

# Ketty

system

# 0.0 preface

This report shows the process of developing a master thesis in industrial Design at Aalborg University over a 4 months course.

The education is an engineering education and the project will therefore have a certain technical character illustrating skills in construction, manufacturing and business planning as well at the common Industrial Design aspects like ideation and detailing.

## 0.1 Title page

Title	Ketty system
Project theme	Shelter cages
Study programme	Master's thesis
Project period	02.02.15 - 27.05.15
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Company cooperations	Kattens Værn, Aalborg
Main supervisor	Kaare Eriksen
Technical supervisor	Mikael Larsen
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## 0.2 Synopsis

This master thesis addresses the issues regarding keeping cats in shelters with a focus on developing a better caging system for shelter use. The focus areas are divided between three main actors; The shelter, the cats and the customers. Though visits at Danish cat shelters research is done defining problematic areas like hygiene, space limitations, lack of stimulation of the cats and an unfriendly environment for the customers. The customers are a very important factor of this project since that is the areas where the current solutions come in short. On this front, the interaction with the cages is thoroughly investigated as well as the way the customer meets the cat when entering the room. Another factor is the cat's health which is improved through accessible options for exercise and incorporated stimulation of the instincts. Lastly the shelters needs are approached through installing simple solutions to replace all of the homemade initiatives placed in shelters.

## 0.3 Acknowledgments

Achieving this project would not have been possible without the help of all of the passionate and educated people who have assisted us during the development. Special thanks go to Kattens Værn Aalborg and Dyrenesbeskyttelse Hjallerup for welcoming us with open arms when we needed assistance for research. Our supervisors, Kaare Eriksen and Mikael Larsen have been of great assistance in the development of the project and have provided professional advice throughout the process.

A last acknowledgment goes to Dansk Dekor Laminat, Fiberline and Danpress who have generously provided us with information regarding manufacturing and costs.

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## 0.5 Topic

In society today there is a general change in the understanding of what it means to keep pets and the responsibility it brings, this can be seen at shelters where an increasing number of cats are submitted. This project focuses on the development of new compartments for cats at shelters, with the purpose of presenting the cats at their best and to disseminate as many of them to potential new owner that appreciate them.

An important factor is to ensure a better service at the shelters, better conditions for the cats, a better work environment for the employees and volunteers and ensuring a more presentable situation for new potential owners.

In Denmark there are close to 300 shelters and animal hotels, which is a surprisingly high number [Web 1]. All shelters survive on donations and the amount of the donations can vary a lot from one shelter to another therefore many shelters do not have the option of improving the current condition of their caging and environment, because of the small amount of money they receive annually and the high cost of new equipment. There are many factors that influence shelters and many expectations that must be met; some of the aspects include hygiene, time use, play and stimulation of the cats, the cats' health, availability and finance. The goal for this project is to create a solution for shelters to honor the tremendous amount of work they do by making a better and more accessible solution to the way shelter cats are kept today.

## 0.6 Motivation

This project is bound in a deep connection to cats and a wish to help any cats in need. Through volunteer work at a cat shelter, in Aalborg, many different cases and opportunities for improving the current conditions, both for the cats, as well as the volunteers and the customers, are discovered. This is why a detailed investigation of cat shelters has been conducted in relation to this project.

It is a worthy work shelter employees perform and they deserve improvements to ease their jobs and to allow them to do what they love most; to give love to the cats, to play with them and to help them find a new home.

Cats are amazing, cute, dynamic hunters, whom needs to feel freedom and at the same time have privacy, they are independent animals and they need stimulation to maintain their hunting instinct.

Our motivation for this project is bound in passion for cats, like the passion volunteers show by spending their Sundays at the shelter or the kind of passion it takes to build a cat pension in an annex just to spend your time taking care of other people's cats.



Fig. 1. The cat Tulle from Dyrenes Beskyttelse, Hjallerup.

## 0.7 Reading guide

To initiate the project and the research, studies of cats in general are done through literature, websites and documentaries. The accumulated knowledge is divided into five focal areas: comfort, hygiene, stimulation, presentation and shelter managing. These are categorized using the following symbols, and is a continuous guide through the process and act as part conclusions and summaries:



Comfort



Hygiene



Stimulation



Presentation



Shelter managing

The report is constructed in a chronologic order based on the stepping stone method, starting with the research, leading to framing, then an ideation section, which is followed by a detailing phase, production and business to create a better reader experience and understanding. The process is however conducted with an iterative approach (see fig. 2) and with sub-processes running simultaneously.

The project has been based on the problem based learning approach and therefore the initial step is to define a problem to solve. This is done through research which sets up requirements and wishes for a solution for the issue.

While establishing potential needs through the research, they are highlighted with a need and wish symbol:



Needs



Wishes

The complete list of requirements will then be summarized in the framing section.

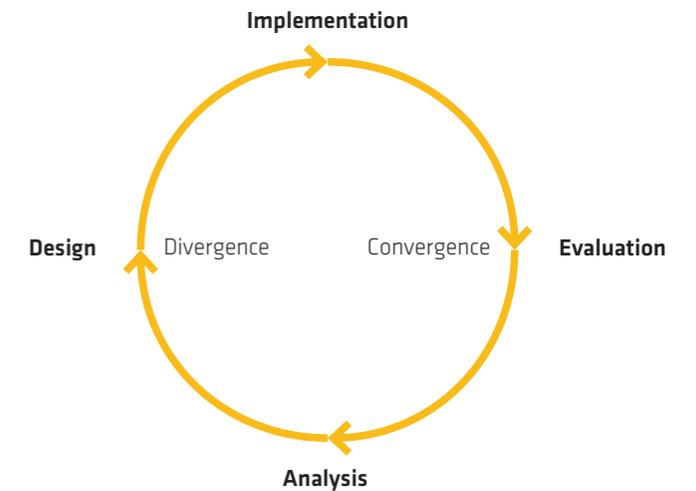


Fig. 2. Iterative development process.

Throughout this section the overall topic of cat shelters are investigated through visits at two different shelters (Kattens Værn, Aalborg [KILDE] and Dyrenes Beskyttelse, Hjøllrup [KILDE]), with the objective of understanding the daily routines at shelters and what staff, cats and customers experience. Additional research is done through literature and documentaries as well as a questionnaire. These are all initiatives which are done to understand the situation at the shelter and since the goal is to develop a caging system, a competitors analysis have also been made to understand why the shelter business is as it is.



Kattens Værn is very rigorous in their daily routines compared to Dyrenes Beskyttelse, but a general comparison are that they both clean, activate (personal cat time) and disseminate each day. This is important to the development of a new product.

Another important area for the shelter, is that the cages are easy to clean, both inside and outside.

## 1.1 The shelters

The first step in the journey for a cat going to a shelter is arriving at the shelter. When cats are brought to a shelter, there are two main priorities; the cat's health and dissemination of the cat.

The first priority, health, involves a general health check, vaccines and worm treatment, to ensure the condition of the cat and to be aware of any diseases that might spread, this is done isolated from the other cats to minimize the risk of contamination. Many of the daily routines done at the shelter is to ensure that any risk of contamination is minimized which is why the rooms are carefully cleaned once a day and if there is the slightest suspicion that a cat is sick it is put into isolation.

The second priority, the dissemination of the cats, is to ensure that the cat get ready for a new home – by the health check, sterilizing the cat and making it used to human contact, but it is also the process of advertising the cat.

### Fact

A cat at a shelter cost around 800-1200 DKK, whereas all health related needs has been taken care of. A farm cat/kitten cost around 0-200 DKK, whereas all health related needs escalates to a price around 2000 DKK subsequent.

**CONCLUSION:** The dissemination is important, because it is what prepares the cats to be sold and can have a huge influence on the why the customers choose a shelter cat over others. This factor will be looked further into later in the research.

It can be stressful for the cats if they have to stay at the shelter for too long, so an aspect that is needed while a cat is staying at a shelter is stimulation, activation and human contact. The employees and volunteers use a lot of time on making sure that every cat gets a certain amount of personal contact during the day. Usually this happens during the cleaning of the cages, when the cat is let free into the room or if volunteers have spare time to individual cats.

## Cleaning process

The general impression is that the shelter has enough time for the cats, but the biggest chunk of time goes to the cleaning process of each room.

Appendix 1 shows a detailed flow chart of the cleaning process, to illustrate all the steps the employees have to go through (app 1.). The tracing is based on the investigation at Kattens Værn that slightly vary from the process at Dyrenes Beskyttelse, because of a more advanced and detailed process. The general conclusion of the cleaning process is that the employees are moving back and forth from the room lots of time when they have to remove and replace many objects inside the room and cages.

## 1.2 Cages

An analysis have been made on the cages at the two investigated shelters. There is in general three different sizes of the cages, which also indicates different use purposes. The floor and room space has been calculated for each cage, to divide the space with the number of cats each cage can hold (fig. 8, p. 11). The cages (two sizes) at Kattens Værn are small and individual; contain a blanket, food & water bowls and a cat tray (fig. 3). The cages at Dyrenes Beskyttelse, Hjøllrup are larger and can hold more cats. These cages contain blankets, food & water bowls, one cat tray, open transport cages (which are used as personal caves), high shelves, toys and a scratching tree (fig. 4). The larger cages provide more opportunities – more choices of stimulation options, hiding places and lookout positions, but an issue is the placement of more cats in one cage questioning the fact that several cats can live together or not. This question is post to a veterinarian and the answer is: “Yes and no. Some cats can go together, but they are vary territorial and can be threatening to each other.” (Pia Bisgaard, appendix 3)

It is good to divide the cats into smaller groups (rooms that can hold 10 cats or less) and it should be possible to assign the cats into individual cages if needed.

A possible direction is to combine the features from the different investigations and incorporate the options in the larger cages into smaller and individual cages to provide the freedom to move around, scratching, space between water bowl, food bowl and cat tray with the compact size of the smaller cages.

## Critical spots

Furthermore, the investigation led to an understanding of the functional used of the cages. A diagram has been conducted with focus on the critical spots concerning general wear like materials and joints, which can affect the cleaning and durability of the cages (fig. 5). These spots creates a set of functional requirements that can be used later in the development. For a thorough description of the current cages see appendix 2.

- ! **Joints have to be concealed.**
- ! **Materials must withstand daily use and cleaning.**

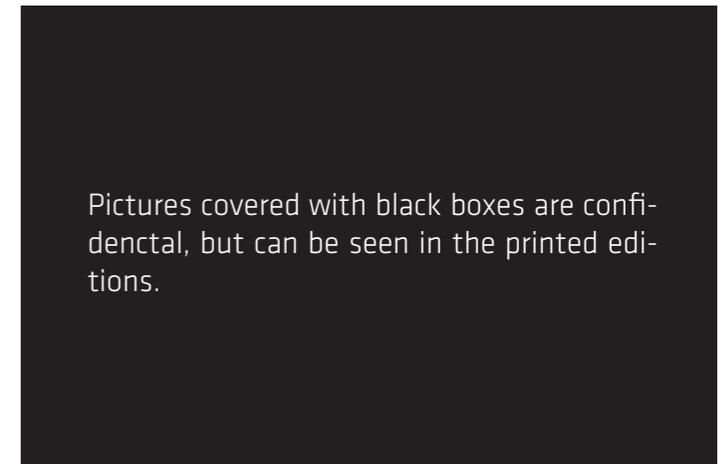


Fig. 3. Cages at Kattens Værn, Aalborg.



Fig. 4. Cages at Dyrenes Beskyttelse, Hjøllrup.

! No rough or sticky surfaces.

+ Avoid lists with sharp edges.

+ Avoid patterning of surfaces.

+ Minimize the use or sectioning of bars.

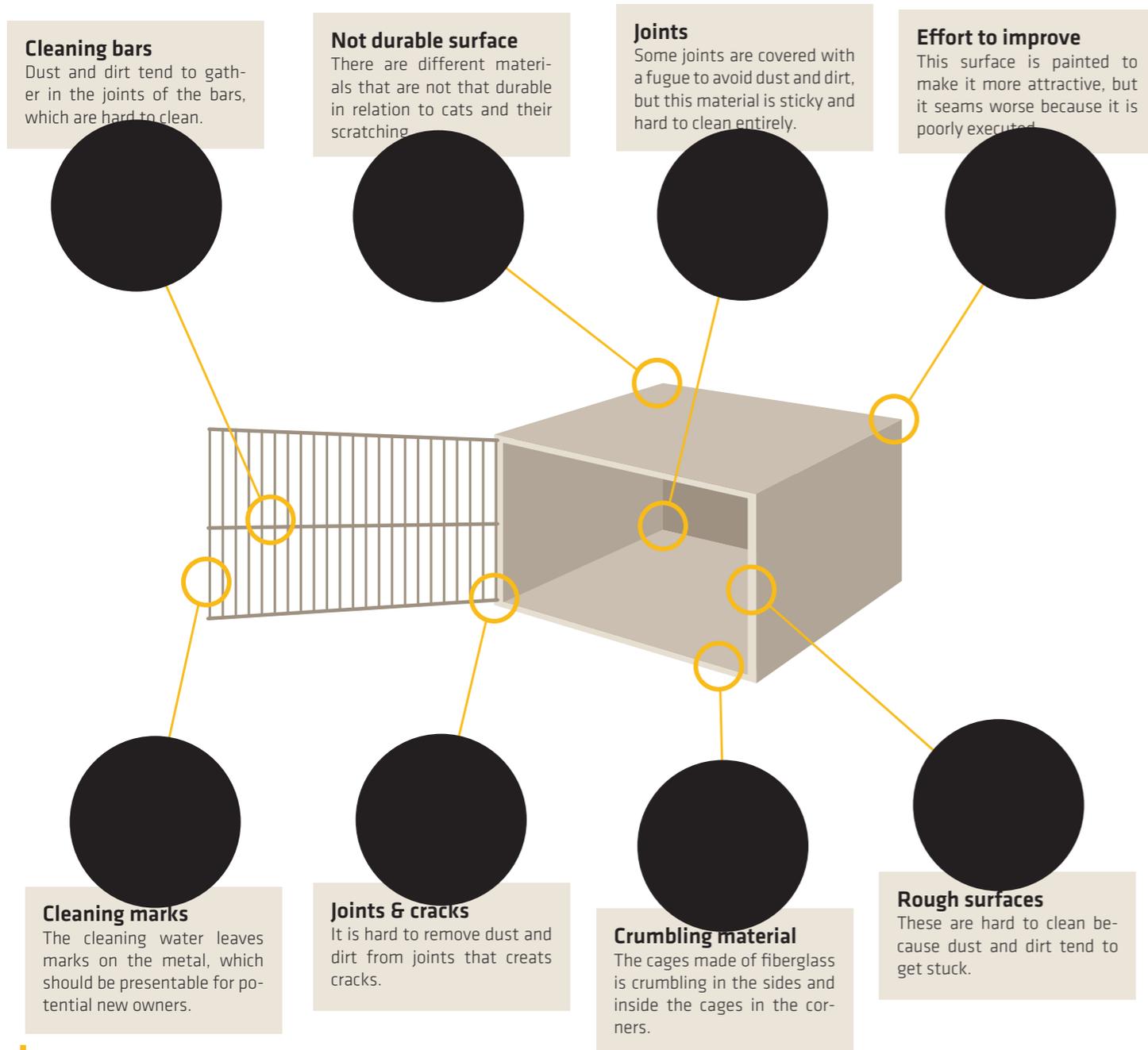


Fig. 5. Critical spots at current cages, at Kattens Værn.

There are many functional areas, which have to be taken care of regarding the hygiene as the problems observed in the current cages show – such as hair and cat litter being stuck in joints.



Fig. 6. Cage are covered with towels to create privacy for cats if it is needed.

Another area investigated regarding functional solutions is usability. One of the observed problem is the use of the gates. There are the following problems:

- The gate is big to handle and occupies much space in the room when open (as long as an arm, fig. 7).
- There are no control over the gate when it is open, it can easily move.
- There are reduced control over the cats while opening the gates.

Another aspect functional problem is regarding the privacy of each cat. If a problem occur between two cats (territorial) it is possible to divide them into each cage, but it will still be a problem while one of the cats are let out of the cage to roam the room. The solution that are used now



Fig. 7. Arm lenght compared with the size of a gate.

is to cover the gate with a towel to separate the cats. It works, but it is not particularly presentable and restricts the customers from viewing the cat that is kept hidden.

**CONCLUSION:** The general problem with the current cages is that they are not special designed with a cats need in mind. The cages at Kattens Værn are developed for pets in general and they are available in a wide range of sizes. The cages at Dyrenes Beskyttelse are made from standard components from the pig industry and are installed by the owner to get cages with the desired possibilities.

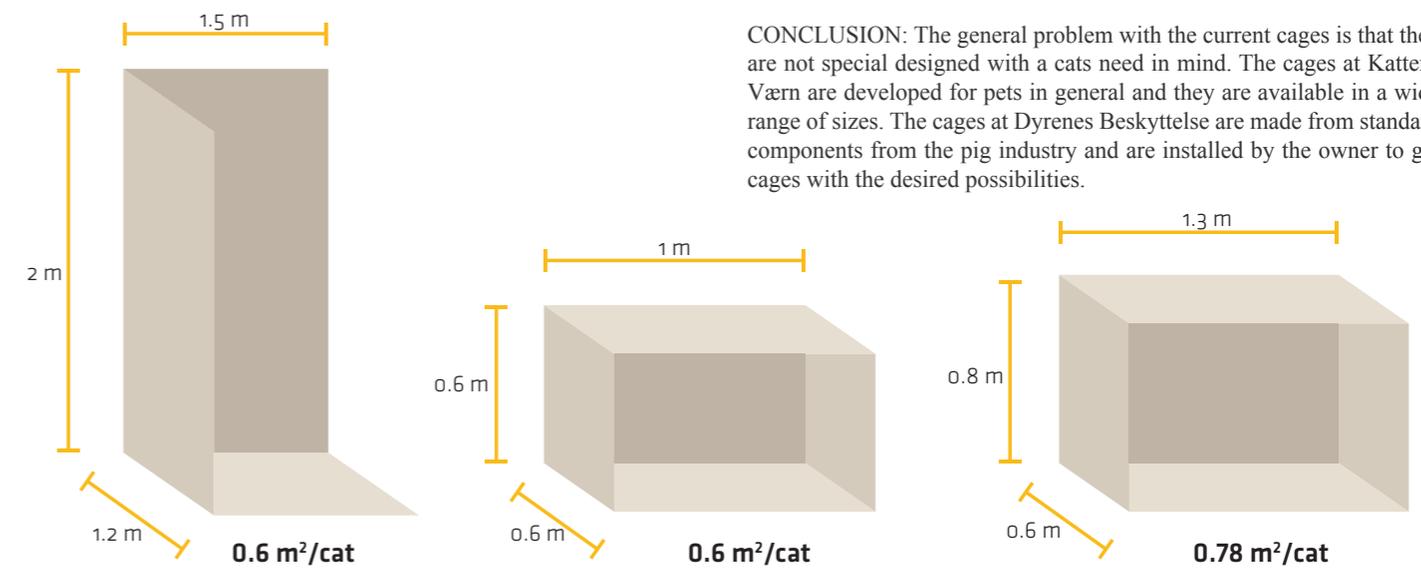


Fig. 8. Space calculations of current cages, divided in into the numbers of cats is can hold.

# 1.3 The cats

The second actor is the cats and to attempt to understand what they need in a shelter situation, it is important to understand the cat both physiological and psychological.

To gain a better understanding of how cats act and what they need, there are looked towards scientific studies but unfortunately the amount of studies that are not only based on private observations are rare to come by. The only scientific knowledge that is obtained about cats today is of phisic character.

**“cats are very complex animals in common to others, and it takes a lot of knowledge and effort to please them” – René, Dyrenes Beskyttelse, Hjallerup**

Generally, cats are more challenging to keep in captivity than other animals, like dogs or rabbits, because they have many physical needs as well as a big need of mental stimulation. Another fact is that the cat is an independent animal, which only can be controlled to some degree (different from a dog, which can be trained).

Cats need a long list of very specific factors to be fulfilled to be comfortable and one of the first and most noticeable are their sensitivity to smells. The cat has a very sensitive nose and can smell all scents much stronger than humans and might in some instances refuse to eat, drink or even stay in specific areas due to the smell of either the cat tray, plastics, detergents or other cats. [Bessant , 2001, p. 28-32] Another problem referring to the cat tray, is that the litter spreads everywhere (bad for the cleaning possibilities), which the cat percieves as a pollution problem.

**! Material must not ooze any odors.**

**! The cat tray must be kept separate from the living space.**

Smells can also be a positive thing for cats, because they communicate through scent marks which tells who, when and where the cat was at a specific point in time. These scent marks are left in form of secrete rubbed of from the cats cheek area onto any surface or by urinating. This is also the main way that cats mark their territory, which is a very important part of the cats’ basic instinct. In the BBC documentary “The secret life of the cat” from 2013 [BBC, 2013] the scientist state that it seems like the cats have two different types of territory, the one in which the living space is (often the owners house) that they don’t feel the need to protect all the time and the hunting space (can range over incredibly big areas) which they patrol often to ensure that intruders are aware that this area are occupied by them.

**+ The cat should have an option of leaving scent markings.**

**! Materials must not absorb liquids.**

In addition to marking their territory, is it crucial to a cat that it has the option of scratching its claws on something. This action is stimulating for the hunting instinct but also for the muscles and tendons which rapidly cna become fragile if not used constantly. A third aspect of this motion is the imprinting of scent marks which indicates territory usually this instinct is stimulated through scratching-trees, but these are quickly damaged at shelters and they are impossible to clean properly. [Barvefjord, 2004, p. 74]

**! The solution must contain an option of scratching.**

Many cats are also attracted to high positions like trees, shelves or the top of furniture because here they can obtain a complete overview of their territory. If the cat cannot find a position on higher ground, it will prefer to stay in a corner of a box, with a lid that protects it from anyone dropping in from the above. [Barvefjord, 2004, p.71-73]

**! The cats should have the option of going to a remote position to relax.**



Fig. 9. A cat met at Kattens Værn, which liked the privacy and safe space in the basked.



