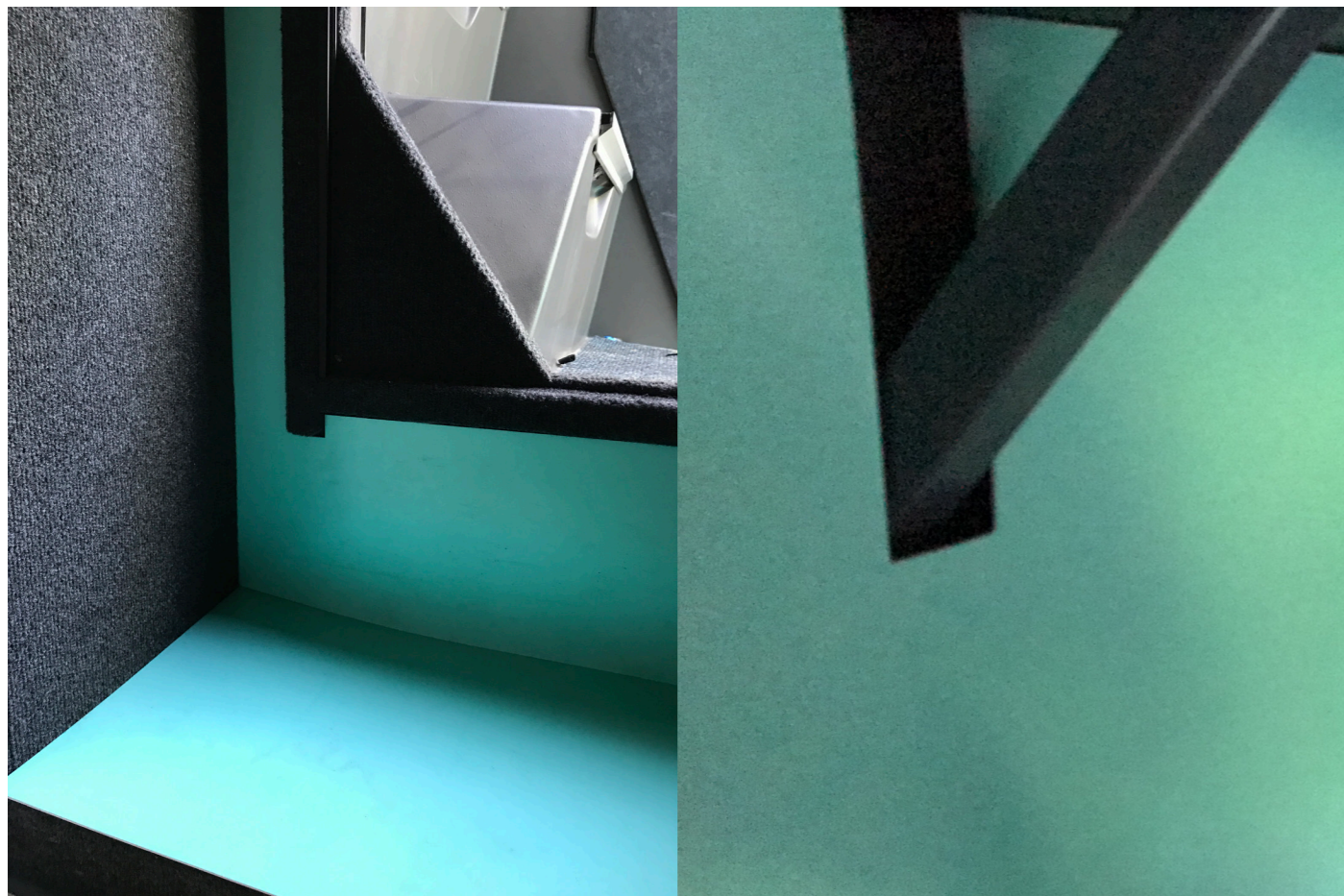
Now that the frame completely has been set, the next step needed to be taken. The 2 mm white PVC (still in protection foil) has been measured and cut to fit in. A good thing is that it has been ordered in the correct height and length, only the edges and extraordinary aspects needed to be measured and cut.



As can be seen below, there has been paid attention to details. PVC has been integrated around the entrance as well.



Most of the entrance has been covered with the first layer of transformation. The following steps were to finish it completely and to start with integrating the light and the lower ceiling. Before the light could be integrated, it was necessary to know how to do so. Several possibilities have been tested and for this mock up, the easiest and best way was to stick it on the already attached ceiling.



First, the protection foil needed to be removed, followed by attaching the attachment material for the lower ceiling as can be seen below. After that has been done, the LED strips have been attached with their self sticky side and with extra tape, just to be sure.





After integration of the LED strips it was needed to test them. As can be seen, they were working fine. The next step was to remove all the protection foil and to get the lower ceiling integrated. Not to forget, detailing. The control panel needs to be attached, as well as the rotation knobs. The first steps are displayed below.



Since it is a mock up, not everything fits perfectly. This is not bad because it will not appear as a final product during the user test. However, it needs to be taken into account that the subjects in the user test, get familiar with the final design.





As can be seen, the wooden foil is transparent to some extent. This has been solved for the final user test with the aid of dark tape that has been stuck on the other side. The result was that the wood appeared more like wood instead of foil.