After the visits at the different shelters it is estimated that the cats are not suffering any kind of overload, and that the majority of them are thriving in the shelter environments.

In every room the cats have many different ways to keep active and to be stimulated, like multiple climbing and scratching tools as well as small toys.

If the cats in the room get along all the cages are left open and the cats can roam free around the room, opposite if there is the slightest doubt only one cat is let free a time. The cat will be free for one hour and then it is put back in the cage and the next one is let out. During the cats free time, many of them seek to higher positions in the room and therefore most of them have a tendency to lie on top of the cages, just watching the other cats or what is going on in the halls, instead of scratching, playing or jumping. Every night the cats are taking turns to roam the room, so the first night cage no. 1 is left open, night two cage no. 2 and so it continues to let the cats use their natural instincts as a nocturnal creature.

## Cat sizes

In addition to the investigation of the current cage sizes, an important step is to investigate the different sizes of cats since they can rage over a broad spectrum, but also to locate the average size. By looking into the height and weight of different breeds of cats, a map is conducted, dividing the cats into three categories; small, medium and large (fig. 10). In some instances, larger cats can grow extremely big, but that often occur when the cat is pure of breed, which the majority of the cats retrieved by shelters are not [web1].

An anatogram of the average cat size is conducted whit a focus of defining the size of individual limbs of the cat [web1]. Here the height and length are defined. The lengths are divided into body and tail lengths. This is done to ensure that the cat can stand in a normal position inside the cage (fig. 11).

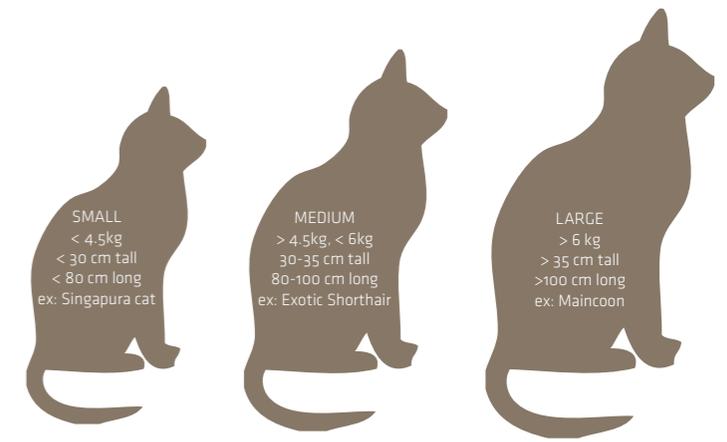


Fig. 10. Cat size study.

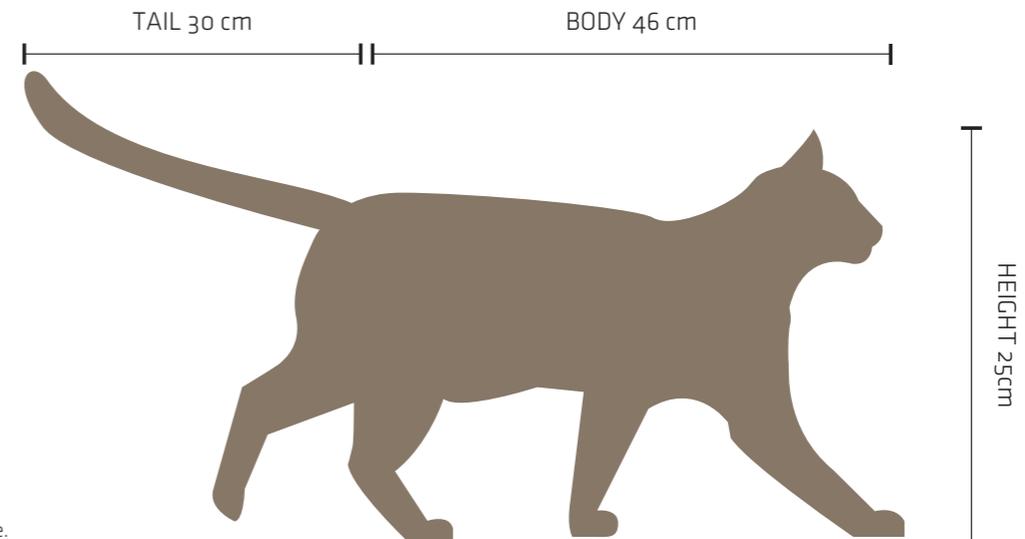


Fig. 11. Average cat size.

# 1.4 The customers

The third actor is the customers, the potential new owners. Their perception are very important, because it is to them that the dissemination must happen.

It is hard to get in contact with former customers at the investigated shelters, due to confidentiality. Therefore multiple discussions are raised at forums like Kattgalleri.dk and Kattagale.dk which are full of people who have gotten their pets at shelters. To accompany the discussions, a questionnaire (app 4) was made to ensure that the wanted data were retrieved. The data from the questionnaire are used to confirm the observations and impressions made at the visits at the shelters, and therefore the data are treated in a highly selective way.

Through all of the contact that are established with former customers, four main concerns are defined.

**Individual space**, are the no. 1 commented concern, independent on which shelter they visited. The size, number of cats and the degree of utilization of the space/room, have a huge effect on peoples perception. The overall common factor seems to be a wish of more freedom for the cats to move and a wish for a better utilization of the space available for the cat. The respondents also commented on how they felt sadness and pity for the cats at the shelter which in lines perfectly with the society tendencies claiming that many potential owners view shelter cats as scared and damaged animals.

**It should be possible for the cats to roam free in a larger room.**

**! It must be possible to divide the cats into individual cages, if necessary.**

**Smell of feline feces**, is a practical aspect that bothered the former customers. Sometimes walking into a shelter can smell like walking into a thick wall of feces.

**Accessibility of the cats**, is one of the lesser mentioned issues, but still one that will be highly prioritized both inside and outside of the cages. When visiting the shelters there are a strong tendency for the cats to seek out positions placed high in the room, making it hard for anyone to interact with them outside of the cage, whereas for inside the cage, the closely placed bars are a challenge because it does not allow direct contact and the potential owner can only fit a couple of fingers through the bars.

**+ It should be possible for the customer to easily interact with the cats.**

**Imprisonment**, is a term that can be used to describe what bars in this industry does to a product, they are often commented on to give the potential new owners an impression of the cats as being robbed of their freedom, even though this is not the case.

**+ The cat should have a bigger space to move around in.**



Fig. 12. Sales situation a Kattens Værn.



Fig. 13. Sally, a cat from Dyrenes Beskyttelse, liked to lie on the top of the scratching tree, to have a great overview of the room. Furthermore, she got stimulated while playing.

## Buyer mapping

Based on a later observations made at Kattens Værn a grouping map of the different buyer types are conducted. There are two main groups - the articulated and the impulsive buyers. The two are described below and figure 14 shows in a diagram how they overlap and connect.

### The articulated

This buyer knows cats, their behavior and has studied the needs of a cat before committing to owning one. Many of these buyers are not first time buyers and they know how to act around cats and will therefore have a strong urge to handle and interact with the cat. This type of buyer can easily wonder around the shelter alone because they know what they are looking for and how to treat the cats. This group also tends to arrive at the shelter knowing which exact cat they want.

### The impulsive

This specific group has a limited level of knowledge about cats and they do not have particularly much experience with them either. They arrive at

the shelter fairly unprepared and often just browse around until they have found the cat they like, and then they might want to interact with the cat. When this type of buyer arrives the shelter employees have to walk them around because they are not familiar with the cat behavior and they don't know what to do and not to do.

### The families

Families also represent a buyer group, but not in as specific way as the previously mentioned. Families can fit into both categories, but what is most important to keep in mind regarding this group of buyers is that they have kids, and that kids often interacts with the cats in a to viol way or that they are not comfortable with an animal they do not know.

**CONCLUSION:** The cages should be intuitive for both customer types, by being tnagible in use and provide all customers, no matter experience, with equal options to interact with both the cage and the cat.

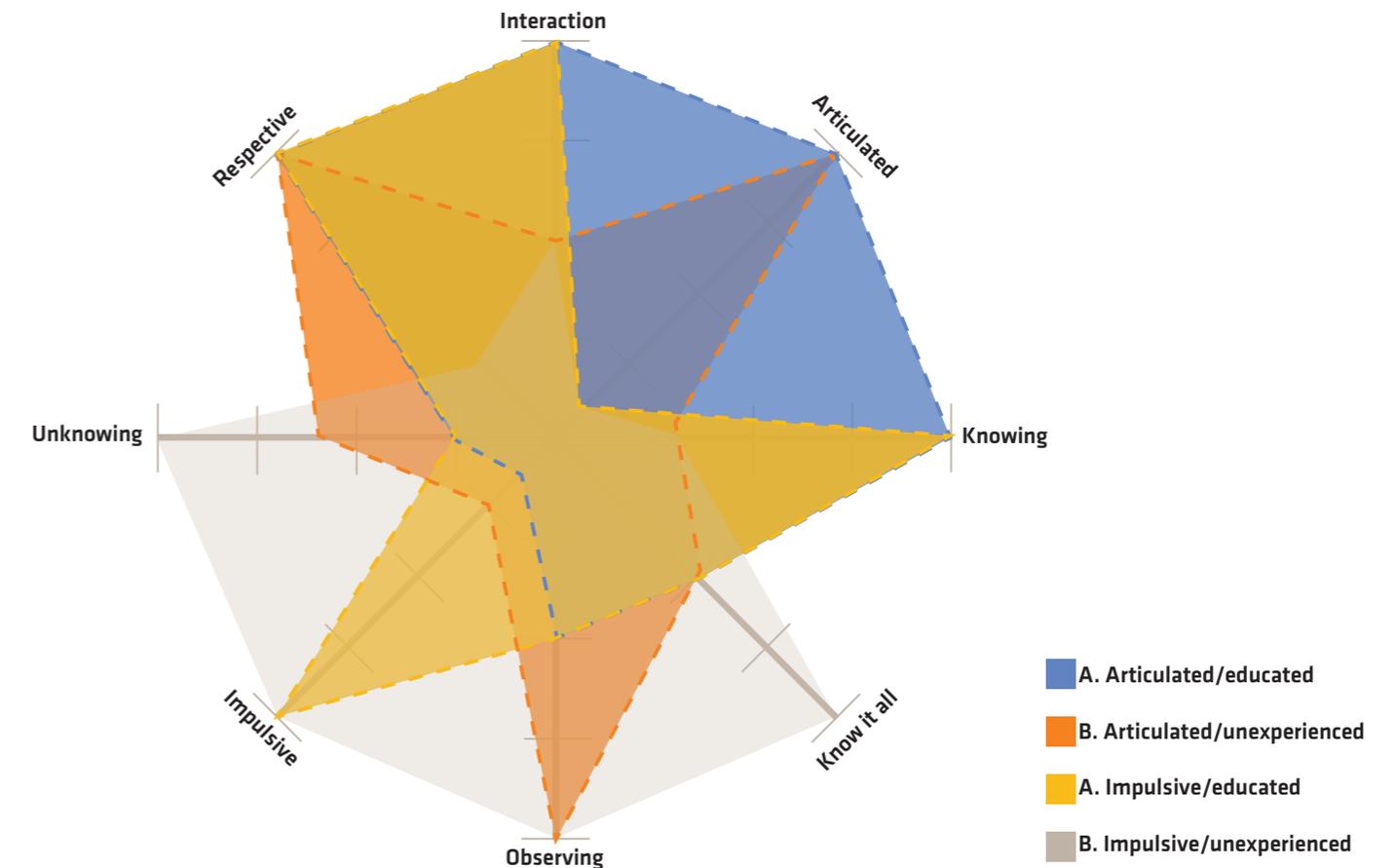


Fig. 14. Buyer map.

# 1.5 Society tendencies

The society tendencies is an important part of the customer investigation to gain a better knowledge of what image shelters have. There is a general change in the understanding of what it means to keep pets and which responsibility it requires. This clearly comes to expression through pet dumping, with the increasing number of dumped pets having a huge influence on the shelters, because it creates an overload of cats. In figure 15 it is clear that cats are at the top of the list over dumped pets, and the second highest – rabbits, has a number that are significantly lower.

Around 8900 cats are disseminated each year in Denmark [Dyrenes Beskyttelse, 2014], in the mentioned 20 shelters and a large part of these cats have been dumped in a cardboard box, a sports bag or a cat transport box, in areas they either cannot survive in or close to a place where people know they will be found.

It is suggested that the reason for this behaviour is a lack of understanding of the responsibilities of being a pet owner and in one year the sad statistics have increased with nearly 50 %.

One of the reasons that cats is such an exposed group is that it is super easy to get hands on a kitten for free. This means that many families get a kitten spontaneously without thinking through the responsibility. Kittens are super cute and they are gone from the shelters as fast as they get there. This is of course good for the shelters, but it also present a small problem. The thing with kittens is that they have yet to develop their personalities, so there is no way to know how they will turn out. Too often shelters experience owners returning their pets because they do not like how the personality turned out.

**Facts**

Dansk Dyreværn Aarhus (1 shelter)

- Receives and disseminates around 500 cats each year

Inges Kattehjem (4 shelters)

- Receives more than 2000 cat found on the streets (including dumped cats)
- Receives around 1800 cats from owners that cannot have them anymore
- Disseminates around 3800 cats each year

Kattens Værn (3 shelters)

- Receives and disseminates around 1000 cats each year

Dyrenes Beskyttelse (3 shelter + 9 private shelters)

- Disseminates around 3600 cats each year

Another issue which occur while getting a kitten elsewhere than shelters, is that they are not neutralized. Many people think it is too expensive and unnecessary, which in the end creates a problem of unwanted kittens (this often lead to pet dumping).

**“That’s exactly why the shelters are full – because nobody takes responsibility for the animals they get, but just expects that when they are no longer desired, they can just be returned to the shelter and when they realize that there might not be room for the animal and that it costs a fee to hand in an animal, they get offended...” Says a user of Kattegalleri.dk**

A third society tendencies is a general misconception amongst people, that getting a cat from a shelter is just like saving a cat from a horrible life. The common perception of cats at shelters is that the cats are damaged or have been mistreated to end up there, but this is rarely the case. Often cats are left near the shelter to be easily found, they are handed in because their families does not manage to keep them anymore and sometimes they are even just runaways with no ear tag. When the cat arrives at the shelter it is given a health check, its own place to stay and it is surrounded by loving people.

The general conclusion is that cats at shelters are healthy, happy cats, which are looking for the right family, a family that appreciate and takes care of them, a family that is aware of what it means to have a cat, a pet.

**+** The customer must not feel like they are purchasing a used “product”.

**Eye icon**

A conclusion on the customer investigation is that one of the biggest tasks in developing a new way to keep the cats at shelters is to make a solution that does not make people feel like the cats are kept in captivity, people must not feel sad for them. Cats that reaches shelters are the lucky cats, and every cat at a shelter has been through a health check.

**CONCLUSION:** The investigation of the three actors provide many areas that can be improved even though things work as they are now. The cats are fine in their cages and shelter are fine with the different task they have doing the day and this is why the focus henceforth will be to create a product that can change people’s perception of the shelter as we know it.

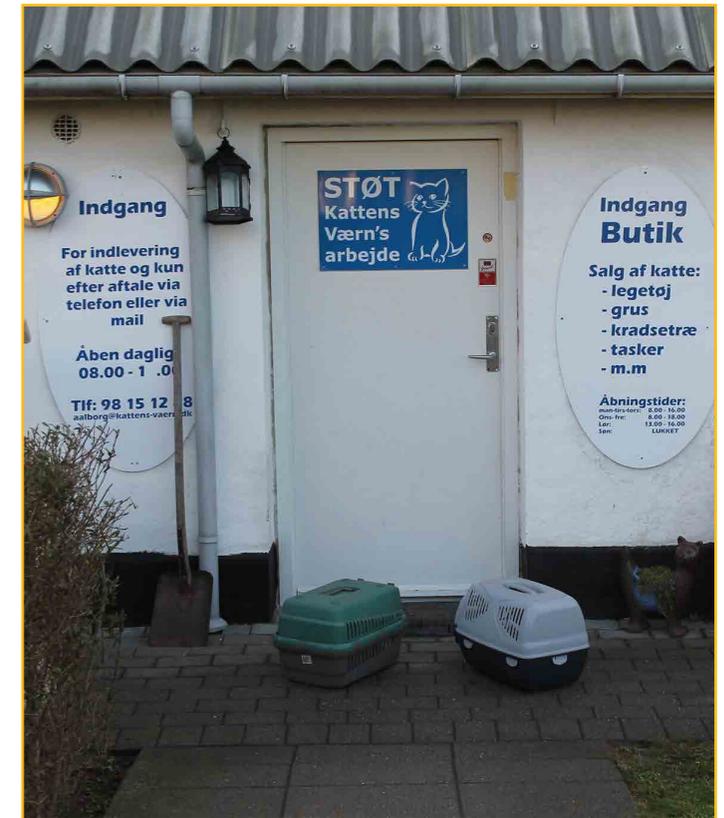


Fig. 16. The picture from a morning where an employee from Kattens Værn, Aalborg, arrived to work and found two cats outside the door.

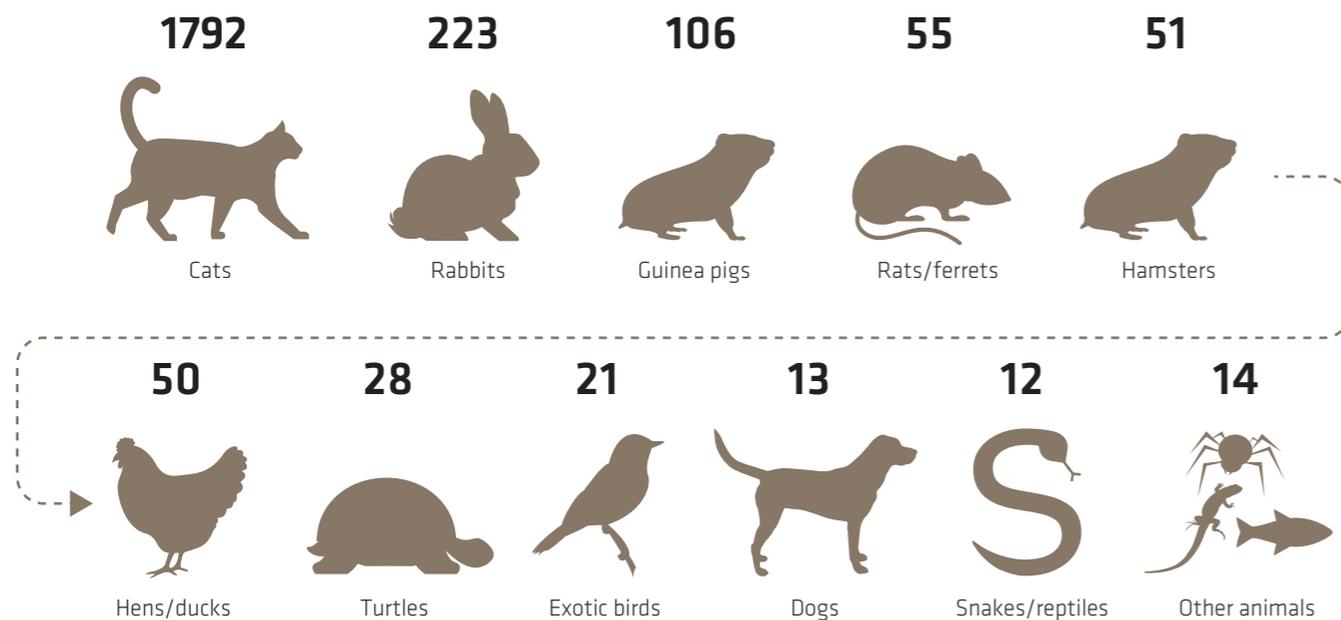


Fig. 15. Dumped pet in Denmark, 2014. The numbers of dumped cats are significantly higher than all other pets.

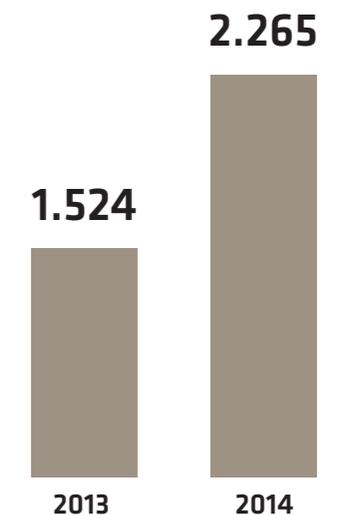


Fig. 17. Increasing number of dumped pets in Denmark.

# 1.6 Tracking of environment

An environment tracking has been created, to sum up the results from the investigations of the three actors. This is to illustrate the actions and the relationship between the different actors. Figure 18 shows the environment of Dyrenes Beskyttelse, where a figure of the environment at Kattens Værn can be found in appendix 5.

The tracking map focus on four perceptives, whereas the positive and negative relations are most important. The cat - which is in focus of the tracking, has a positive relation to the employees and volunteers, because they take care of it and provides it what it needs. It also has positive relations to "petters" and potential new owners, because the relation here between is based on love/appreciation.

The negative relations all relates to other cats in the room. There can be inconsistency between the cat and another cat, which delimits the possibilities for an open environment for all cats. This supports the need of

creating a solution, where it is possible to divide the cats into individual cages, if necessary. Another negative relation at Dyrenes Beskyttelse is the shared cat tray and water bowl, between up to three cats. A cat can feel threatened by another cat's urine and feces, and might not want to go into the cat tray, if it has already been used.