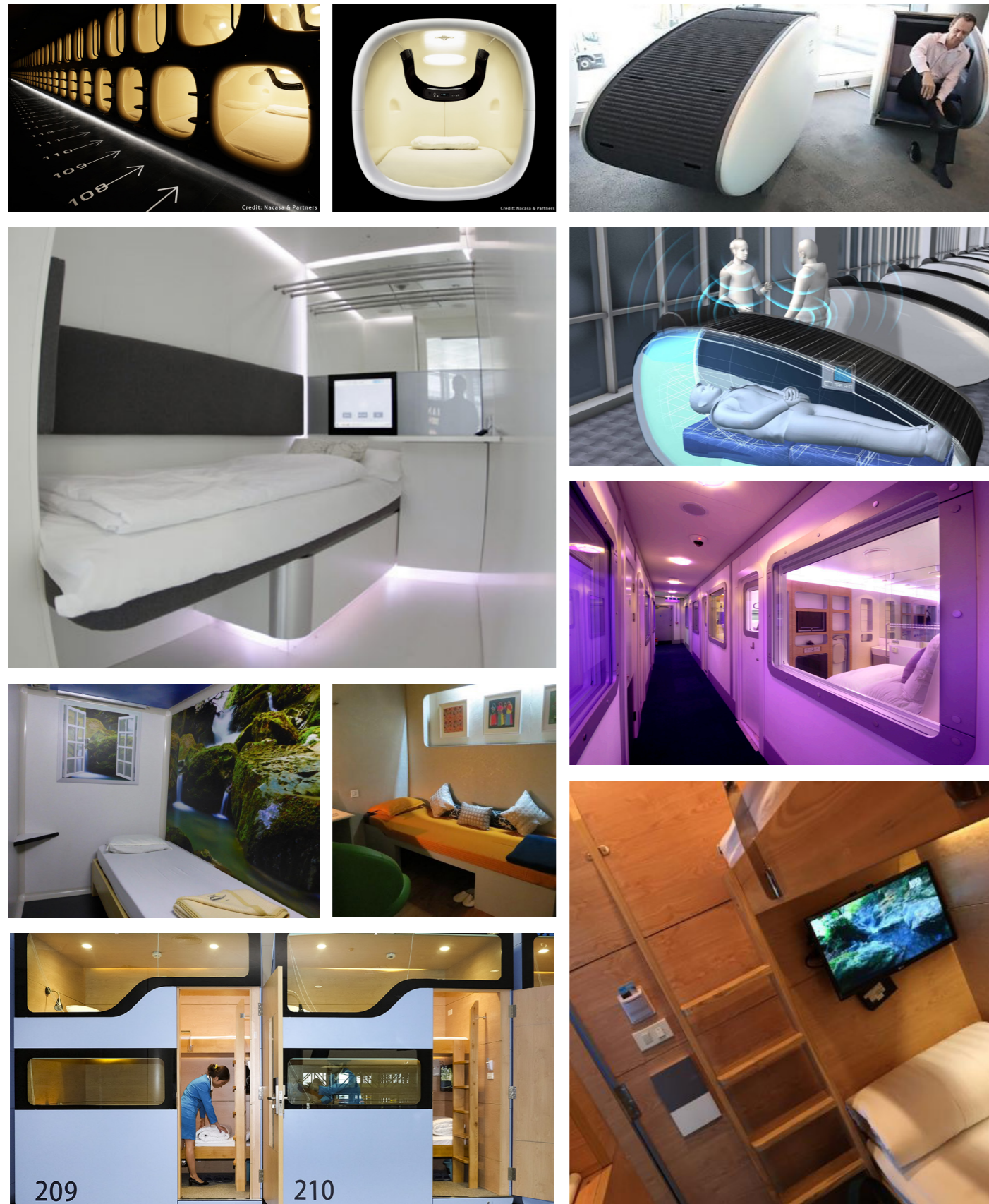
APPENDIX 13

Choices final design

13.1 Design

The overall design and appearance of the sleeping cabin needed improvement. No attention (or almost none) has been paid to its design wise ever since the sleeping cabins are built. It is an empty box with a mattress and some switches for light, ventilation and communication. Since no earlier attention has been paid to the sleeping cabin, the market of small sleeping environments and their design needed to be explored.

Image below, existing sleeping cabins.



The overall shape is the first aspect to be discussed. It was assumed that round shapes would be a friendlier appearance than the sharp edges that are in the sleeping cabin currently. A small user test has been done in order to define what is experienced as friendly. The Bouba Kiki principle is a simple and effective test that can be done.

18 sheets of paper have been used and images have been drawn on them. 9 got round shaped images, while 9 got sharp shaped images (as can be seen in image B) The participants (N=7) were asked to name every sheet of paper either Bouba or Kiki, without knowing what it means (it actually does not mean anything since the words have been made up). Assuming that the participants would name the round shaped images Bouba, this has been considered as correct, however there is no correct or incorrect answer. The results were that all participants were able to get a 100% score. Image A and C shows the table and chart of the scores. This means that the pronunciation of Bouba (which is friendlier than Kiki) is related to round shaped images. Therefore, the assumption made that round shaped corners in a sleeping cabin are friendlier, can be underpinned.



18 index cards	Participant 1	Participant 2	Participant 3	Participant 4	Participant 5	Participant 6	Participant 7
1 Kiki	Correct	Correct	Correct	Correct	Correct	Correct	Correct
2 Bouba	Correct	Correct	Correct	Correct	Correct	Correct	Correct
3 Bouba	Correct	Correct	Correct	Correct	Correct	Correct	Correct
4 Kiki	Correct	Correct	Correct	Correct	Correct	Correct	Correct
5 Bouba	Correct	Correct	Correct	Correct	Correct	Correct	Correct
6 Kiki	Correct	Correct	Correct	Correct	Correct	Correct	Correct
7 Kiki	Correct	Correct	Correct	Correct	Correct	Correct	Correct
8 Kiki	Correct	Correct	Correct	Correct	Correct	Correct	Correct
9 Bouba	Correct	Correct	Correct	Correct	Correct	Correct	Correct
10 Kiki	Correct	Correct	Correct	Correct	Correct	Correct	Correct
11 Bouba	Correct	Correct	Correct	Correct	Correct	Correct	Correct
12 Bouba	Correct	Correct	Correct	Correct	Correct	Correct	Correct
13 Kiki	Correct	Correct	Correct	Correct	Correct	Correct	Correct
14 Bouba	Correct	Correct	Correct	Correct	Correct	Correct	Correct
15 Kiki	Correct	Correct	Correct	Correct	Correct	Correct	Correct
16 Kiki	Correct	Correct	Correct	Correct	Correct	Correct	Correct
17 Bouba	Correct	Correct	Correct	Correct	Correct	Correct	Correct
18 Bouba	Correct	Correct	Correct	Correct	Correct	Correct	Correct