**Each cat must have its own cat tray, water bowl and food bowl.**

**The solution must be able to create privacy for the individual cat.**

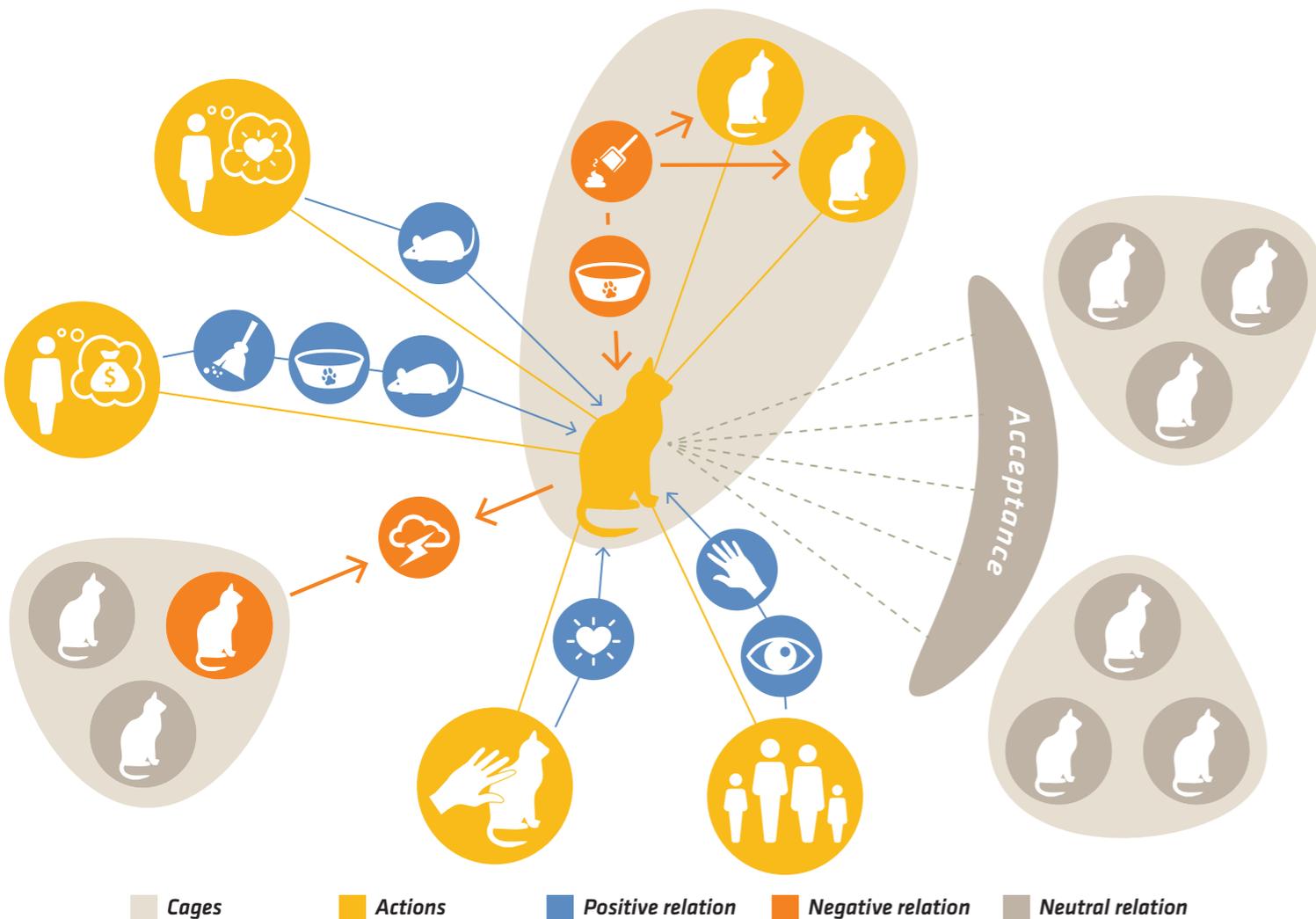


Fig. 18. Tracking of environment, Dyrenes Beskyttelse, Hjøllerup.

## Scenario

To further sum up some of the results of the research a scenario are set up describing the actions set in motion when a cat arrives at the shelter. In the first box is the actions that are done in the instant the cat arrives to minimize contamination risk and to ensure that the cat is healthy. This is an important step for two main reasons, first of all when having many cats in a compact area contaminating is a big issue and many initiatives are taken to avoid this, second it is important that the cat have a health check to make sure that it is okay and that it is ready to get a new family. However, it does not have much importance for the development of a new compartment system.

In the second section of the diagram it is illustrated which options the cat have inside and outside of the cages and that there is a big gap between being in the cage and being outside of it. These are important factors, if the cages must be improved the cats must have an option of stimulating their muscles and natural instincts inside the cage and not only during the one hour in which they roam the room. Therefore a task in the following ideation is to move some of the stimulating elements into the cage.

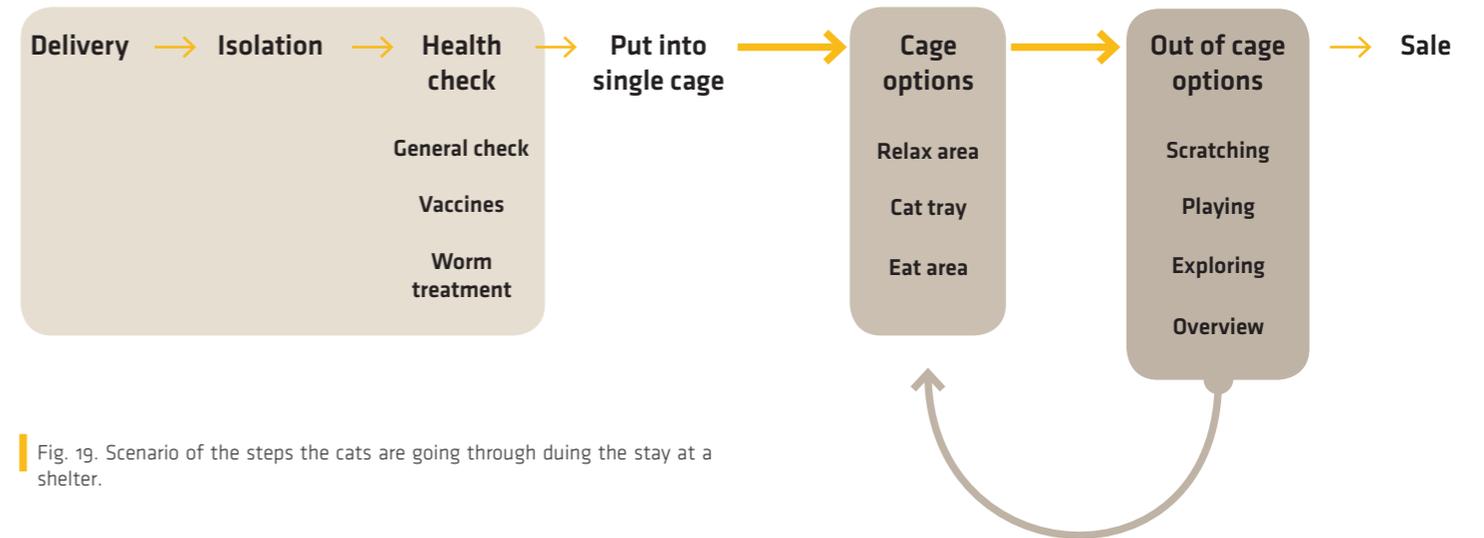


Fig. 19. Scenario of the steps the cats are going through during the stay at a shelter.

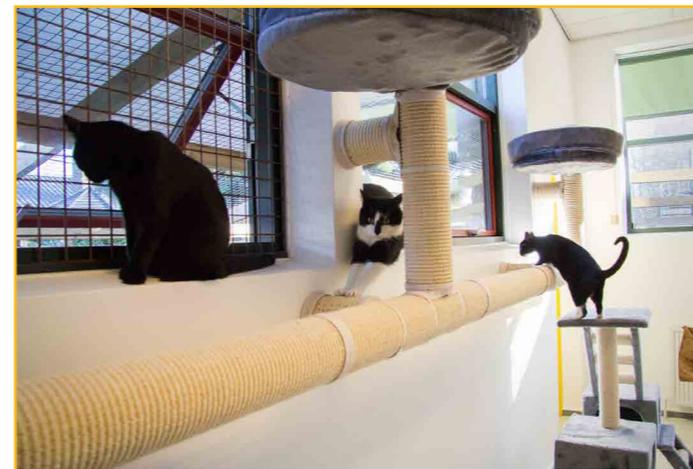


Fig. 20. Stimulation possibilities outside of the cages at Kattens Værn.



Fig. 21. Possibilities to lie in high positions, outside of the cages at Kattens Værn.

# 1.7 Marked analysis

A general market analysis on cages and caging systems for shelters and pensions are made, to get an understanding of the market and potential gaps. On the current market for caging systems there are three different groups of actors and they are all close to equally presented in the shelters.

**Veterinarian/shelter cages** – one of the more popular solutions of keeping cats at shelters, is to use cages specially manufactured for veterinarian use. These cages are extremely durable and easy to keep clean, but they are only developed to keep the cats in when they wake up from surgery or during a shorter period. When the cats, which in unfortunate cases can stay at shelters for more than 6 months, are kept in these cages they are completely under stimulated and their physique will start to deteriorate as well as their exploratory need will fade. Suppliers: Kruuse (DE) [web2], Mason (US)[web3], Snyder (DE)[web4]

**Shelter/hotel cages** – This specific group of cages are specially developed to ease the use at the shelters and to provide the cat with more options of movement to ensure that it stays stimulated and uses its muscles. These cages are often slightly more expensive (therefore it is not that commonly used outside of the US) than the previous mentioned system, they require more space and often the companies providing these solutions only sell in great numbers, so that the shelter is bound to make a big purchase. Suppliers: Mason (US)[web3], Shorline (US)[web5], Snyder(DE)[web4].

**Pig cages** – It is commonly used to install pig stall and use them to keep cats in, because of the unlimited level of customization that these system allows for. This way any room can be utilized perfectly to maximize the number of cats kept in the room. This is a big advantage but using systems developed to other animals also have its disadvantages like the slightly wide space between the bars and most of all, the strong associations to farming, which is not what the customers wish to see. Installing pig cages is often a “do it yourself” project and therefore it isn’t uncommon that there is a lot of makeshift with the cages. Suppliers: Danbox (DK)[web6]

For further description of the actors on the market see appendix 6. Based on the research of the different strengths and weaknesses of the commonly used solutions, an analysis to find a gap in the values they offer have been made. The cages are assessed on 8 basic parameters; cost, mobility, customization, complexity, easy clean, lifespan, interaction and stimulation.

This leaves a clear picture of some massive gaps in the value propositions the current cages provide. The map leaves almost all of the value creating features like interaction, stimulation, customizability and mobility untouched and only covers the bare necessities.

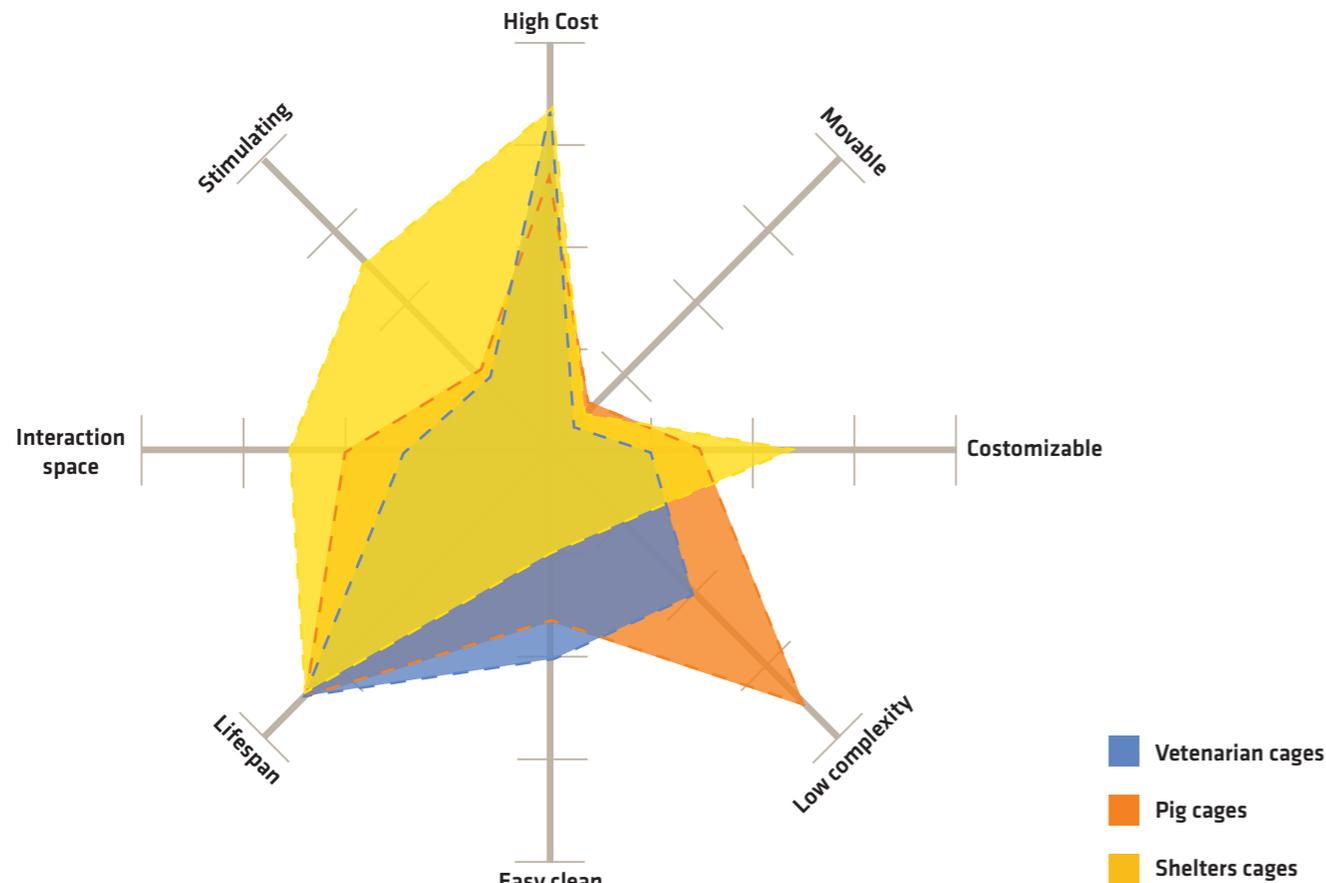


Fig. 22. Spiderweb analysis of current cages on the market.

Another market to investigate is the private market, which is booming with products and has an annual growth of more than 4%. In 2014 the cat accessories business generated more than \$55 billion revenue [web7], and this is just expected to keep increasing. Therefore, it is ideal to consider what the private market is willing to purchase for their pets to make sure that they perceive a shelter as a good place to stay, by utilizing this knowledge.

To investigate what is happening on the private market, a visit to multiple pet stores is given. Here the sales assistants explain what is popular in the current market.

**Bigger is better:** Scratchers and climbing trees are very popular and more and more customers request bigger solutions and recently many expandable options have become available on the market.

**Stimulating food bowls:** When owning an indoor cat, it is important to do all you can to stimulate its hunting gene and to keep it activated, so lately many alternative food bowls, making it more challenging for the cats to retrieve the treats have become available, and they sell very well.

**Filtered trays:** This is not a new phenomenon, but still a very popular one. Many cat owners, especially the urban living cat owners, do not enjoy the smell of cat stools and therefore require filters in their trays.

These inputs provides a suggestion of what buyers like to see the cages equipped with to feel like the cats live in a proper place.



Fig. 23 & 24. First picture shows a large range of scratching trees, whereas the second shows the standard filters that can be bought.



Fig. 25 & 26. Both pictures shows products on the market for stimulation of pets, while they are eating.

# 1.8 Market size

As previously presented the number of shelters in Denmark holding cats are 20 or more. Based on the visits at the two shelters it is calculated that the average number of cats at the shelters is 50, which means that if all shelters in Denmark, were to purchase a one-cat solution, it would result in a number of 1000 cages.

## Price estimation

The existing caging systems vary in prices depending on the expectations regarding flexibility and quality, but most of the companies only provide price upon request and therefore it is challenging to get a picture of what the market is price-wise, however Kattens Værn provided the information that the cages they use costs approximately 20.000 DKK each (they use cages from Kruuse).

Another important factor regarding price is the financial situations of the shelters. At the visit at Kattens værn it was addressed that they have

a yearly budget of 6 million DKK whereas the bigger organization - Dyrenes Beskyttelse, have a yearly income on more than 100 million DKK. This is a tremendous difference and both organizations are within the targeted group.



Because it is hard to get and understanding of the market prices, it is important to look into what the shelter we investigated can afford now. This led to a price per cage in average on lesser than 20.000 DKK.

# 2.0 framing

The framing phase is a condensation of the research phase where a gathering of the requirements and creation of a vision and mission forms the foundation for the further work in the field. Here the initial focus for the project and the desired direction will be presented. The measurable parameters are accompanied by a set of emotional expectations.

## Wishes:

It should be possible for the customer to easily interact with the cats.

The customer must not feel like they are purchasing a used “product”.

The cat should have an option of leaving scent markings.

The cat should have a bigger space to move around in.

Avoid patterning of surfaces.

Avoid lists with sharp edges.

Minimize the use or sectioning of bars.

## 2.1 Focus areas

Throughout the research the main tendency is that the cats needs as well as the shelters, is well defined and there are done certain initiatives to ensure that the conditions are good in these areas, but with all of the focus currently lying on the shelter and the cats preferences, an extremely important fraction is forgotten; the buyers.

The main focus for this project is to develop a compartment system which is “better” than the current solutions, and the way to do that is to consider the buyers point of view.

## 2.2 Requirements

All of the knowledge which are collected through the research are formulated into requirements which are ranged according to importance. The majority of the requirements are of technical origin and are therefore more relevant later in the process.

### Needs:

It must be possible to divide the cats into individual cages, if necessary.

The cats should have the option of going to a remote position to relax.

Materials must withstand daily use and cleaning.

The cat tray must be kept separate from the living space.

Each cat must have its own cat tray, water bowl and food bowl.

The solution must be able to create privacy for the individual cat.

Materials must not absorb liquids.

Material must not ooze any odors.

Joints have to be concealed.

No rough or sticky surfaces.

The solution must contain an option of scratching.

### Vision

The vision is to create a more attractive situation when getting a cat from a shelter, by increasing the life quality of the cats inside a compartment, allowing the customers to interact more and easier with the cats and ensuring effort-less use for the shelter.

### Mission

The mission is to update the cages at the shelters to align them with the social tendencies affecting the shelters. This will be done through a redesign of the cages with the objective of turning them into a compartment system to make them more welcoming for customers to interact with. The compartments must ensure a high degree of freedom for the cat to move, as well as allowing for stimulation of its natural instincts. Furthermore, the shelter employees must benefit regarding utilization of the space, less time spend cleaning and more time for each cat.

## 2.3 Guidelines

Throughout the research some very valuable observations have been made, but these have not been converted into requirements due to their soft and less definable origin. These statements will be used as guidelines for initiating the ideation and will be a deciding factor for the further process.

Cats are extremely territorial animals and often need to be separated, therefore the solution must provide the cat with a private space.

Cats communicate through scent marks and these are also a big part of their mental strength, so to incorporate an element designed for these marks are of high priority.

All the cats at the shelter use their free time to lie at the highest available position and therefore it is desired to work such a feature into the project.

There are many different kinds of customers at the shelters and it is important that the cage allows users to take things in their own pace regardless of if they prefer to observe or interact.

There is a general lack of commitment and understanding among many of the customers at the shelter and therefore it is the shelters task to educate people and if the product can help them do so it is a big step in a right direction.



Fig. 27 & 28. Cats at shelters.

## 2.4 Focal points

The further work in the project will be based on three main focal points which present great options of improvement as well as crucial importance for the development of a realizable and standout project. The areas are as follows:

### SIMPLICITY

To ensure that the product is realizable and will function in the surrounding which it is meant to be placed in, the focus must always lie in simplifying the solution to ensure a more durable product.

### CUSTOMER EXPERIENCE

This aspect will be a deciding factor in the project, since this one aspect has a great impact on the relationship the buyer gets to the shelter and most important, the cats. This is the areas where the sad tendency of pet dumping can be improved or even prevented.

### FLEXIBILITY

The compartments system must provide all of the actors with a certain degree of freedom in relation to interaction, privacy and daily routines. It is of high priority to supply the users with the freedom to continuously change the appearance of the system to create a dynamic emotion to match the cats nature.



Fig. 29. A car display.

## 2.5 Moods

To prevent cat dumping, an important aspect is to work with the perception of the shelter and which kinds of cats they can offer. This must be done through a set of moods and emotions which the shelter and none the least the compartments must convey. Below there are two examples of which situation it is aimed to offer.

**Car purchase, exclusivity** – the situation of buying a cat must resemble the situations when purchasing a car. When purchasing a car you know that it is a big decision, it's expensive and the car will stick with you for a while. The owner of the car are completely aware that they are responsible of the car and any damages is might get. This level of responsibility, both in the purchasing phase but also in the owner phase, must be presented as an expectation at the shelter.

**Walking in the forest, Time to immerse yourself** – the calm and clarity a walk in the forest can give, must be conveyed in the solution. It is important that the solution encourages the buyer to take their time and to interact with whatever they please.



Fig. 30. An idyllic forest.

## 2.6 Moodboard

To ensure that the emotions are fulfilled a moodboard is developed to inspire the aesthetic decisions made throughout the project. The pictures below illustrate different aspects of the desired look like dynamic, strict, natural, open and welcoming.

All of these aspects are elements that will help achieve a product which can contribute to lifting the perceived quality level of the shelters to a higher level.



Fig. 31. Moodboard. 1) the feeling of a luxury product, which are displayed, 2) the simplicity in the display of something, 3) A luxury product within the right environment, 4) the display and panoramic view of a product, 5) the open and welcoming feeling, 6) dynamic display with space for experience.

## 2.7 Conclusion

Throughout the research a load of information has been gathered and these have been condensed into a clear direction for the following ideation of how to solve some of these problematic. The initial step in the ideation will be to utilize the statements gathered from the research because the requirements are of such a technical character.

The moods will be incorporated in the overall ideation to use the shape language as a big part of the communication of these emotions, additional the emotions will also be used in the detailing and manufacturing section of the report due to their effect on the decisions made during those phases.

# 3.0 ideation

The ideation phase is based on generic ideating methods to generate ideas connected to the parameters set up in the framing, combined with studies and experiments to confirm the assumptions of the system functions.

## Methods used

**Brainstorm** is a method for opening the mind, with all possible ideas, to get started or to generate ideas based on a specific areas. In this case a requirement based brainstorm where made to put each need in focus.

**Brainpool** works like a brainstorm, the difference lies in the action of the group members rebuilding each other's ideas to create new and better ideas.

**Word ideation** is a method used to create ideas "outside of the box". An example is to ideate based on the words rocking chair, where an idea of a rocking scratching board where made.

The different methods where used through all of the ideation to divagate the field and the focus where con- vated by studies and experiments - which will be described in this phase and compared to the framing. The final concept will be the result of this phase.

## 3.1 Initial ideation

A general brainstorm on compartment solutions have been conducted to initiate the ideation, with a focus on exploring the field of interesting areas. The figure board show a selection of the ideas, which each is numbered and described.

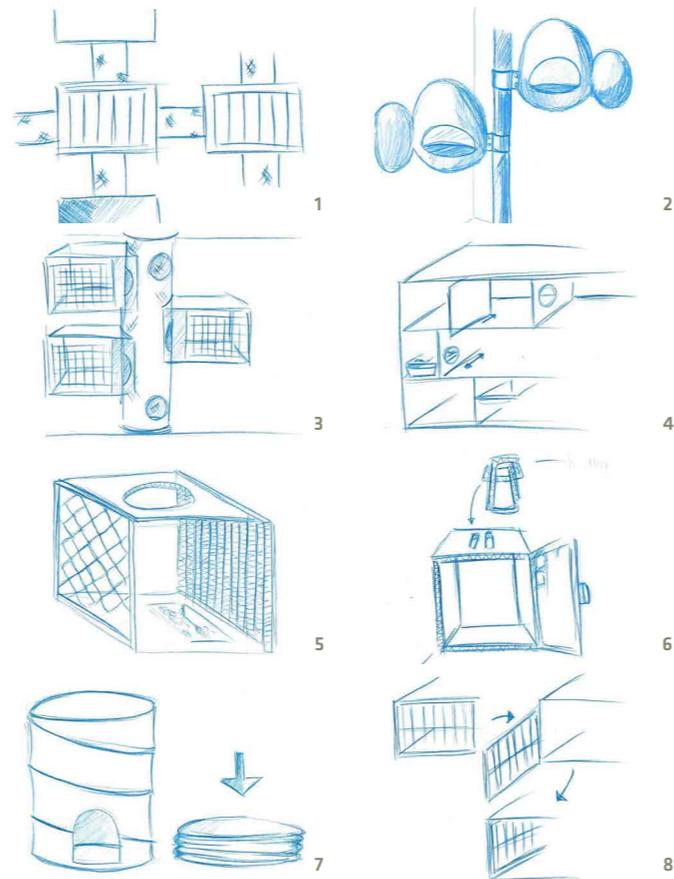


Fig. 32. Initial sketching round. 1) Single compartments (hanging on the wall) that are connected through pipes, which manual can be closed and opened depending on the numbers of cats. 2) Compartments that can be clicked onto rods, so the shelter can create the room as wished and depending on the numbers of cats. 3) Compartments connected to a pipe, where the cat can move around in. The three first sketches also focus on exploration for the cat outside of the compartments. 4) A large system that can be divided into smaller compartments, depending on the number of cats. 5) A frame where different walls can be slid into. The different walls focus on different needs for the cat, as stimulation. 6) A cardboard box, which the cat can used while staying at the shelter and that the customer can transport the cat home in. In this way the cat develops a connection to this object. 7) A textile/metal cage, which can be folded together when it is not used. It should also be possible to wash it in a machine. 8) A technical solution whereas the gate can be slid away to optimize the impression.

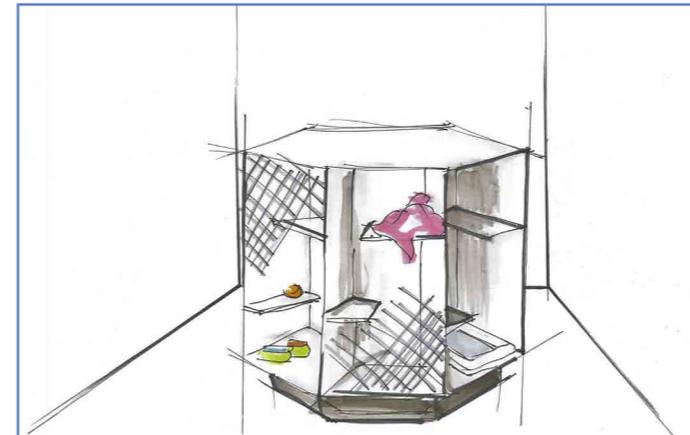


Fig. 33. Group 1. A center room compartment, which the customers can move around to get an impression of each single cat.



Fig. 34. Group 2. A multifunctional compartment wall, which can be customized for the shelters needs.

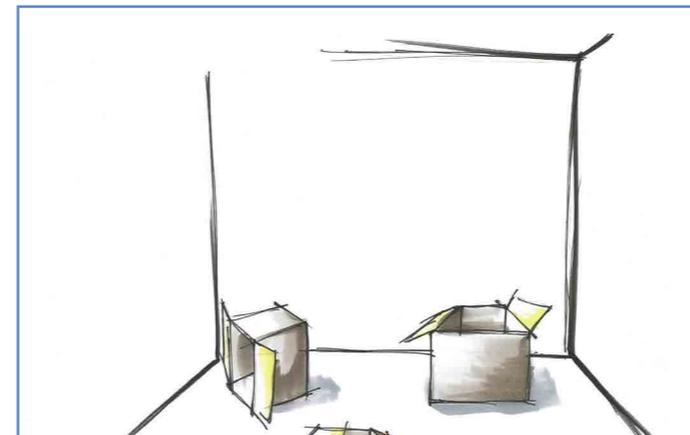


Fig. 35. Group 3. A disposable product, which the buyers can use for transportation of their new cat.

The output of the initial brainstorm is analyzed and grouped into three main principles which are commonly presented through the ideas. These concepts are of different character and are as follows: central room placement, wall mounted solutions and a disposable solution.

### Group 1 - center room compartments

The main principle in this group focuses on moving the product from the wall into the center of the room. By moving the compartments into the center of the rooms, the cats do not have to face each other, which is a big trigger of their territorial instincts. This will create an increased feeling of security for the cats, but it will also allow the potential new owners to focus on the individual cat, because not all of the cats are visible on the same plane surface.

One of the essential issues with this principle is the consideration of how centering the compartments will affect the number of cats that can be kept in one room, if it will make the cats space more compact and how the product adapts to different shelter rooms.

### Group 2 - wall compartments

In this group the principles are focused towards a high level of customization of the space. The solutions are wall mounted, but all allow for changes depending on the current situation of the shelter. By allowing the shelter to customize the cat's individual space depending on how many cats are staying at the shelter, the single cat will highly benefit from this. They will gain the option of separating the litter box from the living space, they will gain greater spaces to explore in some cases and if a mother cat comes in with her kittens a special room can be arranged to fit them.

There are two pressing issues with these principles and they both concern the shelter use. It might be time demanding to change the compartments in a flexible system, and parts might need to be stored when not used as well as the cleaning process might be further complicated because there are more gathering and joints.

### Group 3 - alternative materials

The third concept is of a different character than the two previous ones. Here the focus is to develop an impermanent solution which allows the shelter to set up however many compartments they need. This principle also focuses on using materials which can be disposable or easily cleaned. An additional principle that can be found in this group is that the potential new owners can buy a part of the compartment together with the cat, to get a subject that the cat has a relation to and feels safe around to ease the transition. There are definitely many great aspects in using alternative materials, both regarding cleaning and price but the bigger challenge might lie in the great amount of storage space needed for these solutions.

## Facts

While studying this third principle the idea of doing a system which allows the new owners to take home the cat in its well known compartment or a part of it, occurred. The principle is already used at American shelters and it is very common that when you purchase a cat, you bring it home in a cardboard cat carrier. In Denmark this phenomena is also used, but most frequently with smaller animals like hamsters or bunnies. This is an extremely cheap way for the shelters to provide an extra service which eases the situation for the new owners. The cardboard box could be used as an easing element in the process of the cat feeling safe in the new environments it is brought home to. This would require the cat to have stayed in the box of a longer period than the trip from the shelter to the home

and therefore the box should be incorporated into the compartment.



Fig. 36. Transportable cardboard box for cats.

**CONCLUSION:** All of the three groups have very strong aspects that all make perfect sense to incorporate into a final concept. Therefore, the further development will focus on how to combine some of the principles as incorporating the aspect of the new owner getting a part of the compartment to allow the shelter to replace it with a new compartment to ensure some renewal in the compartments.

Based on the first section of the ideation phase another round of proposals are initiated. A focus in this section is to incorporate aspects that will affect the user experience. A selection of ideas are illustrated on the right.

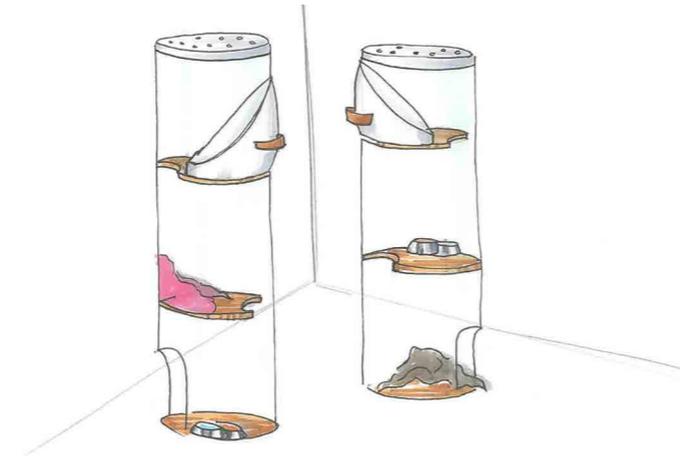


Fig. 37. Round compartments made of glass were the cat have more than one level to move around in. The advantage of this solution is that the potential new owners have a full view of the cat, and incorporated tray and a carbon filter.

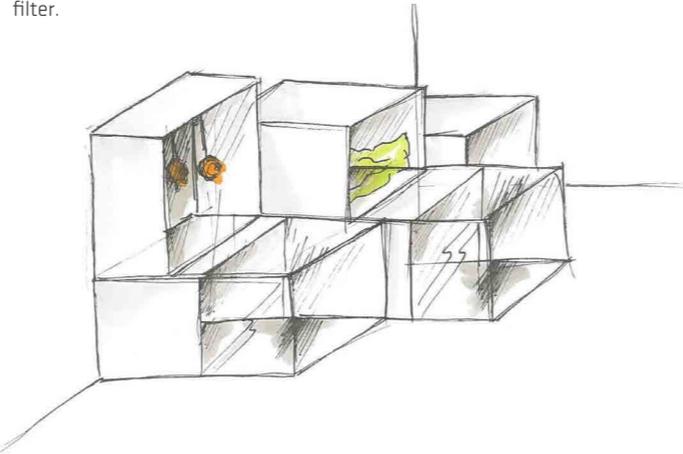


Fig. 38. Different sized boxes are placed together in groups to create a dynamic look. This makes it interesting for potential new owners at the same time as making it explorational for the cats.

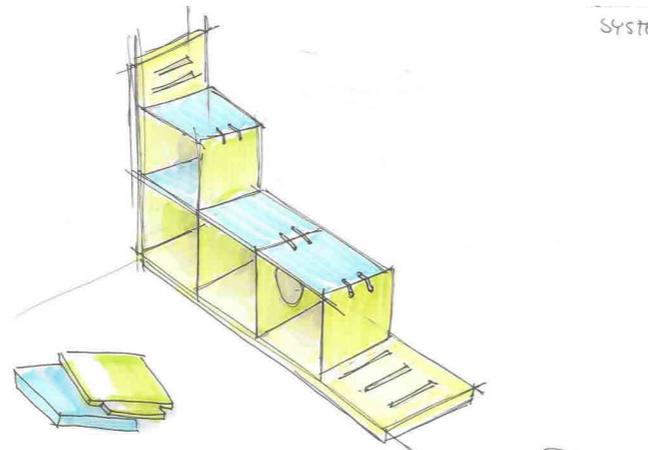


Fig. 39. Boxes that are constructed in a frame to make a flexible system which can be altered depending on each shelter and the number of cats they have at the time.

## 3.2 Re-focus

The previous ideas are analyzed and condensed into a few statements describing the further defined target for the final concept. Basically the statements are condensed from the research, the requirements and the creativity in the ideas. The statements are not requirements, but will be used as guiding focal areas through further ideation.

**The option of bringing some of the cats "territory" home, to ease the transition from shelter to home.**

### A dynamic look:

Exploratory and exercise options for the cat  
Surfaces for sitting while petting the cat.

**Flexibility in relation to the cats need and the amount of available space.**

**View of the cat as a first impression.**

**Incorporate a transformation to increase the level of accessibility of the cat.**

**An incorporated cat tray to heighten the level of control and the ease the cleaning process.**

**Leveling of the compartments in relation to the cats needs.**

**The compartment should ensure that the cat does not have to consider more than 3 "competitors"**

Based on the elaboration of the focus, another round of suggestions solving some of the new problematic is initiated. Here the statements are used to generate a new perspective on some of the ideas which already have been presented.

In this session the transformation have been a great focus, for more than one reason. First of all, there is a wish to develop a system which can go from daily use to presentation mode in a simple motion, and second to

have a simple transformation for easing the imprisonment feeling some customers might experience when looking and interacting with cats at the shelter.

Another factor, which is dominating, is the space utilization on the cat's behalf. Here it is explored how space at the shelter can be utilized better but also what it takes to stimulate and keep a cat happy. This is an important factor for all the three actors and especially for the customers because one of the first thing they notice at the shelter is the availability the cat has to move to different spaces.

Below there are a few of the ideas which have sparked ideas which are discovered further.

The use of unconventional shapes to make the space more interesting and challenging for the cat. This allows the cat to discover the space and to find its favorite space. This also creates some dynamic in the room to make it feel less static and bring out the natural dynamic of the cat.

One of the issues that occur now, when customers shop for a new cat, is the lack of control over the opening of the cage situation. Therefore, a better solution for the compartment gate is explored. Below the principle of creating a sliding "door" which slides into the compartment instead of out into the customer and the room are developed.

Lastly, there is a stimulation station for the cats. Here the idea is to incorporate some of the toy-elements in the compartment, or even use it as a "get to know your cat"-station, where potential new owners can play and bond with the cat before making a decision. This idea is great for adding the homely feeling to a more sterile situation.

**CONCLUSION:** The sliding gate principle is very interesting due to the integrated transformation form caging to interaction which can be done in one simple motion and will be the subjective for further development. The idea integrating some of the toy elements in a gathered area also have potential and will therefore be kept in mind for further development.

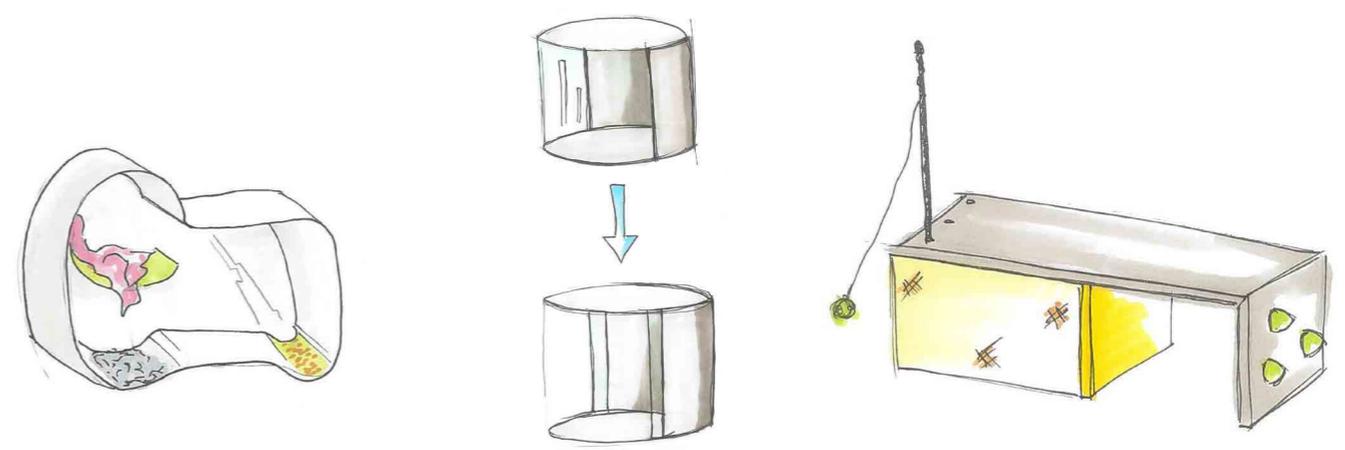


Fig. 40. First sketch focus on the utilization of the compartment regarding the cats needs, second sketch focus on transformability by combining compartments when the shelter have less cats, third sketch focus on the interaction between customers and cats and the impression of the cats.

# 3.3 User experience

It is clear that the user experience is a big deal in developing a solution that can elevate the level of confidence a customer might have in the shelter. In the following section, different way to do just that will be presented. These ideas are developed to explore every way possible to interact and experience the cats at the shelter.

The first idea (fig. 41) consists of a box, which is the living space of the cat, and an enclosed area where the buyer can meet the cat in its territory - its comfort zone. This is a good solution for interacting with and meeting the cat, but it might be problematic to install this solution in smaller rooms that some shelters have.

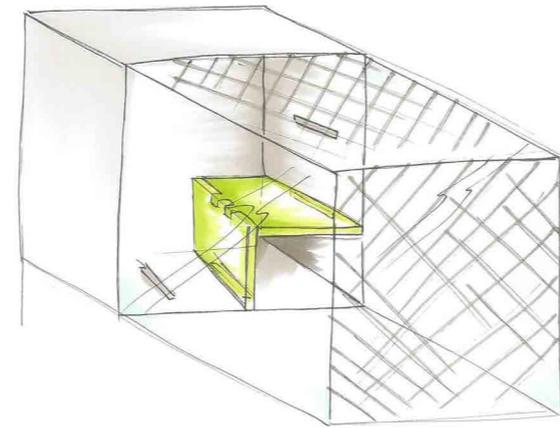


Fig. 41.

The next idea (fig. 42) is based on the freedom to constantly change the room depending on the number of cats and their needs. The idea of using a round shape provides a lot of dynamic to the room, as well as a panoramic view of the cat. The high level of flexibility might be a problem since the shelters would rather store animals than extra parts to expand the system with.



Fig. 42.

The principle in the next idea (fig. 43) is to create a smooth opening mechanism, which gives the employee and the customer more control of the cat they let loose. The principle is that the front opens in the middle and slides back. This gives a smooth motion and in captures the cat while opening the compartment. The challenge in developing this principle is that moving parts contracts dirt, hair, might break and can carry bacteria.

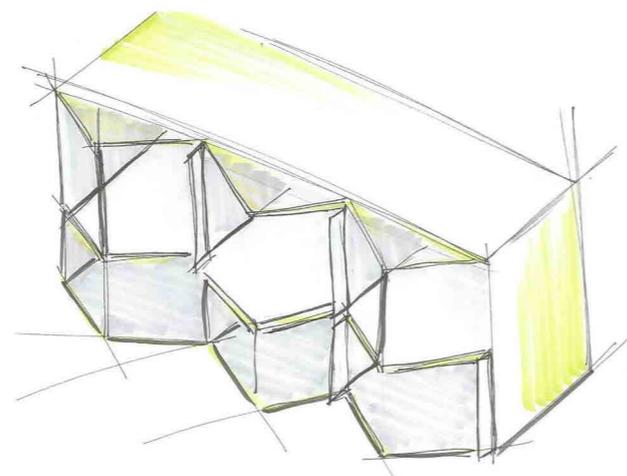


Fig. 43.

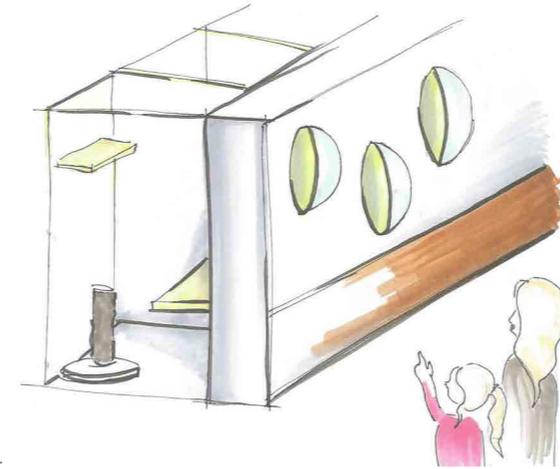


Fig. 44.