Bouba-Kiki Principle test

Image A, table of answers Bouba-Kiki test

Image B, round and sharp shaped sheets

Image C, chart of results

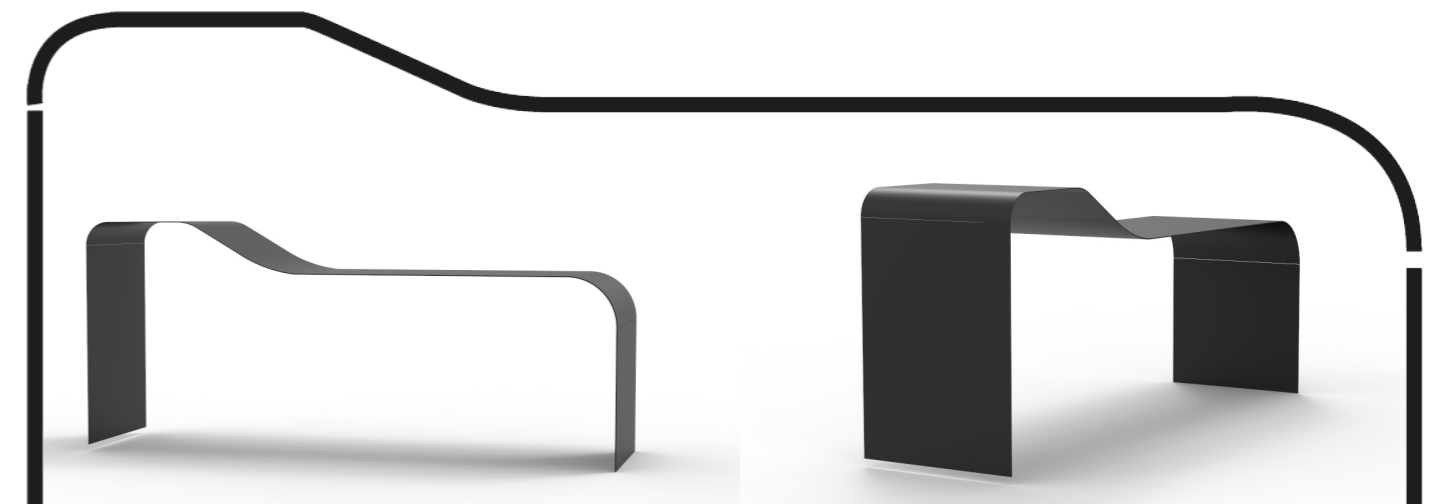
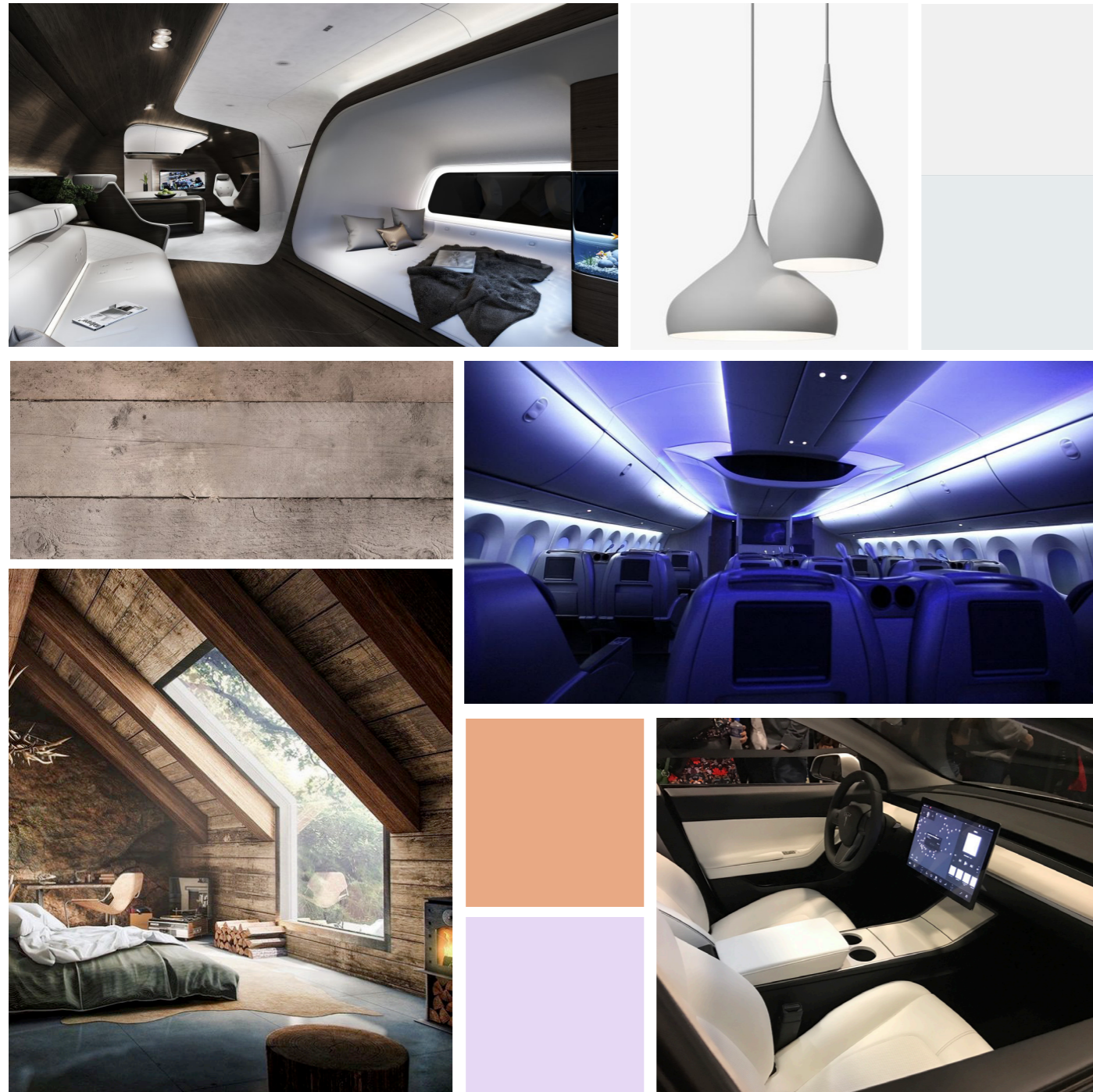


Image D, Curves of sleeping cabin in different views

Furthermore, the round shapes will not have their effect if the cabin is not changed any more than that. Therefore, the colour should be determined before the materials are discussed. As known, white is more appreciated in small environments. First of all, it makes the environment appear bigger than it actually is. Besides, white is often used in interiors of houses since the walls will shift in levels of daylight. Therefore, it will have different appearances during the day. (Chan, 2007)

Since the shape and colour has been determined, the overall design style could be introduced. To do so, a look has been taken at the already existing sleeping cabins and at the concepts that were designed (appendix 9). A final design style (image below) has been created based on the final concept.

Image below: Final design style, based on clean and home design



The final design is recognizable in the given design style board. The contrast has been created between a clean design and a home environment with the aid of clean white side walls/ ceiling and with the lower ceiling of a wood look alike material. The light has been placed behind the ceiling in order to create ambient lightening which is also recognizable in the design style board.



Image of final design

13.2 Materials in general

Since the overall design has been discussed, it is time to dive more into things that could influence the design. To start with the materials in general, meaning not the details.

The sleeping cabin will have to be functional as a sleeping cabin, but as well as baggage storage room as well. Therefore, it is important that the bottom the sleeping cabin is resistible to scratches. The bottom part is also in contrast with the rest of the cabin. First of all, it is a darker colour, preferably dark grey or black. Furthermore, it will be of the same material as is used currently.

The side walls and ceiling are different. Those have been chosen to be white. However, a lot of materials that communicate different experiences are white. Think of leather, plastic, cloth (or velvet). But the most important property of these materials is hygiene. Cloth (and velvet) are more difficult to keep clean in comparison to leather or plastic.

While leather has the most luxurious and warm experience, which is wished in such a sleeping cabin, plastic is the cheaper, more durable and more hygienic option. This is a choice that needed to be made. Leather (or fake leather) is less durable in case baggage will be stored in the sleeping cabin. It can be cut or scratched in such a way that it loses its luxurious experience. Besides, leather needs care once in a while and it is more difficult to clean. Therefore, it has been chosen to have a smooth surface plastic as side walls and ceiling. This is easy to clean (wiping it off with a cloth), it is more durable and cheaper.

13.3 Materials specific

Since the material has been determined in relation to the ceiling and side walls, it is important to think about other materials. Ambient is created with the aid of contrast between the two ceilings. Wood has been chosen as contrast material because it will increase the home experience of the sleeping cabin and next to that, it is the warmest material. Other possibilities were: metal, stone or plastic.