To increase the user experience and the feeling of a high end purchase, the idea of having the room split into two parts - a presentation side and a meet and greet side - are developed (fig. 44.). Here the first sight that meets the customer is the look at the cat, all of the excess stuff which might disturb the eye are hidden. When they have seen the cats, they continue to the opposite side where they can interact with the cats. This idea though, might encourage the buyers only to base their decision on the look of the cat, and not on its personality.

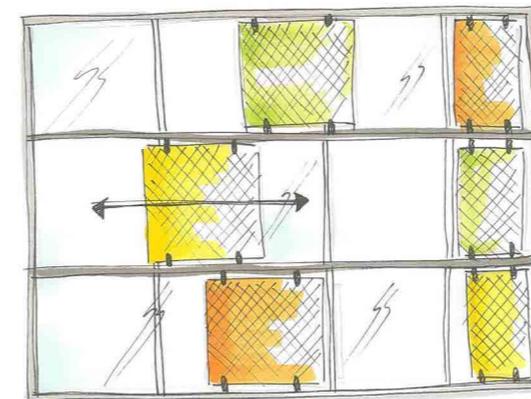


Fig. 45.

The next idea (fig. 45) uses a principle that increases the level of privacy that can be given to each cat. Here different blocking pads are mounted on a slider and these can be moved back and forth to sooth any situation. This principle has a lot of potential, and can even be expanded to include the gate to the compartment. This allows for the ultimate level of flexibility.

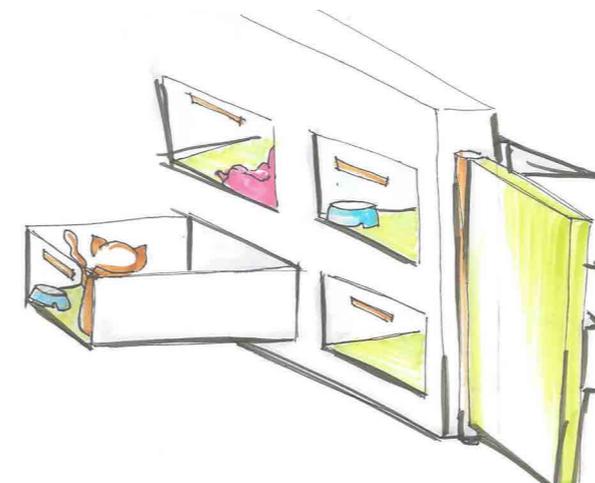


Fig. 46.

The last idea (fig. 46) is based on only allowing the buyers to be presented to the pleasant side of keeping a cat. Here they meet the cat at one side - behind the wall the shelter employees do all of the dirty work. This is great for presentation, but it does not increase the level of awareness of what it takes to have a cat, which is a problem. This concept can be an advantage, but in moderations. If the litter box can be kept hidden or less visible, and the smells of cat can be minimized the user experience is definitely increased.

**CONCLUSION:** there are a lot of interesting elements in the suggestions presented above and the following will be combined into a complete concept. The aspects which will be combined are the following; integrated tray, privacy covers, initial visual contact then interaction, intuitive motion to open gates and a stackable shape providing a panoramic view of the cat.

## 3.4 Concept: Ketty

The concept called KETTY is a combination of many of the previous ideas, which are based on the re-focus statements as well as the framing which covers following considerations; the compartments should induce dynamic to the room, a panoramic view of the cats, a smooth opening to gain a good control of the cat, a level of privacy for each cat and covering the less attractive part of the compartment, such as the cat tray. These considerations are all contributing to improve the customer experience when getting a cat from a shelter.

KETTY is a three level compartment system, which is to be occupied by one cat at a time. The bottom level shields the cat tray and because it is placed close to the floor it is less reachable and visible. The other two levels are meant for living space, to give the cats more opportunities to lay different places. Pia Bisgaard stated in the interview (app 2) that cats like to lie in high places to get a better overview of the area and due to KETTYs tall stature, this is now possible.

Another part of the proposal is the sliding gates and privacy covers which slides around the cylinder. By having these sliding gates it does not take up the space in the room, and it is easier to open the compartment at the same time as obtaining good control over the cat. There is a rule at Kattens Værn, which states that only one cat can be out at the time, but this concept makes it possible to open the compartment without letting the cat out into the room and this can be an advantage in the sales situation. The covers function in the same way as the gates, sliding along the curved surfacento make them an integrated part of the concept.

There is some elements of the concept proposal, which have to be considered before detailing it. These considerations revolve which shape the product should have, which size, how the product fits into the different shelters rooms and how the function of the sliders should work. This have been investigated through further experiments.

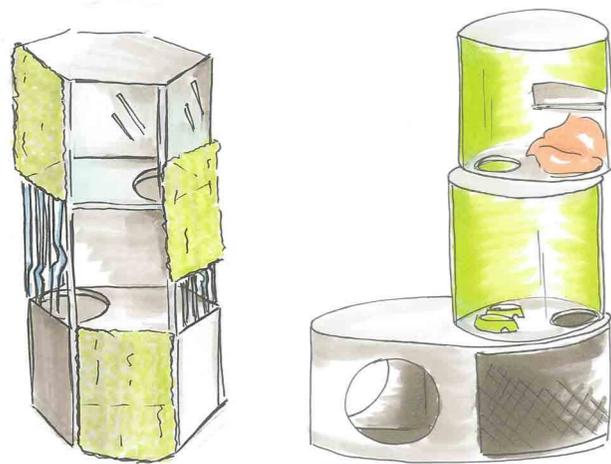


Fig. 48. First a hexagonal shape, where the gates and covers goes up and down, second an alternative form, with a sitting space for the customer to interact with the cat.

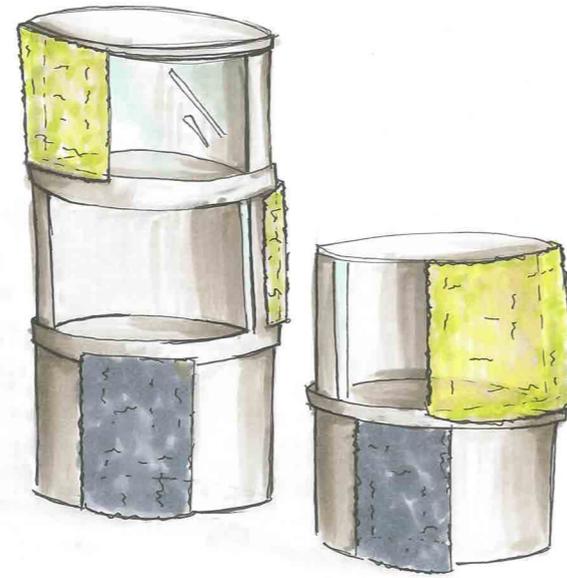


Fig. 47. Round solution with a glass gate to create the panoramic view.

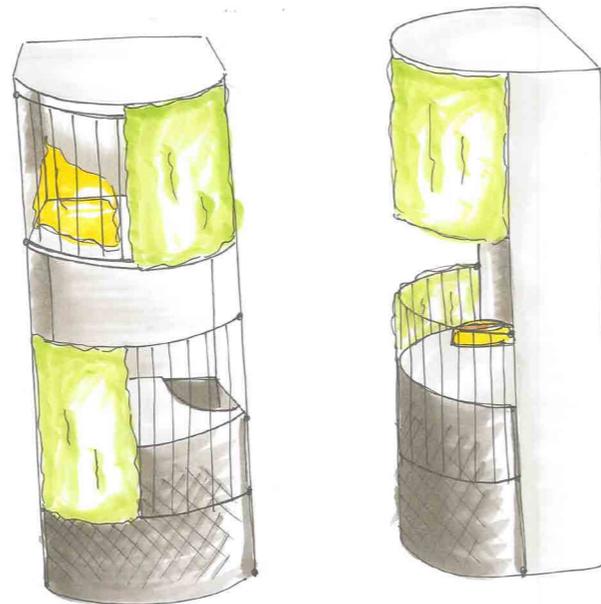


Fig. 49. A fusion form with a squared backside to place against a wall and a round front to create a panoramic view.

## 3.5 Experiments

### Room and shape experiment

By developing a vertically oriented solution, a pillar, the space in the room will be occupied in a different way than it is now. Therefore, a space experiment is conducted with the objective of investigating how these pillars might affect the different sized rooms. In this experiment, the two rooms are based on the sizes of the rooms at the shelters that have been visited (app 7).

By basing the solution on a vertical system which is not dependent on wall support, the shelter is provided with the option of placing these pillars in many different constellations. On the pictures it is illustrated that the pillars can be placed following the edges of the room, in patterns inside the room or randomly as the shelter please. The model used in the pictures has a diameter of 60 cm, and with this diameter, the number of cages for cats will not decrease but stay at the 8 cages for a small shelter and 28 for the bigger rooms (the same as they have now).



Fig. 50. Room/shape experiment in small room (based on a room from Kattens Værn, Aalborg).



Fig. 51. Room/shape experiment in large room (based on a room from Dyrenes Beskyttelse, Hjallerup).

To follow up on this space experiment, a shape experiment session is set up. The initial suggestion is to develop a round shape, which is based on two main aspects; the panoramic feature and the sliding transformation. These two aspects can be incorporated in alternatively shaped columns which might have features that fulfill the wished for the product better. Firstly a matrix with different requirements and feature descriptions are set up, to compare the different shapes (app 8). Based on the aspects used

in the matrix the circle, the pentagram and a square is selected for further work. These are build in smaller scales and placed in rooms of the same scale to see how they behave in a room and how the valued features act when put in context (see figure 52-54). All of the three shapes are constructed within 6X6 cm (in real life 60X60 cm) to ensure a common size range.

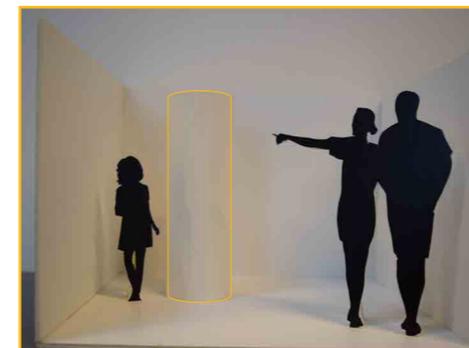


Fig. 52. Round shape.

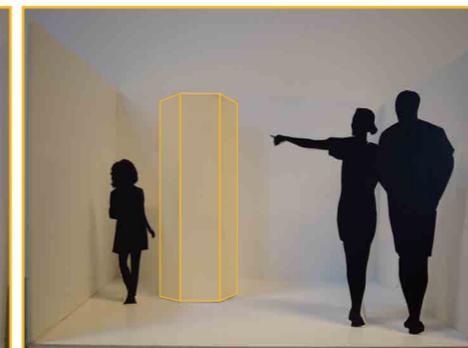


Fig. 53. Pentagram shape.

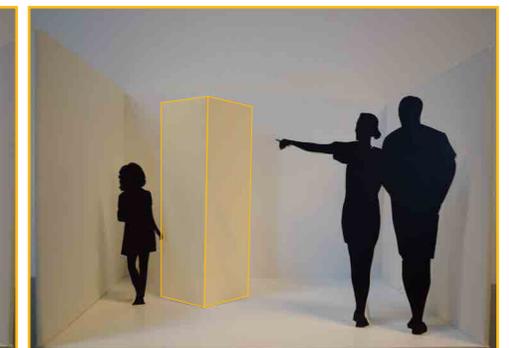


Fig. 54. square shape.

Another part of creating the shape is to combine the aesthetics and functions of the shapes with the room experiment. How each compartment relate to each other and the room is important to the overall impression, and there are different approaches, which can be great solutions. The compartment could be either a standalone product or an integrated product, which connects well with more of its kind.

Both solutions have been developed into a form which have been modelled in real size. This is to gain a better understanding of the size and form (see figure 55). The first form has a round shape whereas the second form has a round front and a squared back and this will be mentioned as the fusion form in the further work.

The experiment with the models show that by having a plane surface the column is easier to place in the space and the square back side utilizes the space best for two reasons; first, it uses the total surface space within the compartment and it leaves no space open when placed close to the wall



Fig. 55. Second model of the fusion shape (to get e proper size) and first model of the round shape.

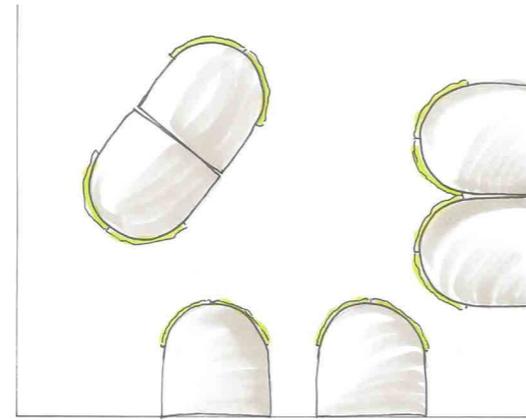


Fig. 56. Fusion shape placed in a room, to see the possibilities.

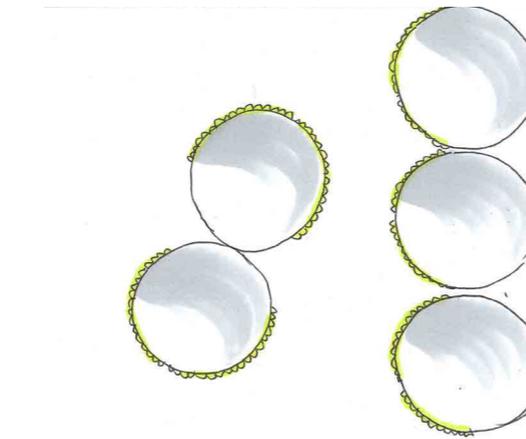


Fig. 57. Round shape placed in a room, to see the possibilities.

in opposite to the round shape, which will leave an open area around the product that are hard to clean (see figure 56 and 57). A positive feature for the round form is that the functional transformation can slide horizontally without requiring a complicated mechanical system, which will be needed in the fusion shape.

**CONCLUSION:** the two shapes both posses strong features but due to the pureness of the cylinders shape and the optimal function of the gates and slider, which is a big feature in this solution, the cylinder will be the object of further discovery. An experiment which is needed is a size investigation to determine a size in which the cats can fit but s size that also meets the need of the shelter.

## Size experiment

To ensure that the amount of space on each level is optimized to fit a cat (based on cat sizes from research), but also kept in a proper size to maintain the constructions lightness an experiment is set up. Here three different sizes are selected (60 cm, 70 cm and 80 cm) and tested with a medium size cat.

It seems that the 60 cm is too small, whereas the biggest circle leaves plenty of space for the cat, but this does also make the system incredibly space consuming. 70 cm seems as the ideal size, but this will still create a space consuming compartment. During the incestigations of the size Mario (the guinea cat) ventured to his favorite position which is the windowsill and curled into a little bundle (fig. 61-63).

This perfectly illustrates how little space a cat needs to feel comfortable. Therefore 60 cm is a good suggestion since it is very close to the amount

of space each cat has in the current cages at Kattens Værn, while Ketty has two times that space due to the levels. To test the size of the 60 cm diameter levels, a model in real scale is constructed and it shows that 60 cm seems optimal.

To prove that the amount of space is increasing (compared to the current cages), calculations on the space available in Ketty are compared to the calculations of the old cages found on research, p. 11. The calculations show that the cats get a total of 0.84m<sup>2</sup> which is 1.4 times more than the smallest cages at Kattens Værn and similar to the biggest ones, but what is really interesting is that they get a much better exploitation of cubic meters available.

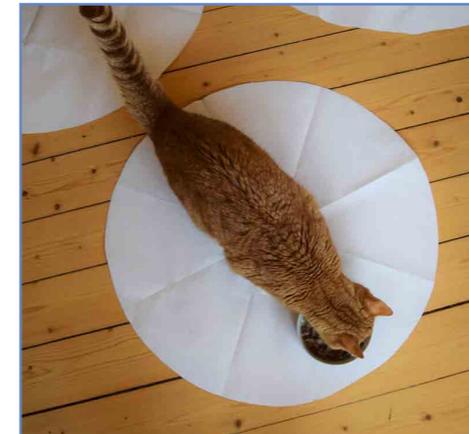


Fig. 58. Mario on a 60 cm circle.



Fig. 59. Mario on a 70 cm circle.



Fig. 60. Mario on a 80 cm circle.

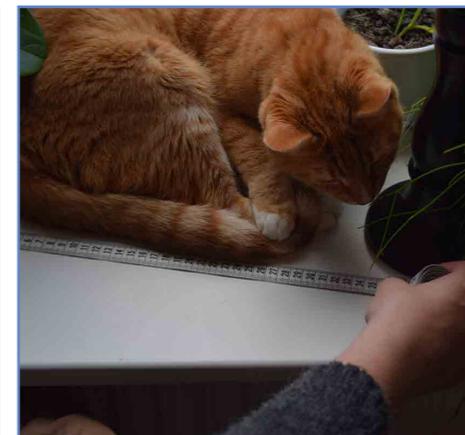
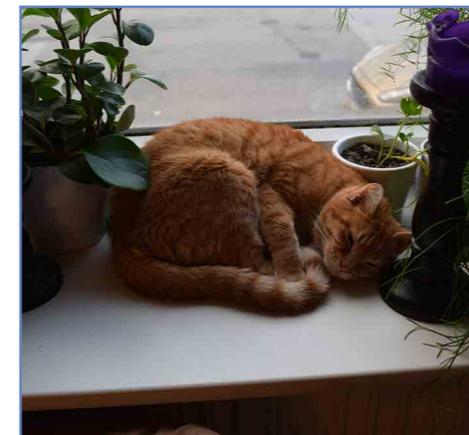


Fig. 61- 63. Mario lying curled up in the windowsill, where there is more space if he wanted it. Cat do not allways need lots of space. The space is around 35 cm x 35 cm.

## 3.6 Fusion vs. round

Based on the shape studies made earlier it is concluded that the round shape have some strong advantages over developing a edged shape and it was further explored. Yet one of the biggest issues with having a circular shape is the placement in the room and the fact that they do not interact perfectly with one another as well as posing an ethical question of keeping animals contained in a round space. Therefore the fusion shape is brought back for further exploration.

By combining the round front, maintaining the panoramic view and the interaction surface, with a square back to ensure an easier placement in the room and a interaction surface in between the compartments some of these concerns can be solved.

By using this fusion shape the desired sliding mechanism, which on the original concept was simple due to the round origin, have been forced into further complexity due to the need of a motion transformation mid slide.

After discovering the fusion shape and meeting an endless count of challenges a step back is taken to reconsider the decision of using this particular shape.

The fusion form is held up against the former round shape and analyzed for pros and cons. The objective for this motion is to either confirm that the fusion shape is the right or to discover a better option.

### Round

#### Pros

- Simple technical solutions
- Possibilities for a more flexible solution (customization)
- More elegant, a sleeker look
- Better view of the cats
- No premeditated back or front
- Total placement freedom
- Easy cleaning due to lack of corners

#### Cons

- Utilizes the space less efficient
- Have no premeditated biding link between cages
- The footprint might create some cleaning challenges

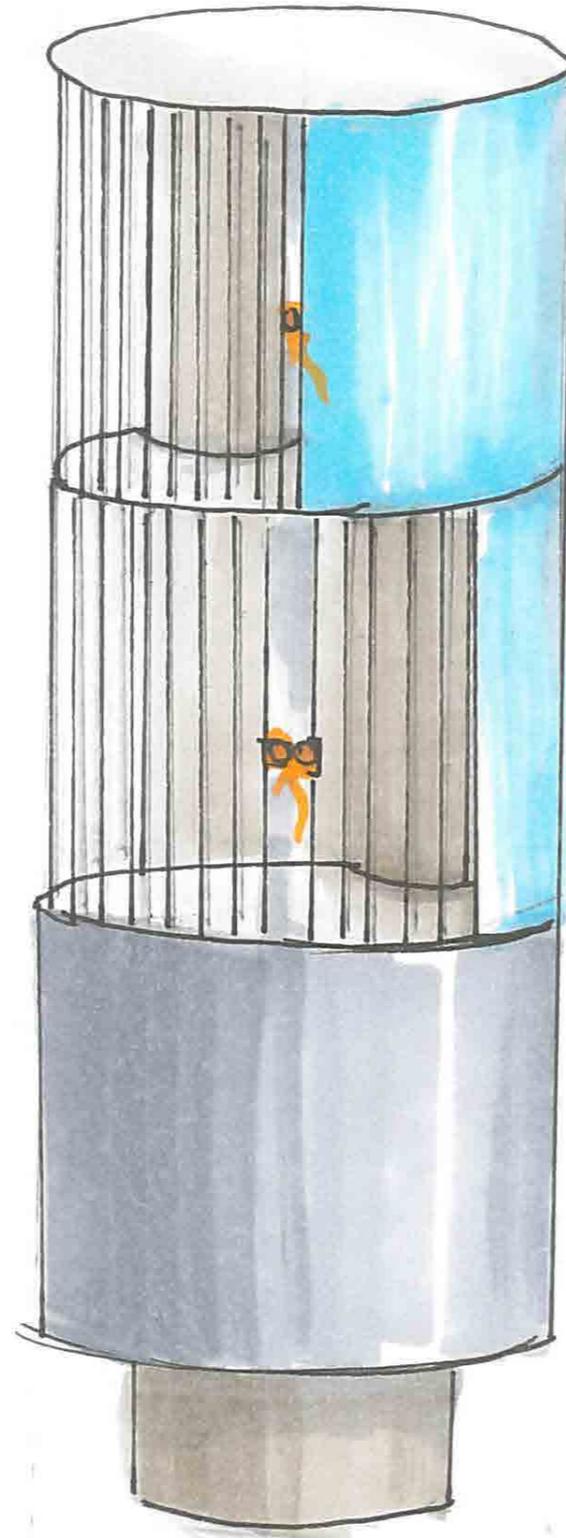


Fig. 64. Round solution.

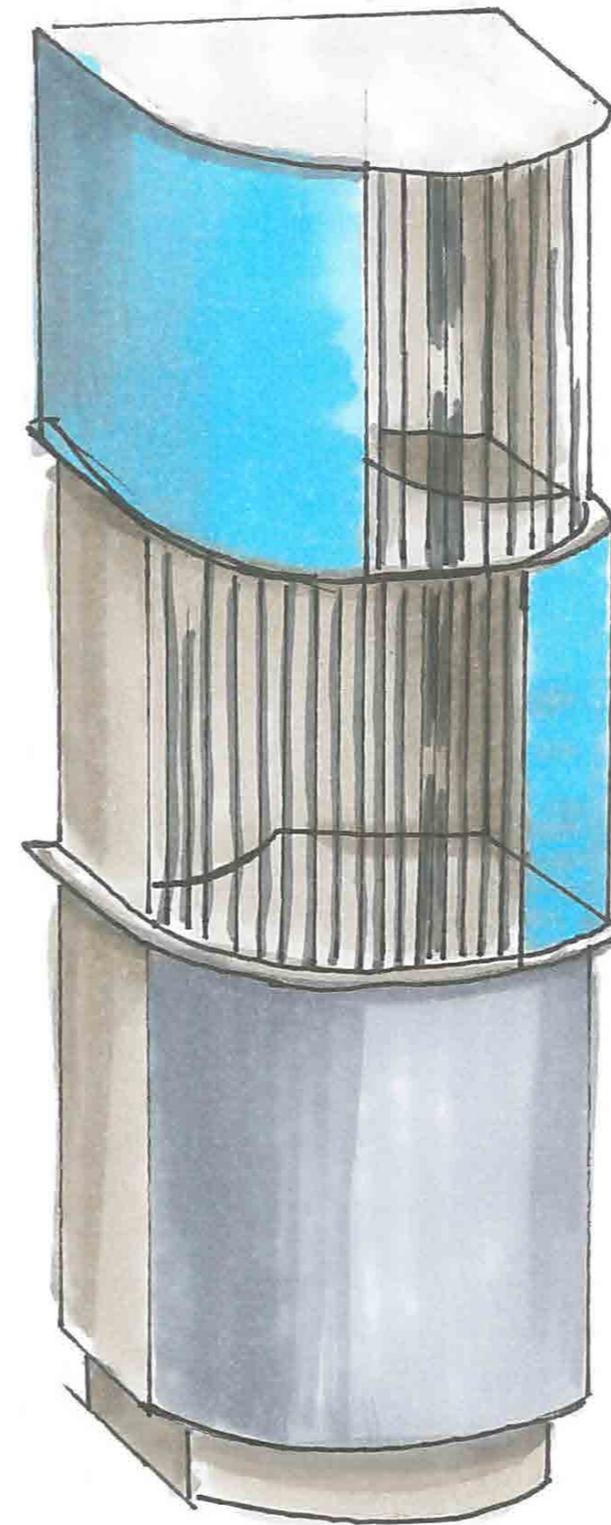


Fig. 65. Fusion solution.

By doing this analysis, it is clear that one of the most important features of the concept is that it is completely customizable for the shelter in the aspect of decorating the room. One of the biggest elements to impact this freedom is the orientation of the product meaning if it has a clear back and front. The fusion shape will always have a clear back due to the square shape, while the round shape provides unlimited possibilities and this is a contributing factor to selecting this shape for further development. Another reason for selecting the round shape is the functions of the sliders. In the development of the fusion form it where clear that the functions would be too complicated and therefore problems concerning cleaning and maintenance would occur.

The round shape is selected with the purpose of making a customizable system, which will decorate the rooms at the shelters and appeal to customers, at the same time, as it is intuitive to uses and clean.

### Fusion

#### Pros

- Better space utilization
- Clear link between each compartment
- Good view of cats

#### Cons

- The squared backside makes the expression to massive and compact - missing elegance
- Has a strong product orientation and a premeditated placement position
- Minimizes the degree of freedom of placement
- Highly complex technical solution (sliders)
- Cleaning issues regarding technical solutions (sliders)

### Fusion solution

Due to the degree of development done during the discovery of the fusion shape some of the solutions discovered will be directly transferred to the selected round shape. These functions include:

- The foundation/footprint (app 9)
- The interaction point and the opening motion
- The composition of the structure, level height of 50cm and diameter of 60cm

### 3.7 Final concept

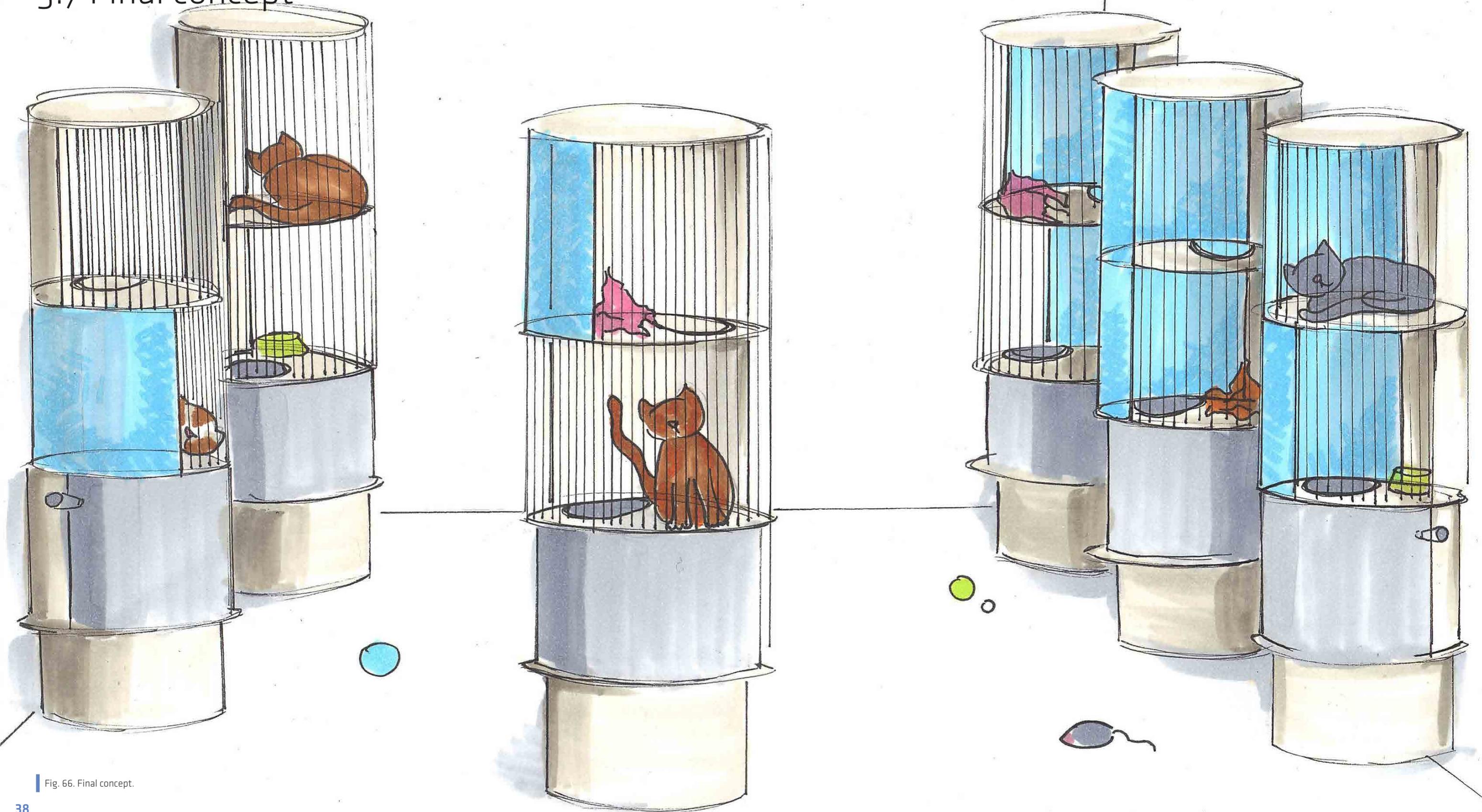


Fig. 66. Final concept.

# 4.0 detailing

Throughout this section of the report the key features will be further defined through investigations, experiments and models, to ensure that the desired experience of the product is fulfilled. Mechanical systems will be defined and described as well as the single parts will be assigned materials fitting for the tasks the element must solve. Throughout the process prioritizings based on the research, the requirements and the focal areas will be stated to ease the selection of solutions.

## 4.1 Construction

To ensure that the column shaped system can be a standalone product and that it can be placed regardless in any room, it must be self supportive and stable. Below are three suggestions to how the stability can be ensured, still considering the lightness of the construction.

The three suggestions work with stability on different levels. The first suggestion is on the safe side and would not need further enhancement to ensure a strong self supportive construction, but the suggestion compromises the view and freedom by placing supportive elements in the front. The third solution can be self supportive but it will need further work to ensure that the discs will not deflect. By selecting the last option, the product is assigned a front and back, which provides Ketty with a orientation but also ensures that the ethical considerations are indifferent.

One aspect than can be tempered with – in the third solution, to increase the stability is the size of the back panel, or the spine if you like, to ensure a wider distribution of the forces. By increasing the range of the spine to a half circle, a higher level of stability can be obtained, but this action clashes with the goal to make the compartments system light, visually. Using a quarter of a circle could be a possibility, since it contributes to a light looking construction. The problem with the quarter is the limited force it can handle. Therefore, the mate between the two sizes is a good suggestion and will be the suggestion for further development. To find the full investigation see appendix 11.

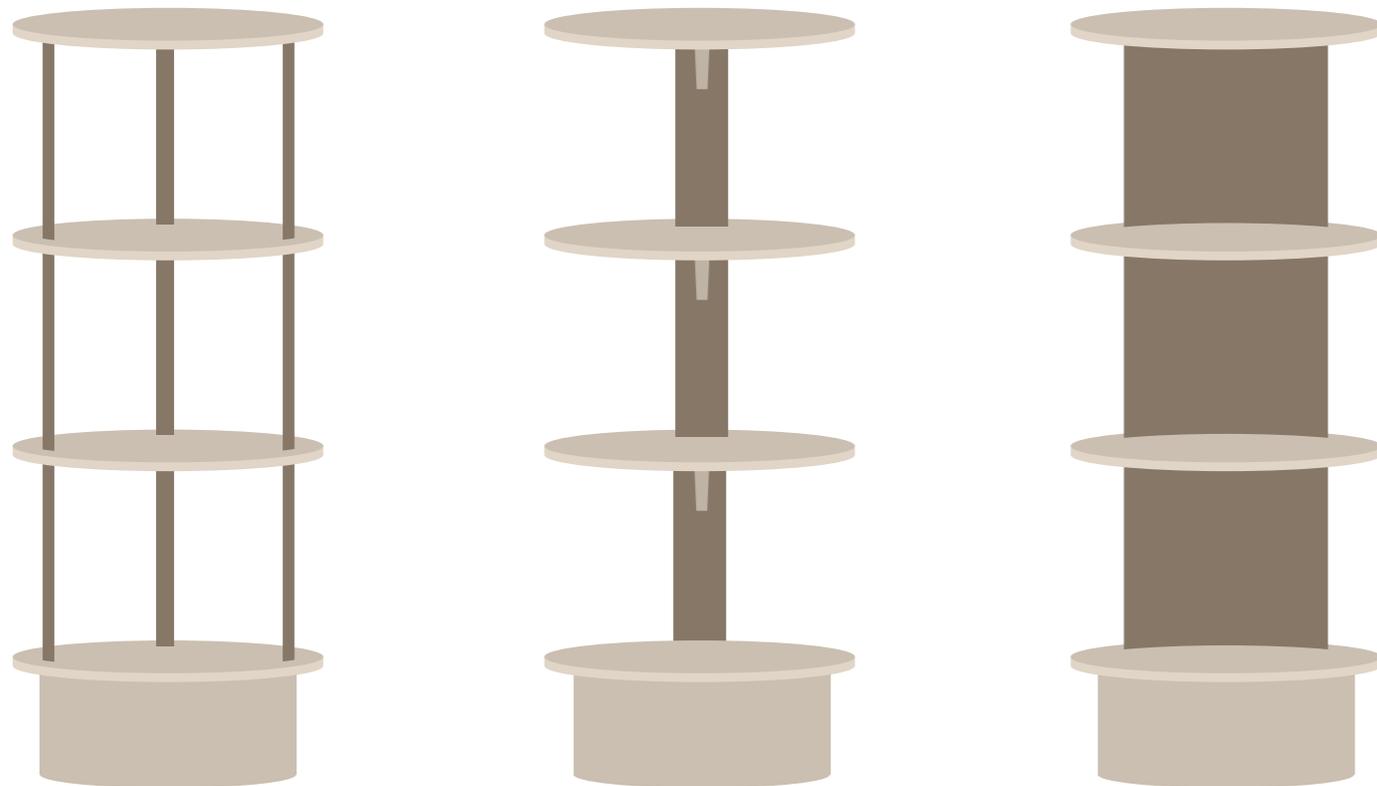


Fig. 67. Three construction solutions.

The reason for choosing the construction with the back panel is also based on the investigation of, whether or not the product should have a front and back side. There are different pros and cons with having it, such as:

### Pros

- The customers gain better understanding of how they must interact with the compartment.
- The placement of the compartment are more strict/important.
- There is a fixed structure which the cat can lay against.

### Cons

- The view to the cat can be compromised.
- The placement is slightly limited.

The reason for choosing a back panel that covers 1/3 of the compartment is also based on a slider investigation, which will be presented later in the detailing phase.

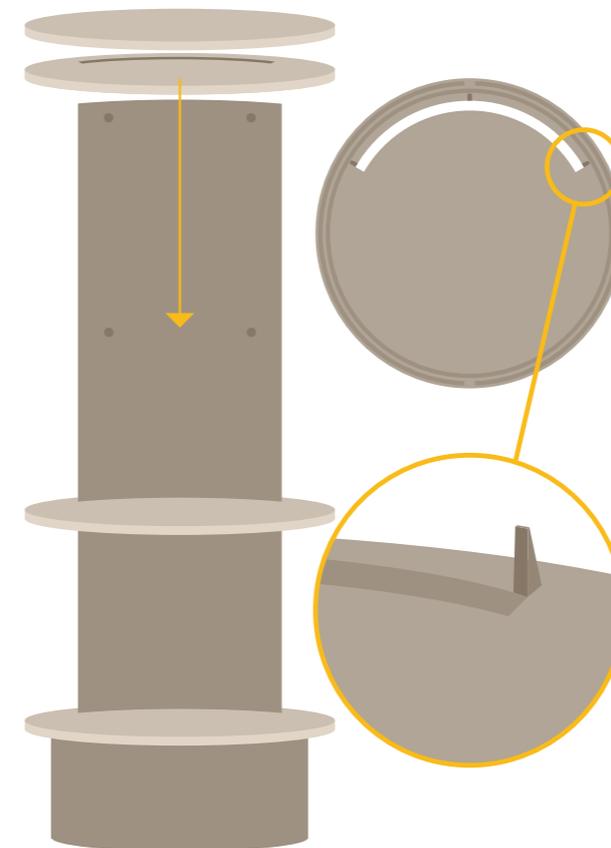


Fig. 68. Final construction.

## Mounting the construction

To ensure that the construction can withstand the forces that are being applied onto it, the task is to minimize the amount of joints and gatherings because this breaks the force flow and thereby each joint must withstand more force than it would with fewer gatherings. There are two overall approaches – to make a complete spine where the discs are mounted on or to split the spine into the different levels, and construct one level at the time (app 12).

The advantage of the first solution is that the spine is in one piece and thereby it will be stronger than the first solution, but the disadvantage is that the discs have to be mounted onto it, which will create joints inside of the compartment. This is a problem because of dirt and dust. The advantage of the second solution is that the discs are clamped between the spine parts, which makes the joints invisible inside the compartment, but the disadvantage of a less strong construction lead to the conclusion of further work with the first solution.

The discs will be mounted with angle brackets, this is to give a stronger stability to the discs (fig. 69). There will furthermore be some taps on the back side of the spine, to ensure the pressure which will affect the discs from the front, will not make the disc flip upwards (fig. 68).

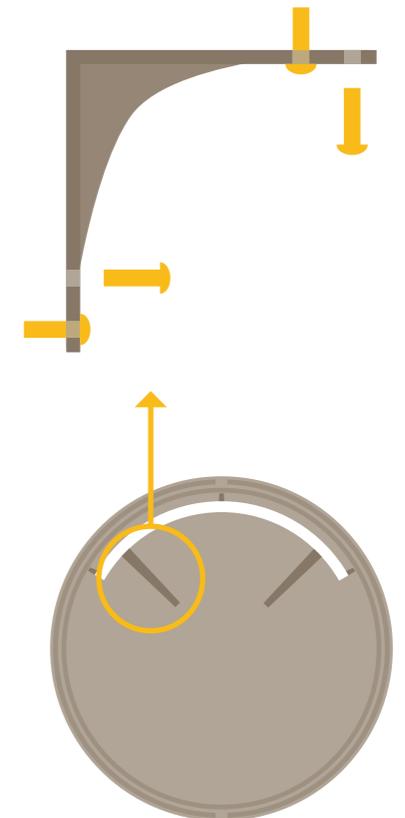


Fig. 69. Mountion the discs.

## The foundation

To maintain the highest possible level of stability and strength the back spine will be mounted in a heavy foundation.

The foundation is the element which are stabilizing and holding the system in place while adding a light and flowing look to the system. To ensure that it possesses the strength and weight needed it is manufactured from steel sheets. The back element is mounted in the foundation by pushing it into a matching hole hereafter it is secured with screws and bolts. The foundations functions as a counterweight to the rest of the system to ensure balance, this means that it needs an extra weight, besides the weight of the metal. This could be a metal section welded into the front of the foundation as shown in figure 70. The foundation should be made of two metal rings, which are welded together by walls to support the construction.

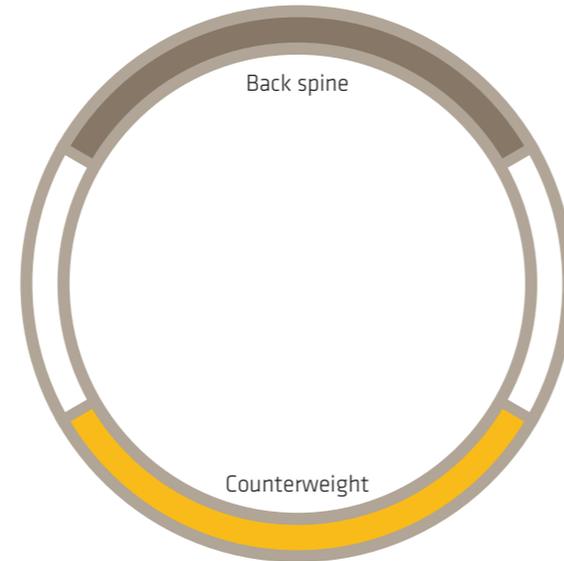


Fig. 70. Construction of the foundation. The light gray is the metal frame, whereas the dark gray is the spine going into the frame and the yellow is the counterweight.

## 4.2 Sliders

The size of the gates and the covers are depending on the size of the spine, and therefore a discovery of the available combinations is setup (see appendix 11 for the full setup and figure 71 for a section of the three best fits in each category). The factors that are valued highly are the overall lightness of the construction, the available size of the entry point for both employees at the shelters and customers and the amount of privacy/security the cat are provided with. There are advantages and disadvantages for each of the solutions in figure 71.

### 1.1:

- An advantage is that the gates is the only objects that have to be controlled in connection to the locking of the compartments.
- Another advantage is the whole compartment can be shielded, the back with the spine and the front with the cover.
- A disadvantage is that the compartment is half shielded because of the spine, this gives a dense expression that are not wished.

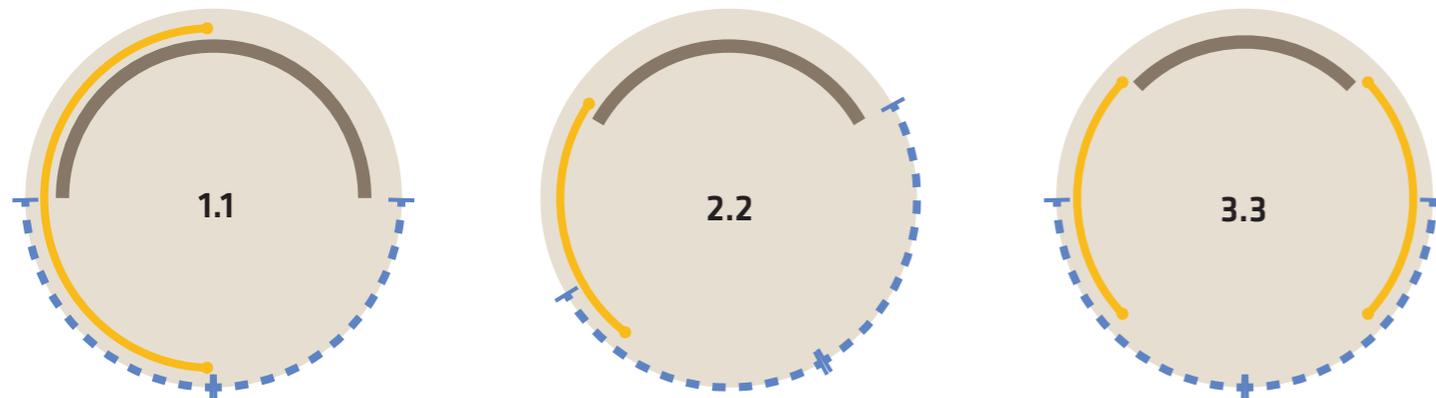


Fig. 71. Slider experiment. The dark gray is the spine, the blue dashed lines represents the gates, whereas the yellow lines represents the cover.