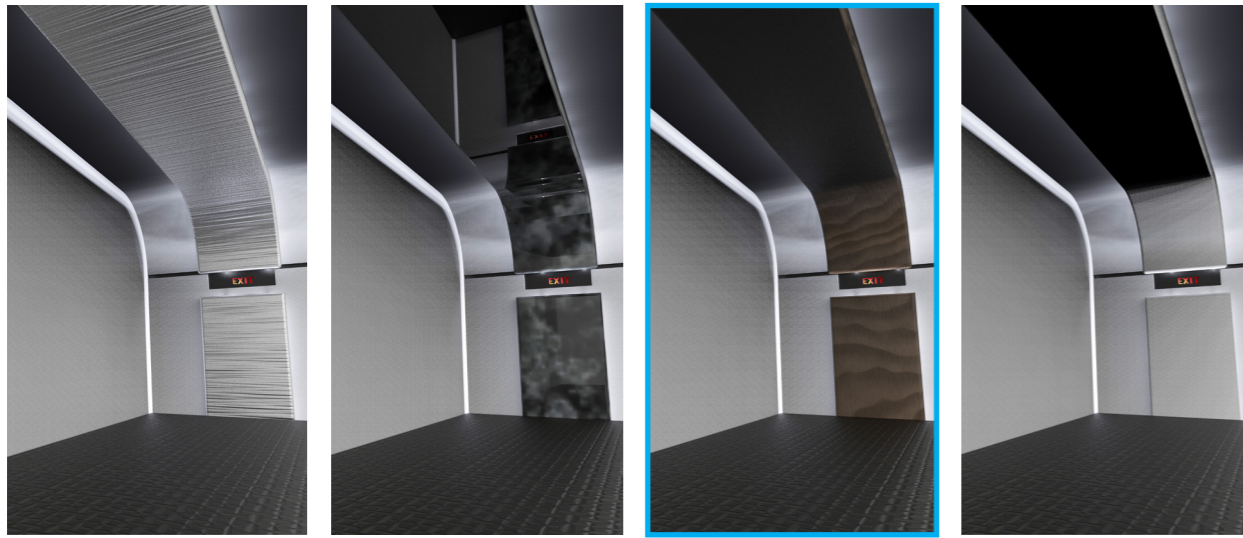


Image E, material possibilities lower ceiling

What needs to be taken into account is that wood, stone or metal cannot be used as material itself. Weight and safety is important. VDL is market leader when it comes to weight of travel coaches. Therefore, it is chosen to use a foil, which shows the appearance of wood, but is attached to plastic. This will save weight, will be safer (not fire incentive) and most probably also cheaper.

Furthermore, it is important to think about materials that are used for other things, such as the rotating knobs, the screen and lightening.

First of all, it has been chosen to create a control panel with rotating knobs and a screen. A touchscreen has not been integrated because of the amount of functions such a cabin has. Including a touchscreen would ask for a well-designed interface and it would still be less user friendly because of the several menus. The driver is now able to immediately control whatever he wants.

The knobs are taken into consideration to be completely redesigned. However, the sleeping cabin is a part of the travel coach that is not used by passengers, but drivers only. Therefore, it has been chosen to use rotation knobs that can be delivered by a supplier (made from plastic). This will save costs firstly, but the knobs will be familiar for the drivers as well since they might be at the dashboard. This will result in an experience of comfort by familiarity.

Other material choices for ventilation, climate control and the speaker are based on costs. Those aspects are hidden behind the double ceiling and not visible for the driver nor passengers. So, those materials can be based on price and durability. The material is not assigned by the student since the company has their own suppliers and knowledge about cost/durability ratio.

13.4 Detailing

As aforementioned, it has been chosen to put a regular screen with rotation knobs in the control panel instead of a touchscreen. However, the control panel has been placed in an angle of 60 degrees in order to provide comfort (appendix 10).

Furthermore, there has been an exploration with lightening and the width of the double ceiling in order to determine the best light position and the aesthetics of the double ceiling. The light exploration can be found in the same appendix above mentioned. Image F shows different possibilities of the ceiling width. As can be seen, the light distribution is different according to the width. The first preference would be option B since the light is not too bright, but still visible. Also because the sleeping cabin looks mostly balanced with the lower ceiling. However, the conclusion is that the ceiling needs to be as wide as the screen in the control panel. This will create consistency in design and lines that are “virtually” drawn in the sleeping cabin. Therefore, it is important that the emergency exit handle is as wide as the screen and ceiling as well.

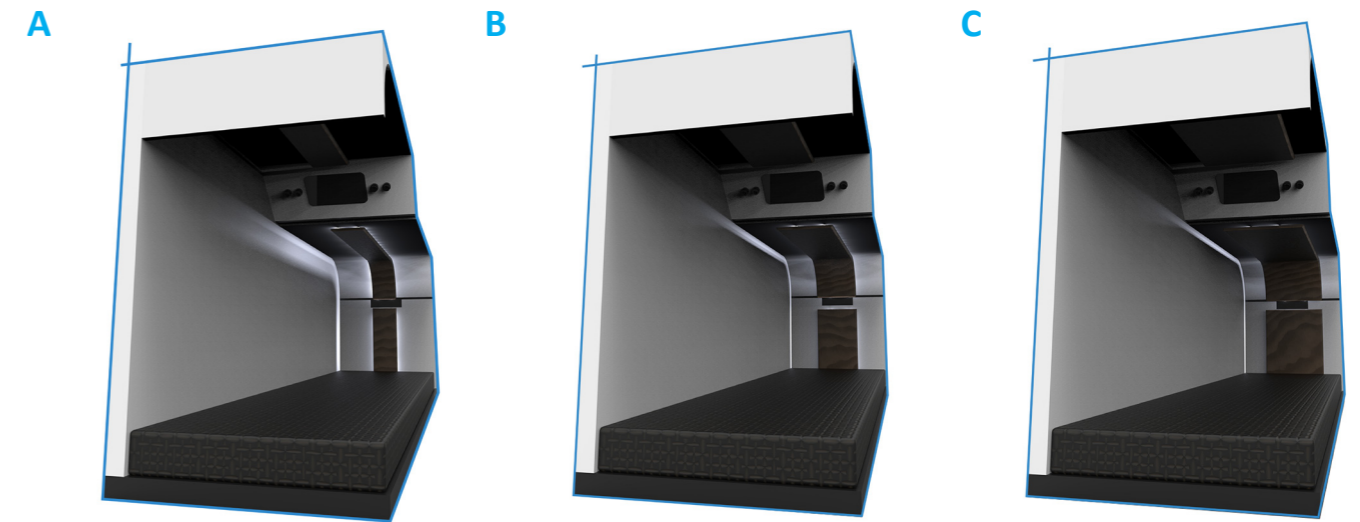


Image F, width explorations lower ceiling

Not to forget the round shaped cabin shape. The top ceiling has been shaped perfectly in round corners. But the lower ceiling needs to be well integrated as well. No sharp edges, but slightly designed curves. Image G shows how the lower ceiling has been integrated to fit the sleeping cabin.