### 2.2

- An advantage is that the spine only shields 1/3 of the compartment; this makes it less massive at the same time as it still creates a back and front side.
- A disadvantage is that the cover have to be a part of the locking system; this makes it more complex for the employees and customers to use. The Front side will also move position depending on where the cover is needed.
- Another disadvantage is that there are few changing possibilities for moving the cover, it have to be in either the left or the right side of the compartment.

### 3.3

- This solution has the same advantage as 2.2, by being less massive with a spine that only shields 1/4 of the compartment (but this can be a disadvantage construction wise).
- It also has the same disadvantage as 2.2, because the cover(s) have to be a part of the locking system.
- Another advantage it has is that there is two covers; this means that the compartment can be shielded from both sides at the same time.

To follow up on the advantages and disadvantages, a combination has been developed (fig. 72). Three things were important – first that the spine shields less than half of the compartment, second that the gates are the only objects that have to be controlled in the locking system and third that it is possible to move the cover so it shields most of the compartment. This is why the gates each close of 1/3 of the compartment, which means that the compartment have an opening on 1/3 while the gates are fully open. The spine does also shield the compartment with 1/3.

The overall desire where to avoid the half circular spine, because it closes of the structure too much, though this is also the strongest construction wise. The 1/3 circular spine is a good compromise for the visual impression.

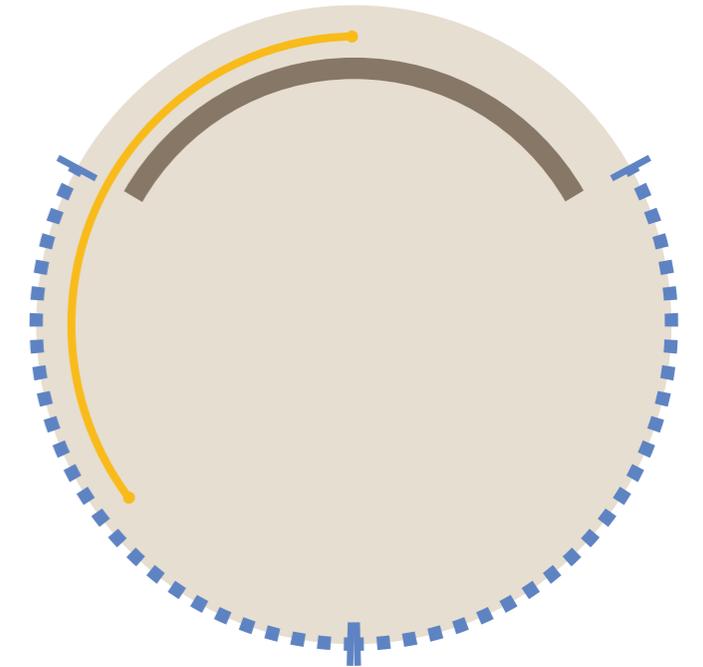


Fig. 72. Final slider positions and sizes.

To investigate how the compositions affect the opening and interaction with the cat, an experiment is set up. Here different cutouts represent the back spine and the gates, to create a frame that limits the access. The experiment can be seen in the pictures.

By having the opening being a third of the circle, the access is in no way obstructed and it creates a very controlled field of interaction.



Fig. 73. Testing of gate sizes and open interaction space.

## The discs

The compartments are made up from discs which are mounted on the spine. These have two main functions; to divide the space into compartments and to set the frame for the sliding mechanisms which make out the cage.

As previously introduced (in the ideation phase) the size of the discs will be 60 cm in diameter.

There are two options for the sliding ridges, either they are placed on the top and bottom of the discs or other-wise they must be placed on the sides. The two principles can be seen in figure 74.

The idea of mounting the slider on the side edges of the discs is very interesting, but through an attempt to further discover the idea it is concluded that the discs will be too thick if there must be space for four sliders. There are too many challenges in developing this system, and both the mounting and the ridges will be more complex than if the sliders are placed on the surface of the discs.

The ridges for the sliders must run on the outer side of the spine to minimize the amount of space they take from the room and so the gates and cover does not slide into the compartment, where it might run into the cat. The gates and the cover does also need a certain amount of space, which is why the ridges are made 10 mm wide each, this size also makes them easier to clean. The spine, has due to the sliders, got a outer diameter on 50 cm, which leaves 5 cm for the sliders to run on together with space for mounting.

To make sure that the gates and cover slide stable in the ridges they must have a depth and maybe even a lock in place profile. Many profiles are suggested, like a t-profile which would hold the slider in place but also make it more challenging to remove not mentioning the production of the ridge. Therefore the decision is to make a plane ridge as shown on figure 75, this is easy to manufacture and can be made in any material. The ridge must have a depth of between 3-4mm to make sure that it can provide enough stability to the gates and sliders.

On the middle disc it is required to have ridges in the top and bottom which will require:

$$2 \times 4 + 1 = 9 \text{ mm of material}$$

This is the minimum thickness needed to make the ridges, but to make sure that the construction will not break, the material thickness should be a bigger standard, like 14 mm. This leaves some wriggle room for incorporating further functions in the slider ridge and it ensures a 6 mm thickness between the ridges which should be enough construction wise. The discs can be made of compact laminate because it has good strengths and advantages. Plastic and metal where also solutions, but plastic might not have the needed strength and would have a hard time handling the pressure, whereas metal tend to be cold and cats like to lay against warm surfaces.

### The advantages of compact laminate is:

- It has high strengths regarding the many layers of material that are combined into a sheet.
- The discs can be cut out of sheets and the ridges are easily drilled.
- It does not absorb liquid.
- The surface can come in any colors and with any structure that are wished.
- The surface has great friction regarding that the sliders should have a smooth movement.

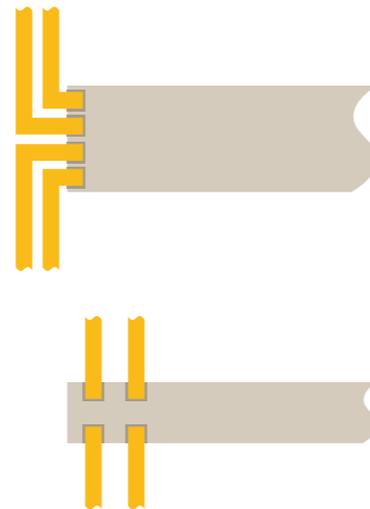


Fig. 74. Position of the slider ridges.



Fig. 75. The ridges position in relation to the back spine.

## 4.3 Gate construction

Because the gates should be the only elements that lock the compartment, it is investigated what needs to be done so that this can happen. If the gates are locked together in the front as the only place, they can slide together and open the compartment and this is not wished. Either the solution should be locked in the sides of the spine or the ridge should be divided in parts.

By closing the ridge in the front, the gates cannot be moved while they are locked together and this will be an optimal solution because it is more intuitive and easy to unlock/lock the gates at the same place you will interact with them when opening and closing the cages. See the ridges on fig 77. The ridge is also divided in the back to provide more control over the gates when they are unlocked.

An aspect which is wanted of the gates, is that they are easy to clean, this does also go for the ridges. A solution could be that the gates can easily be removed and replaced hereby the gates can be carefully cleaned each

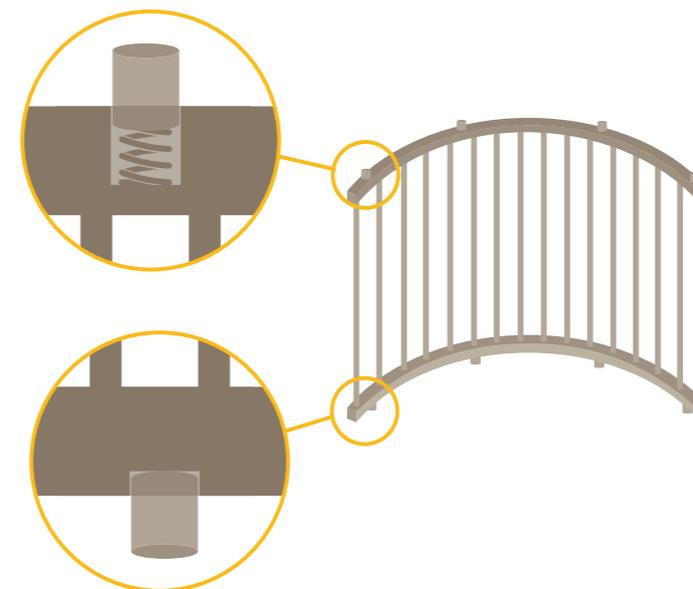


Fig. 76. Top yellow circle illustrates the spring which helps removing the gate from the compartment, by pushing the gate up.

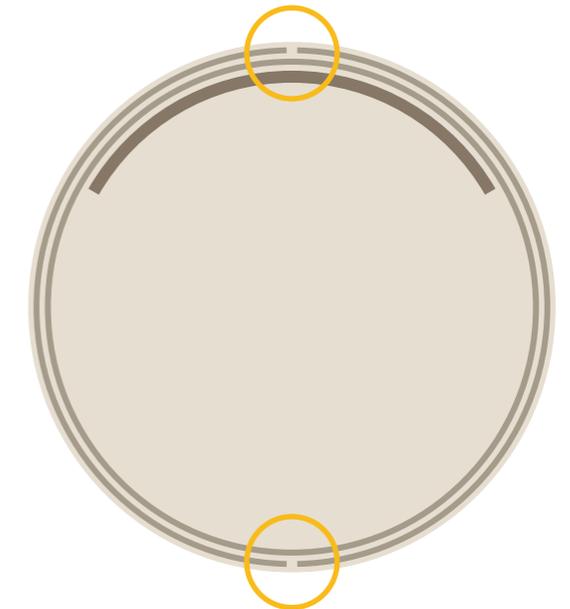
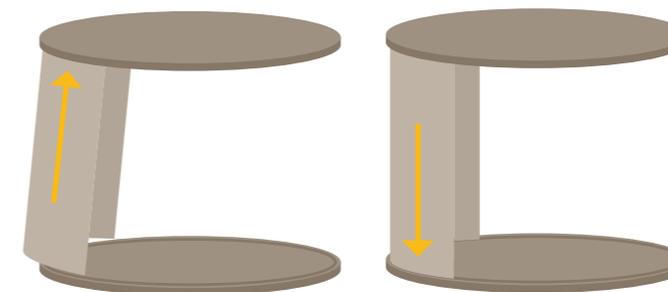


Fig. 77. The two yellow circles marks where the ridges are closed to help create an easier locking solution.

time a new cat has to move into the compartment.

Different ideas for solutions have been investigated, some where more complex than other, but a general wish is to make the solution as simple as possible. This is why the solution illustrated in figure 76 has been chosen.

The solution consist of a frame in the bottom and the top. On the bottom frame, nylon taps are mounted because they provide a good friction against most materials. The nylon taps are the parts which are sliding inside the ridges. The top frame does also have nylon taps, but these are smaller and mounted on a spring which are mounted in holes in the frame (fig. 76). The springs will push the taps in position when the gate is mounted in the ridges, and when it is wished to remove the gates, they are pushed up (which compresses the spring and makes the taps disappear into the frame) and the gate can be pulled out (see figure 78 for replacing the gates).

The ridges can easily be cleaned when the gates are out.

Fig. 78. Motion of replacing the gate. Push in into the top ridge, turn it into the compartment at the bottom and release the pressure.

## 4.4 Hole placement

Based on the slider study and the knowledge of how cats fold a placement of the holes can occur. A illustration of different possibilities has been made to show which positions a cat can have, to see how the space will be utilized (fig. 80). A general brainstorm on holes, forms and size have been made before this illustration, which is why the hole is round and has a hole size on 20 cm in diameter. This hole size has also been tested in real size to see if it is enough at a visit at Kattens Værn, showed that cat can get through small places, see the pictures.

Another factor which has been important, is that there are two levels with holes and that they have to be seperated from each other, at the same time as it provides space for the cat to jump up and down, with the possibility to land right. Studies shows, that there is no problem when the cat are going down, but there might be a problem when it is going up, because it is harder to see where it have to go and it has to turn the right way to avoid the gate (see figure 79). Therefore, the holes should be places so it provides the best opportunities for the cat to jump in more than one direction.

The placement on disc 3 has been chosen, because it provides opportunities for the cat at the same time as it does not absorb much living space for the cat. The illustration below shows how the cat can move between the levels, where disc 3 at figure 80 shows the different placement opportunities for the cat.

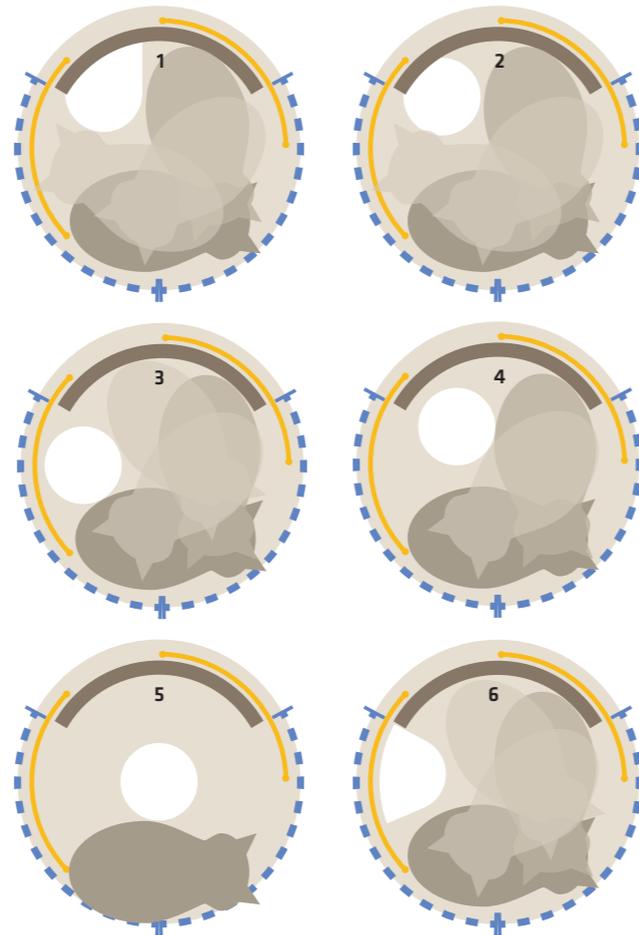


Fig. 80. Placement experiment of the holes. suggestions 3 has been chosen.

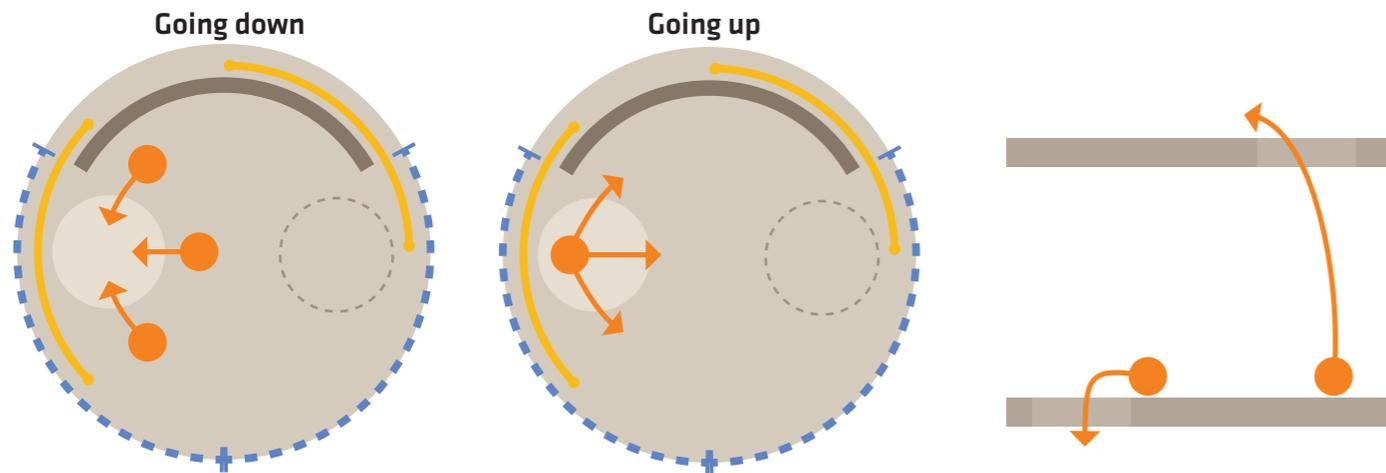


Fig. 79. Jumping scenarios, jumps between the levels.

## 4.5 Accessing the compartment

One of the key features to get right, to make sure that the customer gets the desired feeling when interacting with the compartments and cat, is the opening of the gates. There are two aspects to this experience, first the lock which binds the gates together and then the separation of the gates.

### The lock

When approaching the lock, there are certain aspects, which must be fulfilled, but the most important one are mentioned in the framing; the cage must invite for interaction with the cat. Other aspects are the security of the lock and the simplicity of the function.

The development are approach through a categorizing of Lock/binding mechanisms consisting of; lock, handle style and wrap style. At figure 81 you see the first category – the lock, which are based on the solutions they have at Kattens Værn, which also can be seen in the pictures. Figure 84 shows the category of the handle style, whereas figure 85 shows the soft and simple solutions.

The mechanisms that occur in the first category are the ones which are most commonly used at shelters, and these only fulfill one of the expectations for the lock which is that it locks.

In the second and third category there are two solutions of different character which might be interesting and suitable for the product. The first one is the twist handle in the second category, this is interesting because it is similar to the handles we often se on doors, and thereby we do not associate it with captivity. The second suitable solution is a ribbon tie which is very similar to something you might find on a present or a folder. But the final selection of the lock depends on the way the gates are opened, because the motion of the unlocking must refer to the opening motion of the gate.

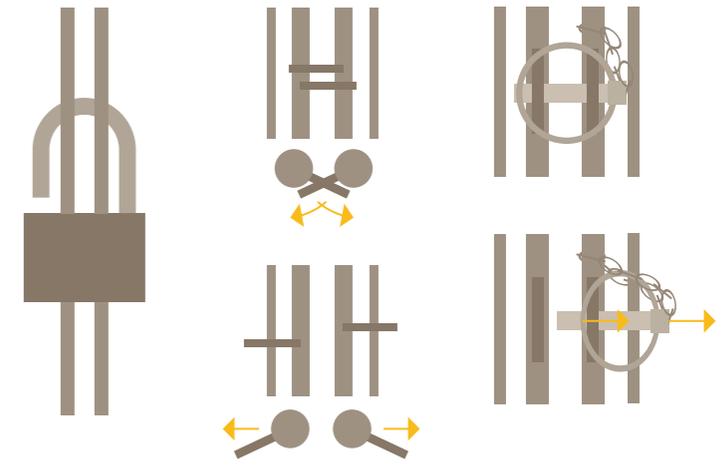


Fig. 81. Sterile and highly visible lock suggestions. First: Standard padlock. Second: Turning lock, that cant be opened unless it turns the right way. Third: strog spring lock.



Fig. 82 - 83. First picture: Turning lock system at the newer cages at Kattens Værn. Second picture: Spring lock system at the old cages at Kattens Værn.

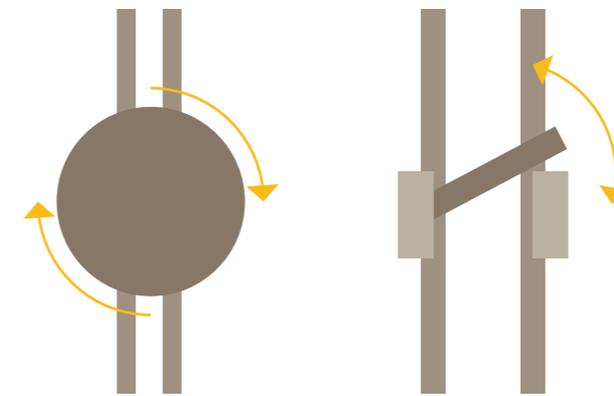


Fig. 84. Handle style locking suggestions. First: Turing handle with a simple door lock funktion. Second: A bar which has to be tilted.

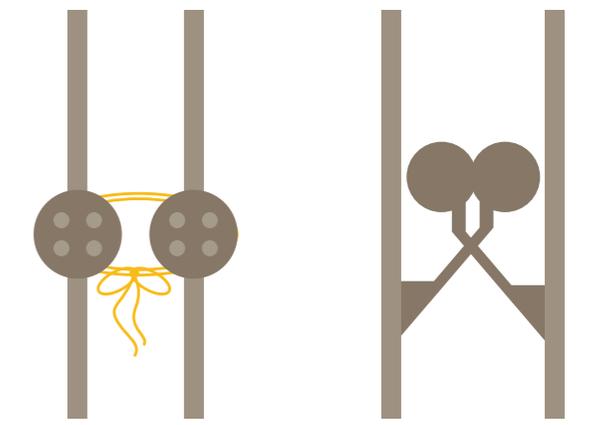


Fig. 85. Soft and calm locking suggestions. First: A string attached around two knobs. Second: Twisted wires with beads that locks into each other.

## The gate motion

It is a completing factor for the compartment system that the sliding gates function as an integrated part of the compartment. To ensure that these are in line with the overall feeling of the cage, different motions are studied, these can be found in appendix 14.

The different motions are valued from four defining factors, which are as follows:

- Control over the cat when interacting with the gates.
- Natural occurrence of movement.
- Interaction with the gates.
- Interaction with cat.