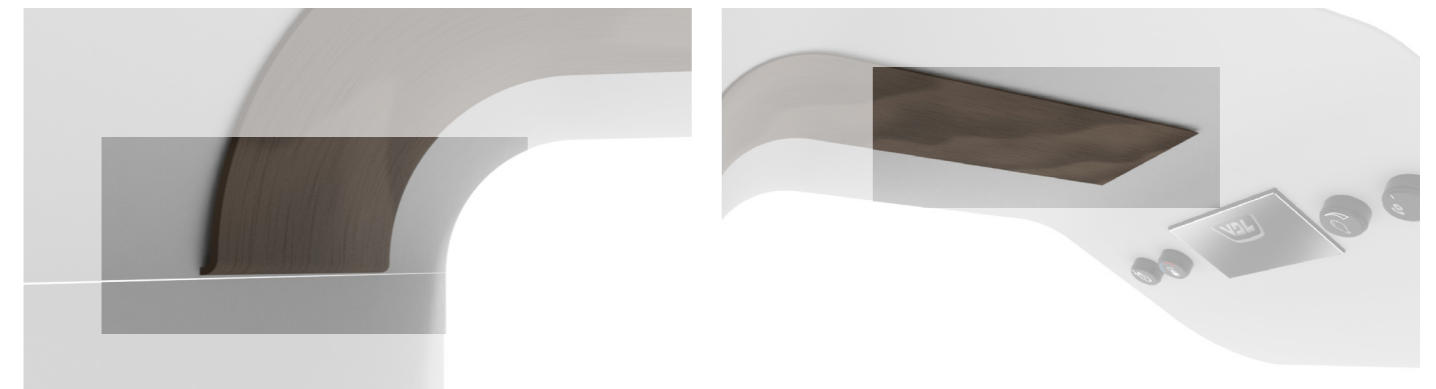


Image G, integration of lower ceiling in sleeping cabin

References

Chan, Y. (2007). Small Environments: Contemporary design in detail (1st ed., p. 144). Rockport publishers.

APPENDIX 14

Final user test

Validation of the redesigned sleeping cabin (Mock-up used)

Goal: validate the designed aspects and experiences of the new sleeping cabin.

Actions taken: The subjects have been asked to get in a current sleeping cabin, spend some time in it, experience the control panel, functions and fill in a questionnaire. The process of evaluating the new design sleeping cabin (mock-up) has been explained to them after the first test. A presentation has been displayed on the control panel screen, which was automatically played. The researcher was controlling the lights with the aid of his smartphone and Philips Hue. The offered experiences within this mock up were the welcome light, ambient lighting, wake-up light and the emergency signal.

The questionnaires are attached at the end of this appendix.

Amount of subjects: 6 in total, 3 students and 3 qualified coach drivers

Notes: The subjects were aware of the fact that they were in a mock-up. Renders of the final design have been showed. Two students have not experienced the current sleeping cabin, only the redesigned sleeping cabin.

Insights and results: The students were enthusiastic about the sleeping cabin. Especially the light in combination with the clean design was appreciated. Since the students have been participating first, it was expected that the light would draw the coach drivers' attention immediately as well. However, they experienced it differently. The overall appearance was more appreciated in combination with the control panel and its usability.

In general, the new designed sleeping cabin is scoring significantly better than the current one. Most surprising is the effect of the light appearance in combination with the control panel. Figure X is displaying the ratings given to the both sleeping cabins. The rating could be from 1 till 10. As aforementioned, two students have not experienced the current cabin and could not grade it. However, the difference in average is 3.7. Concluding that the redesign of the sleeping cabin succeeded. It offers a better experience, more comfort and has several USPs that can help VDL distinguish from their competitors.

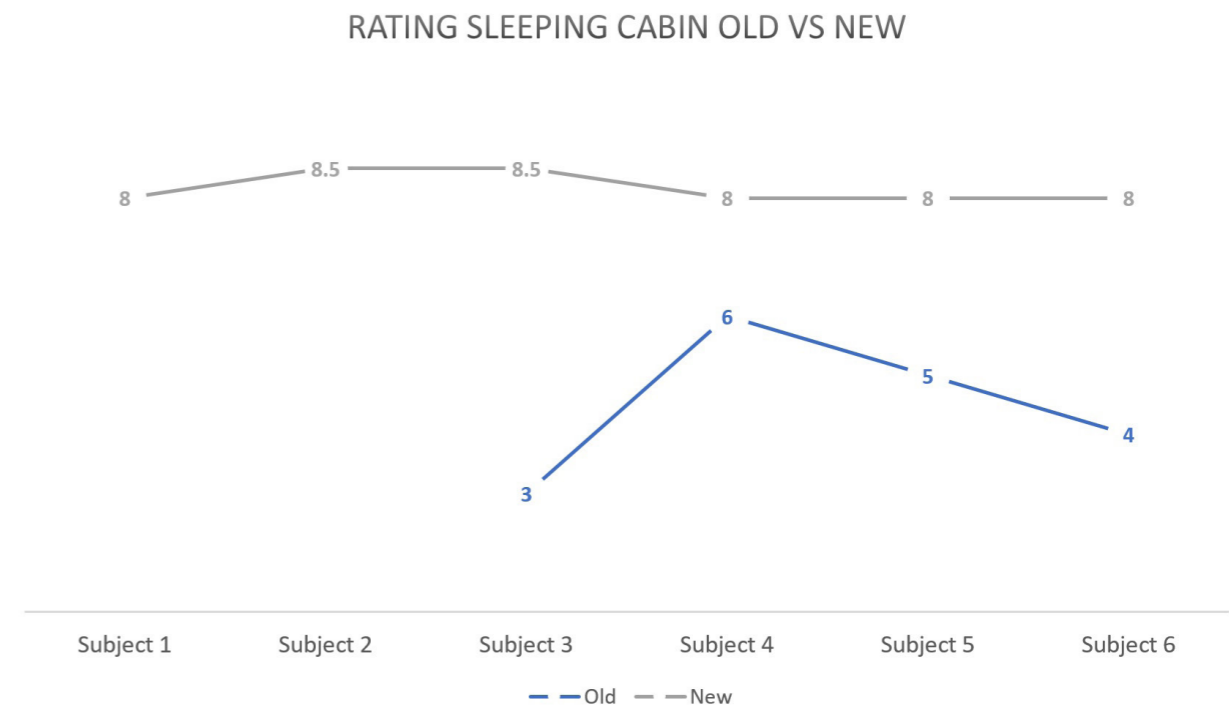


Figure Ratings for the cabins

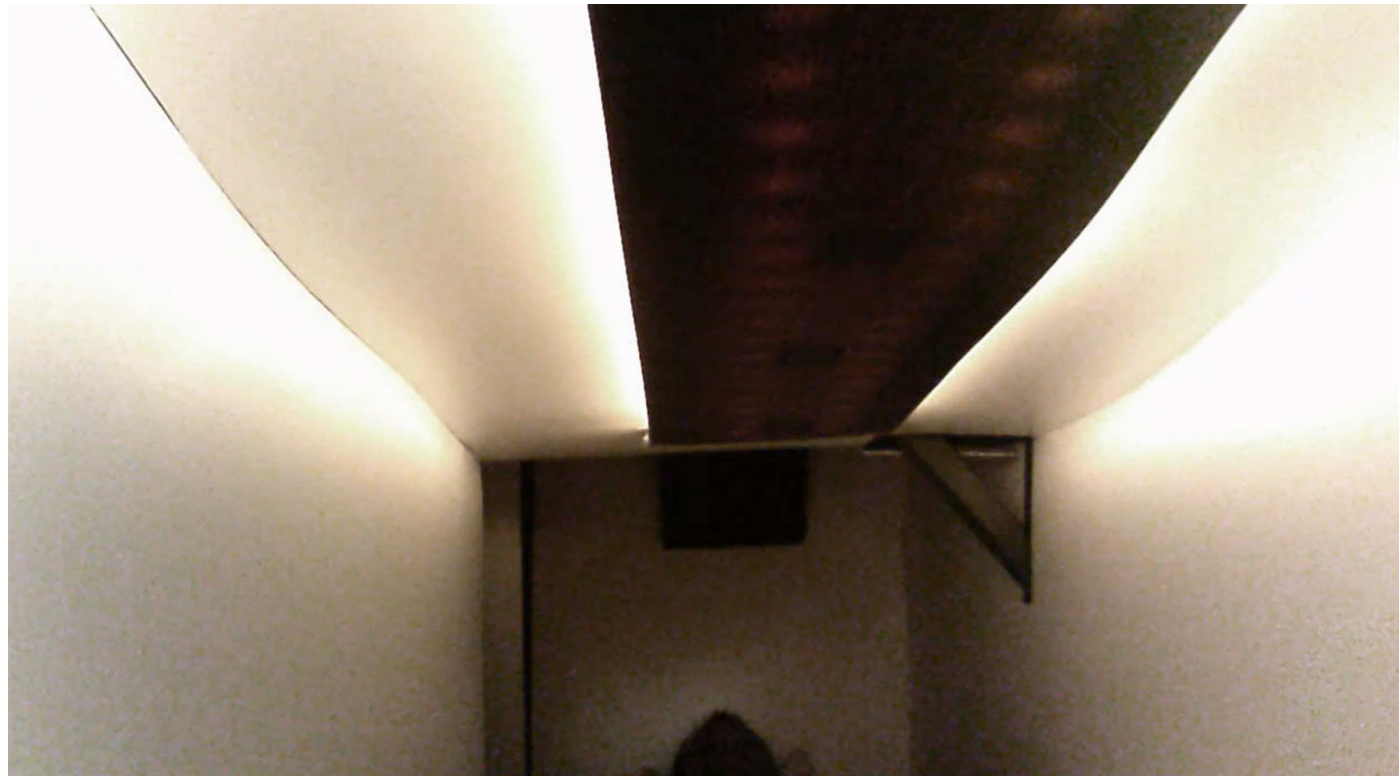
Some quotes have been given below in order to share the experiences of the subjects during the final user test. After the quotes some screenshots of the footage taken during the tests is displayed.

This is how a sleeping cabin is supposed to look. Comfortable and modern.

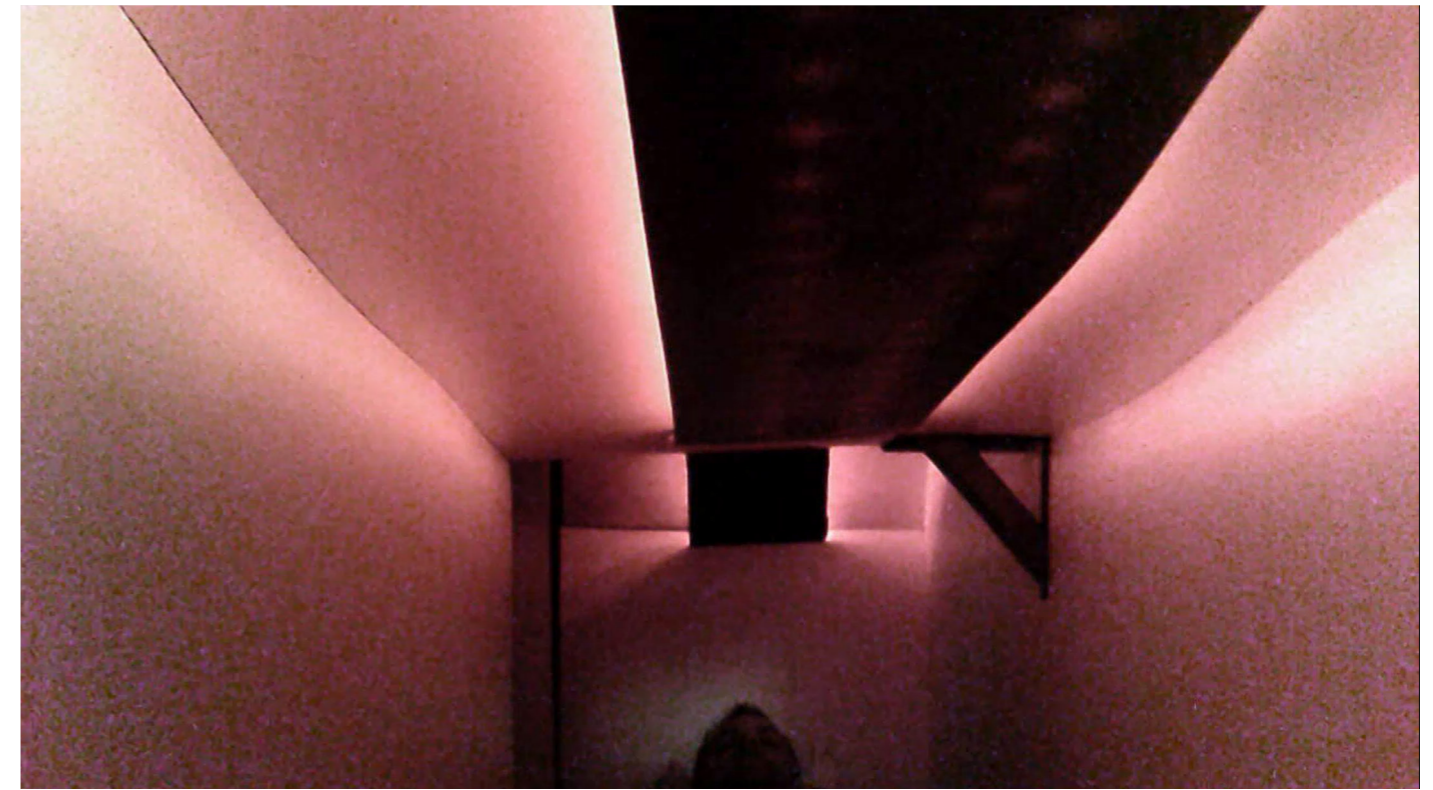
This is not a dark box anymore, it is actually a place someone can sleep in.

I was expecting comfort, that was what invited me in.

It was a friendly experience because the lights went on.



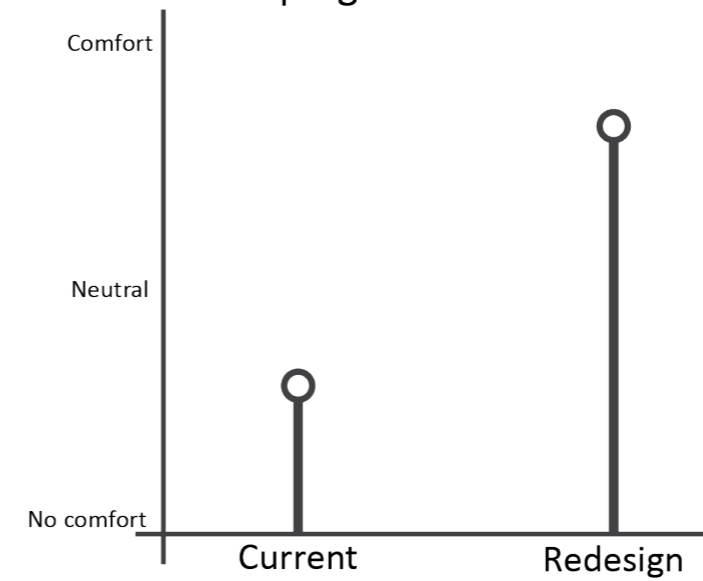
Ambient lighting has been shown above, while below the wake-up light is completely active.



Above displayed is the emergency signal. The cabin is completely lighthened in the colour red and the interaction is flashy.

As can be see below, the comfort of the redesign has been rated significantly better than of the current sleeping cabin.

Sleeping cabin comfort



Meaning, the redesigned sleeping cabin can influence the market position of VDL positively, based on the final user test.

The next couple of pages will be the questionnaires that have been used during the test.

Evaluatie herontworpen slaapcabine

Wat was uw eerste indruk bij het openen van het luik?

Clean, home feeling, Not really expect to see this inside the a coach.

Ervaarde u de eerste indruk als een uitnodiging om naar binnen te stappen?

Ja / Nee

Waarom?

- I would like to see what is "glowing".
- the lighting makes the place more comfortable.

Wat viel als eerste op toen u in de slaapcabine lag? En waarom?

Control panel & Exit.

Hoe was uw ervaring met het controle paneel (scherm, rotatieknoppen etc.)?

The interface is quite handy, I don't have to follow them, which is nice.

Hoe comfortabel was het om in de slaapcabine te komen?

Oncomfortabel Neutraal Comfortabel

* no handles at the rear entrance.

Hoe comfortabel lag de slaapcabine?

Oncomfortabel Neutraal Comfortabel

Hoe comfortabel was het gebruik van het controle paneel?

Oncomfortabel Neutraal Comfortabel

Ik geef deze slaapcabine het volgende cijfer:

8.

Evaluatie herontworpen slaapcabine

Wat was uw eerste indruk bij het openen van het luik?

• kleine ingang
• maak ik het matras niet vies met schoenen?

Ervaarde u de eerste indruk als een uitnodiging om naar binnen te stappen?

Ja / Nee

Waarom?

"Wat is er in die ruimte?" vraag je je af

Wat viel als eerste op toen u in de slaapcabine lag? En waarom?

Scherm boven je, doordat deze loodrecht op zichtlijn staat.

Hoe was uw ervaring met het controle paneel (scherm, rotatieknoppen etc.)?

Zeer positief (zie ook bovenstaande)
~~Maakt~~ Geheel maakt verzorgde indruk

Hoe comfortabel was het om in de slaapcabine te komen?

Oncomfortabel Neutraal Comfortabel

Hoe comfortabel lag de slaapcabine?

Oncomfortabel Neutraal Comfortabel

Hoe comfortabel was het gebruik van het controle paneel?

Oncomfortabel Neutraal Comfortabel

Ik geef deze slaapcabine het volgende cijfer:

8.5

Evaluatie slaapcabine

Wat was uw eerste indruk bij het openen van het luik?

Too dark + scary (it looks)

Ervaarde u de eerste indruk als een uitnodiging om naar binnen te stappen?

Ja / Nee

Waarom?

Klaastrofobia - lack of light

Wat viel als eerste op toen u in de slaapcabine lag? En waarom?

led matrix they were the most thing

Hoe was uw ervaring met het controle paneel (telefoon, lichtschakelaar etc.)?

I couldn't understand the functions

Hoe comfortabel was het om in de slaapcabine te komen?

Oncomfortabel Neutraal Comfortabel

Hoe comfortabel lag de slaapcabine?

Oncomfortabel Neutraal Comfortabel

Hoe comfortabel was het gebruik van het controle paneel?

Oncomfortabel Neutraal Comfortabel

Ik geef deze slaapcabine het volgende cijfer:

Evaluatie herontworpen slaapcabine

Wat was uw eerste indruk bij het openen van het luik?

It was friendly because lights go up and feels like there will be nothing to afraid to get in

Ervaarde u de eerste indruk als een uitnodiging om naar binnen te stappen?

Ja / Nee

Waarom?

Being able to see inside was quite important

Wat viel als eerste op toen u in de slaapcabine lag? En waarom?

Wooden texture part goes along with the ceiling. It was a good contrast with the overall interior

Hoe was uw ervaring met het controle paneel (scherm, rotatieknoppen etc.)?

Position was quite ok. Reachable and visible. All the effects with the light was quite helpful too

Hoe comfortabel was het om in de slaapcabine te komen?

Oncomfortabel Neutraal Comfortabel

Hoe comfortabel lag de slaapcabine?

Oncomfortabel Neutraal Comfortabel

Hoe comfortabel was het gebruik van het controle paneel?

Oncomfortabel Neutraal Comfortabel

Ik geef deze slaapcabine het volgende cijfer:

Evaluatie slaapcabine

STILSTAND, MOTOR UIT

Wat was uw eerste indruk bij het openen van het luik?

DONKER HOL

Ervaarde u de eerste indruk als een uitnodiging om naar binnen te stappen?

Ja / Nee

Waarom?

HOE KOM IK BINNEN?

Wat viel als eerste op toen u in de slaapcabine lag? En waarom?

MET LICHT AAN VALT HET WEL MEE

Hoe was uw ervaring met het controle paneel (telefoon, lichtsakelaar etc.)?

HOOFD LINKS = OK
HOOFD RECHTS = MOEILIK BIJ TE KOMEN

Hoe comfortabel was het om in de slaapcabine te komen?

Oncomfortabel Neutraal Comfortabel

Hoe comfortabel lag de slaapcabine?

Oncomfortabel Neutraal Comfortabel

Hoe comfortabel was het gebruik van het controle paneel?

Oncomfortabel Neutraal Comfortabel

Ik geef deze slaapcabine het volgende cijfer:

6

Evaluatie herontworpen slaapcabine

Wat was uw eerste indruk bij het openen van het luik?

AANGENAME RUIMTE

Ervaarde u de eerste indruk als een uitnodiging om naar binnen te stappen?

Ja / Nee

Waarom?

VERWACHT COMFORT

Wat viel als eerste op toen u in de slaapcabine lag? En waarom?

MODERN

Hoe was uw ervaring met het controle paneel (scherm, rotatieknoppen etc.)?

ZICHT GOED. EERSTE INDRUK DUIDELIJK

Hoe comfortabel was het om in de slaapcabine te komen?

Oncomfortabel Neutraal Comfortabel

Hoe comfortabel lag de slaapcabine?

Oncomfortabel Neutraal Comfortabel

Hoe comfortabel was het gebruik van het controle paneel?

Oncomfortabel Neutraal Comfortabel

Ik geef deze slaapcabine het volgende cijfer:

8

Evaluatie slaapcabine

Wat was uw eerste indruk bij het openen van het luik?

Donker, Goedkoop Luik

~~Donker~~

Ervaarde u de eerste indruk als een uitnodiging om naar binnen te stappen?

Ja / Nee

Waarom?

Donker Hol, Klein luik

Wat viel als eerste op toen u in de slaapcabine lag? En waarom?

Fel licht, niet fijn om nog even iets te lezen of zo.

KAAL

Hoe was uw ervaring met het controle paneel (telefoon, lichtschaakelaar etc.)?

Bediening knoppen duidelijk (gelijk aan chauffé plaats)

Telefoon: Onderswets ogend. Gebruik 2 knoppen: geen idee

Wat welke knop doet

Hoe comfortabel was het om in de slaapcabine te komen?

Oncomfortabel Neutraal Comfortabel

Via luik

Hoe comfortabel lag de slaapcabine?

Oncomfortabel Neutraal Comfortabel

Hoe comfortabel was het gebruik van het controle paneel?

Oncomfortabel Neutraal Comfortabel

Ik geef deze slaapcabine het volgende cijfer:

5

*Controlé paneel bereikbaar v. Hoofd linker kant Bus
Raamst. coördin. met hoofd aan rechter kant

* Slot Balken niet afbewerkt

Evaluatie herontworpen slaapcabine

Wat was uw eerste indruk bij het openen van het luik?

Lichte omgeving

Ervaarde u de eerste indruk als een uitnodiging om naar binnen te stappen?

Ja / Nee

Waarom?

Lichte omgeving

Wat viel als eerste op toen u in de slaapcabine lag? En waarom?

Scherf, Hangt recht voor je

Hoe was uw ervaring met het controle paneel (scherm, rotatieknoppen etc.)?

Goed bereikbaar Duidelijk

Hoe comfortabel was het om in de slaapcabine te komen?

Oncomfortabel Neutraal Comfortabel

Hoe comfortabel lag de slaapcabine?

Oncomfortabel Neutraal Comfortabel

Hoe comfortabel was het gebruik van het controle paneel?

Oncomfortabel Neutraal Comfortabel

Ik geef deze slaapcabine het volgende cijfer:

8

Evaluatie slaapcabine

Wat was uw eerste indruk bij het openen van het luik?

oud Bellig/niet van deze tijd
te fel licht (dimmbaar)
stolballi geen stof?

Ervaarde u de eerste indruk als een uitnodiging om naar binnen te stappen?

Ja Nee

Waarom?

zie A

Wat viel als eerste op toen u in de slaapcabine lag? En waarom?

zie A
stof verschillende pool richting
Bedden paneel niet van deze tijd

Hoe was uw ervaring met het controle paneel (telefoon, lichtsakelaar etc.)?

het functioneerd!

Hoe comfortabel was het om in de slaapcabine te komen?

Oncomfortabel Neutraal Comfortabel

Hoe comfortabel lag de slaapcabine?

Oncomfortabel Neutraal Comfortabel

Hoe comfortabel was het gebruik van het controle paneel?

Oncomfortabel Neutraal Comfortabel

Ik geef deze slaapcabine het volgende cijfer: 4

Evaluatie herontworpen slaapcabine

Wat was uw eerste indruk bij het openen van het luik?

Modern / Prachtig erwaer

Ervaarde u de eerste indruk als een uitnodiging om naar binnen te stappen?

Ja / Nee

Waarom?

van deze tijd

Wat viel als eerste op toen u in de slaapcabine lag? En waarom?

modern / lichte materialen

Hoe was uw ervaring met het controle paneel (scherm, rotatieknoppen etc.)?

van deze tijd

Hoe comfortabel was het om in de slaapcabine te komen?

Oncomfortabel Neutraal Comfortabel

Hoe comfortabel lag de slaapcabine?

Oncomfortabel Neutraal Comfortabel

Hoe comfortabel was het gebruik van het controle paneel?

Oncomfortabel Neutraal Comfortabel

Ik geef deze slaapcabine het volgende cijfer: 8

Bij nieuwe ingang
Beter

APPENDIX 15

Validation - List of goals

Entrance

- The entrance is not smaller than: 61.5 x 52 cm
- The entrance is 64 x 54 cm or bigger.
- The entrance is turning on the light at opening.
- The entrance is triggering an interaction of movement.
- There will take an interaction place that confirms closure/opening of the entrance.
- The way of opening/closing the entrance is providing a more natural experience in comparison to the current entrance.
- The entrance has a user-friendly way of opening/closing.
- The entrance door feels more luxurious in comparison to the current plastic blinds.
- The entrance does not invite unwanted people to open the cabin.
- The entrance unlocks (in case it is locked) automatically in case of an emergency.

Sleeping cabin interior

- The sleeping cabin is not smaller than the current sleeping cabin, which is 230 x 64 x 97 cm (inner sizes).
- Sleeping cabin height is at least 85 cm where the upper body is located.
- The temperature in the sleeping cabin is controlled between 17.5 and 20.3 degrees Celsius.
- The temperature can be adjusted according to personal preference at all time.
- The ventilation does not produce any noise in regular state (ON).
- The ventilation can be levelled up or down according to personal preference.
- Light is adjustable in brightness.
- The light will have a function of waking the driver up.
- The light will interact at the moment the door is opened.
- The light will provide a relaxed experience.
- The light can be adjusted in colour according to RGB.
- The smell in the sleeping cabin is providing a fresh experience.
- The odour in the sleeping cabin is providing a relaxing experience.
- The sleeping cabin is offering the possibility to play own music via the speakers.
- The sleeping cabin is providing a "feel like home" experience.
- The sleeping cabin is providing a "re-energizing" experience.
- A way of communication to the other crew is present within the sleeping cabin.
- The resting driver can follow the trip via live footage recorded by a camera and displayed on the screen in the sleeping cabin.

	Recommendation	Possible small adjustments
The entrance is not smaller than: 61.5 x 52 cm		
The entrance is 64 x 54 cm or bigger.		
The entrance is turning on the light at opening.		
The entrance is triggering an interaction of movement.		
There will take an interaction place that confirms closure/opening of the entrance.		
The way of opening/closing the entrance is providing a more natural experience in comparison to the current entrance.		
The entrance has a user-friendly way of opening/closing.		
The entrance door feels more luxurious in comparison to the current plastic blinds.		
The entrance does not invite unwanted people to open the cabin.		
The entrance unlocks (in case it is locked) automatically in case of an emergency.		
The sleeping cabin is not smaller than the current sleeping cabin, which is 230 x 64 x 97 cm (inner sizes).		
Sleeping cabin height is at least 85 cm where the upper body is located.		
The temperature in the sleeping cabin is controlled between 17.5 and 20.3 degrees Celsius.		
The temperature can be adjusted according to personal preference at all time.		
The ventilation does not produce any noise in regular state (ON).		
The ventilation can be levelled up or down according to personal preference.		
Light is adjustable in brightness.		
The light will have a function of waking the driver up.		
The light will interact at the moment the door is opened.		
The light will provide a relaxed experience.		
The light can be adjusted in colour according to RGB.		
The smell in the sleeping cabin is providing a fresh experience.		
The odour in the sleeping cabin is providing a relaxing experience.		
The sleeping cabin is offering the possibility to play own music via the speakers.		
The sleeping cabin is providing a "feel like home" experience.		
The sleeping cabin is providing a "re-energizing" experience.		
A way of communication to the other crew is present within the sleeping cabin.		
The resting driver can follow the trip via live footage recorded by a camera and displayed on the screen in the sleeping cabin.		