The initial idea with the gates was that the gates would split form the middle since that provides a high degree of control over the cat in the opening situation because the arms are used to encapsulate the cat and obstruct its getaway options. This solution is suggestion A in the appendix and it can also be seen in figure 86. In the appendix there is three additional suggestions.

The more interesting idea are suggestion D, which challenges the common way to open gates by utilizing a diagonal movement. This provides a perception of energy and dynamic in the product which is very much in line with the cat's nature. But to fully understand the impact of this suggestion and the others a experiment of the motion must be conducted. Here the motions occurring when opening the different solutions are analyzed as well as the cats options of leaving the cage without the customers desire, this is also shown in the appendix.

This investigation proves the solution D makes it hard to control the cat and that the motion is fairly unintuitive. B and C both create an uneven arm position which make it had to secure the cat from running off. The most intuitive solution is suggestion A since this idea manages to maintain a high level of control over the cat through the entire opening motion.

Of course, this has only been tested on paper and is not supported by a physical experiment - which would be optimal, but the facilities have not provided the opportunity.

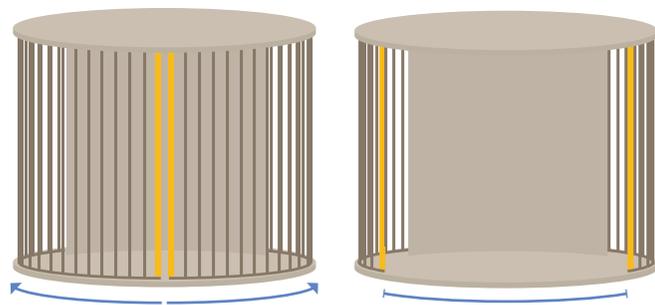


Fig. 86. Opening scenario A. 100 % control over the cat.

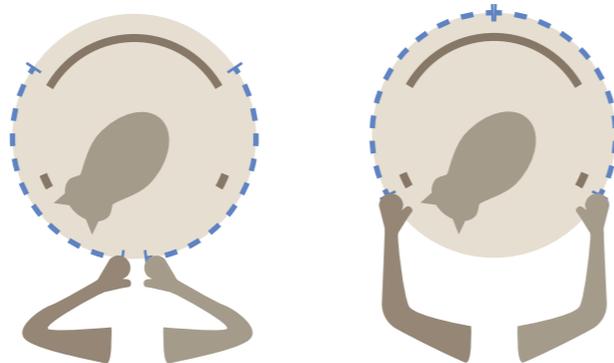
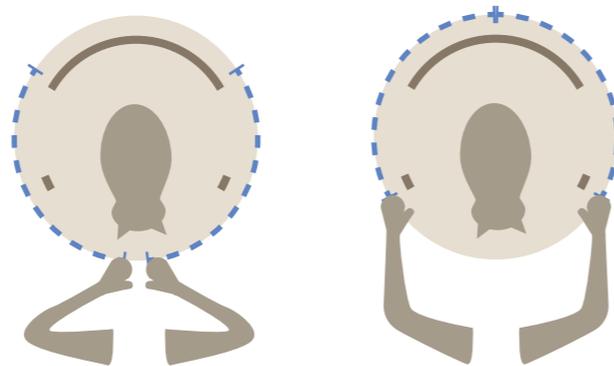
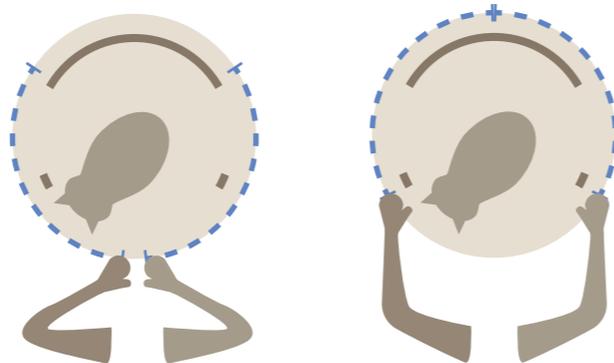


Fig. 87. Opening scenario D. Less control over the cat, with open areas.



## Magnet lock

With the selection of suggestion A it is ideal to incorporate a partial opening system, which ensures that the slider have three different position in which they click in place. These will be as follows: Closed, slit open (hand size entrance) and open (fig. 88). The reason for the middle stage which is just big enough for a hand is that this allows the customer to interact with the cat with full control of its position and it allows multiple customers to interact with multiple cats at the same time in the same room, something the shelter does not allow with their current solutions.

The lock will be a magnet, because it does not require any specific motion to lock and it provide the user wit feedback in form of resistance. The magnets must not have a hard attraction, because it has be intuitive for the customers to know that they can move the gates further without problems.

The magnet is also an advantage in connection to the open position, when a cat is let out of the compartment, making it harder for the cat to move around with the gates.

The magnets will be mounted in the slider ridge and on the ends of the gate as shown in figure 88. The development of the gates will be described later in the detailing.

Using magnets is a very low tech solution and the risk of them breaking is close to nonexistent. There is a wide range of magnets available on the market in different strengths, sizes and prices.

## The Gate composition

An important aspect in the development of a new compartments system is the appearance of the gates in connection to the impressions the customers get, which should not be the feeling that the cats are kept in captive. Conventional bars can give a feeling of imprisonment, which is why a brainstorm have been made on how the gates can be (first round can be found in appendix 15 and few of the ideas can be seen in fig. 89).

The brainstorm is partly based on an investigation of which gates are available on the market and to gather inspiration a search on different fences is done (see the pictures). This provides an idea of what is possible and how atypical compositions are assembled. The result of the brainstorm is divided into three different categories - conventional, atypical and glass.

The ideas where evaluated on following criteria, based on research and observations:

- The current cages has 25 - 35 mm space between the bars.
- In an interview with Pia Bisgaard, she aims that there should not be more than 50 mm space between bars, or other solutions.
- The gates should be open in a degree where air can pass in and out of the compartment without problems.
- It should be possible for the customers to touch the cat through the gates.

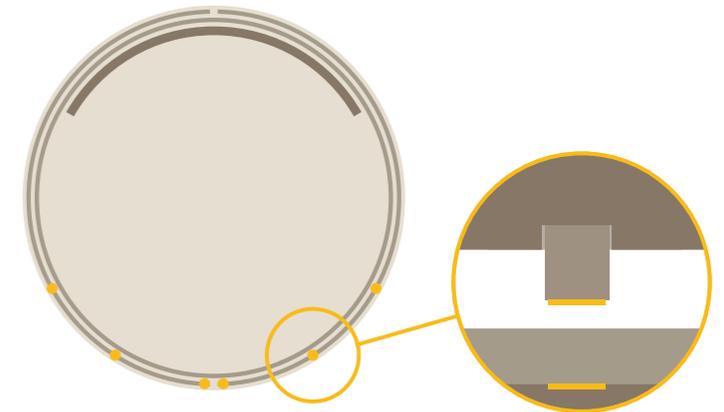


Fig. 88. Magnets to control the opening of the gates. Three positions - closed, half open and open.

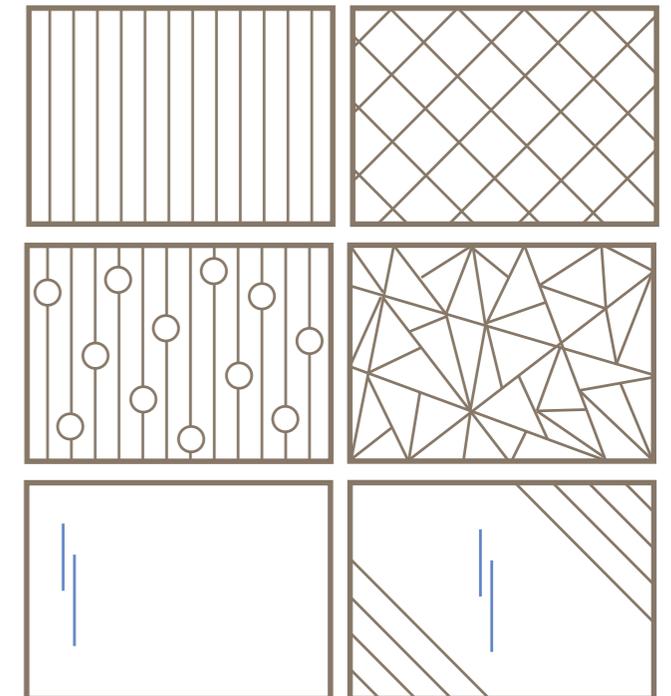


Fig. 89. Gate structure ideation.

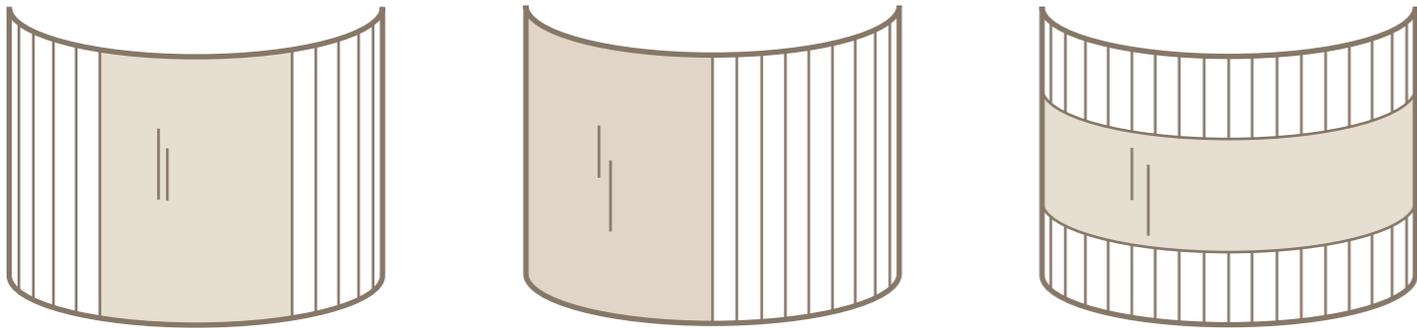


Fig. 90. Gate structure combinations of bars and Plexiglas.

In the framing, there is a requirement of minimizing the use or sectioning of bars and this combined with the knowledge of how space between the bars can affect the hygiene and overall look of the compartment, can create a good base for developing a solution in the atypical or glass section.

There is an overall problem with all of the suggestion from the atypical category due to all of the gatherings and angles. These are challenging to clean and a lot of residue tends to get stuck in these narrow places. Another issue is the higher production price which does not match the amount of value they create.

The third category is quite interesting because of the lightness and transparency of the material. Using Plexiglas to create a transparent surface is great in line with the panoramic shape of the frame and will provide the customer with an even better view of the cat. Though, if only Plexiglas is used, the customer won't have any way of interacting with the cat without opening the cage. Therefore it is ideal to combine the Plexiglas with the classic vertical bars.

Another issue with using a transparent material is the risk of smudging, grease stains and scratches, but due to this being a widely used solution in this business it is proved that Plexiglas and acrylic have great resistance for the wear of animals (app 16).

In figure 90, a new set of ideas are presented, where a combination of Plexiglas and bars are made. It is decided to work further with solution 3, where there will be three horizontal sections, consisting of bars and Plexiglas.

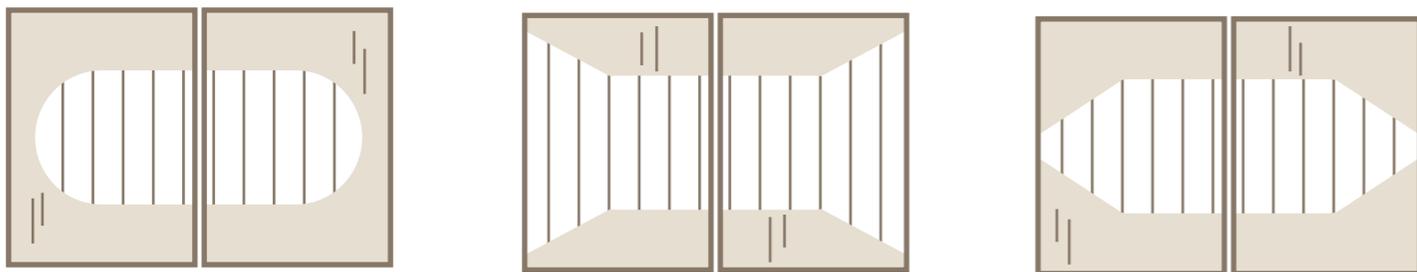


Fig. 91. Gate structure combinations of bars and Plexiglas, final ideation. Third solution will be used for the product.

The order in which the materials range is not without importance. The initial thought is to place the Plexiglas centered, to ensure that the cat is completely visible, and the bars closer to the edges. This is to provide the customer with an interaction point, but by reversing the order of the elements the interaction point will be in the cat's natural position and the vision of the cat will be clear when the cat is lying down (which it does most of the time). The visual view will furthermore be different from person to person depending on their height and the level focused upon.

Visually the system is highly static, which is in collidance with the cat nature, and in the ideation phase it is mentioned that a focus for the product is to make it dynamic and interesting. After implementing the selected solution in a solidworks model, it is discovered that the gates can contribute even further to the perception of the compartment system and therefore it is further refined. The wish to increase the dynamics of the column is conducted through an investigation on how utilizing different angular slopes can affect the look (see figure 91).

The selected solution is the third one. Here the bars fade out and leave a open space (Plexiglas), to completely erase the prison like feeling and to create some dynamic in the product.

## The lock part 2

To further bind together the entire look of the compartment system, the handle must be incorporated. Based on the previous studies of handles and the expectations set up for them, another set of expectations to the experience of opening the gates are conducted. Due to the selection of a mid-split gate set, the lock must consist of two elements with one mounted on each side, to ensure that the opener have an element to grip while sliding.

### Two different experiences are conducted:

**Automatic** – The gates are unlocked and automatically pop apart to ease the opening situation for the staff. Often staff only have one hand free to operate the gate and lock with and therefore it is an advantage if the gates pop up slightly, just enough for them to separate the gate with a few fingers.

**Manual** – the gates are locked in a specific position or within each other. This is an advantage because it can be solved with very simple mechanical principles and this sort of solutions often doesn't need much maintenance.

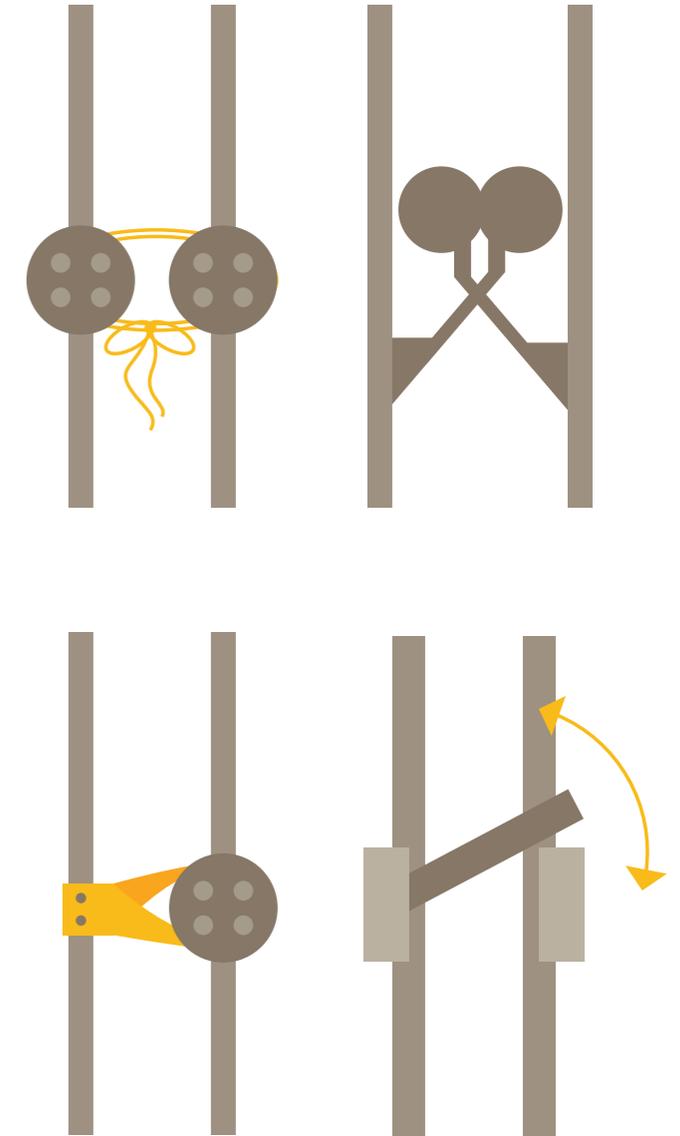


Fig. 92. Ideation of different ways to lock the gate.

Even though it would be a nice sensation to have the automatically pop out lock it compromises the level of control over the cat and the opening of the compartment, plus the factor that it is a more complex system, containing smaller parts and springs that might break or be affected by the harsh environment, leads to dismissing this concept.

The illustrations in figure 92 show a range of different ways to lock the compartment with simple principles.

One of the pressing issues concerning some of the suggestions is the cat's ability to wreck some of the elements of the lock including string, elastics and leather as well as the risk that the cat by accident might deactivate the lock if it is a simple motion that is required to do so.

Therefore, a study of force and motions a cat can deliver are conducted together with a position investigation, based on the chosen gate structure. This is based on experiences from the visited shelters and the anatomic research (fig. 93-94).



Fig. 93. Position investigation of which place a cat can reach.

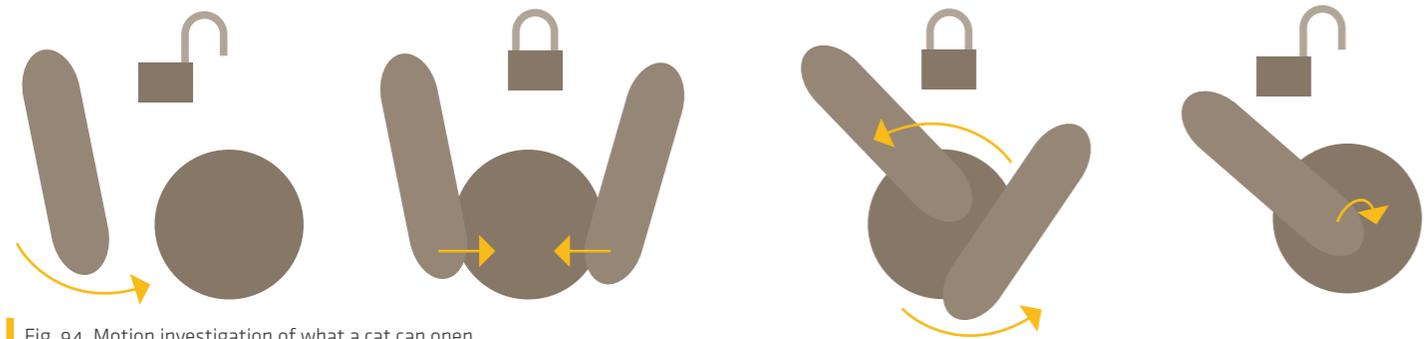


Fig. 94. Motion investigation of what a cat can open.

The cases above illustrate how cats are capable of opening a lot of different locks, by the movement of pushing and pressing, but they cannot open elements that combine two point pressure and a twisting motion. This initiates a deeper exploration of the suggestions which possess this principle.

A good solution is to utilize the principle used in women's purses as a lock. This principle consists of two balls that are mounted on twisted rods welded at the edge of the purse. When the two are pushed together they automatically twist together and lock in place, to open they must be pressed with an uneven force to unlock (see figure 95).

This principle is a new way to look at locks at shelters, and it is not the safest choice, but it works perfectly with the look and the function of the compartment system. The principle will be further tested while a prototype of the product is made.

There are different available positions to place the lock in, but due to the expected level of force the rods will be suppressed to, only one of the available suggestions is realistic to use, therefore the lock will be placed in the center of the gates, on the two closing rods. This will not be a problem regarding the cat, because it is not able to unlock the lock.



Fig. 95. Purse lock.

## User scenario

Below you see two user scenarios which illustrate the intuitive interaction with the compartment, and the control of the cat while opening the gates. The first scenario shows the interaction between shelter employee

and compartment and the second illustrates how a customer experiences the cage.



1) The shelter employee is in the process of cleaning the room need to clean the individual cage she must bring a stools bucket and a fresh water bowl.

2) She hangs the bucket over the wrist to twist open the lock.

3) She slides a hand in-between the two gates and turn it to separate the gates further, until they are far enough apart to place the bowl.

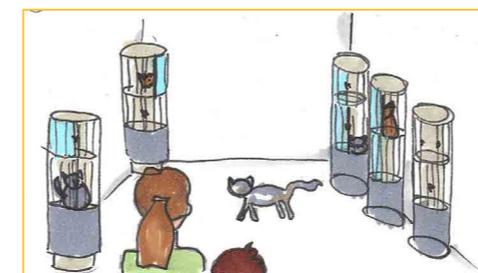


4) She places the new bowl



5) She pulls together the gates in two motions and slightly presses them to activate the lock.

Fig. 96. Scenario. Daily interaction.



1) The visitors enter the shelter room to have a look at the cats.



2) The kid immediately falls in love with one of the cats and they decide to take a look at that cat.



3) First they interact a bit with the cat through the bars, just to get to know it.



4) Then the mother slightly opens the cage still maintaining the cat inside of the cage.



5) She uses both arms to slide the gates back, and thereby creates a perfect encasement of the cat.



6) The kid climbs under her arms and can now talk to the cat which the mother ensures that it does not run off.

Fig. 97. Scenario. User interaction.

## 4.6 Cover

Another vital part of the interaction and concept of the product is the cover that is meant to provide privacy for the cats.

To develop this part a list of desired properties are developed, mainly to select a material and an overall function.

- Must visually shield the cat
- Must be removable
- Must not require much maintenance
- Easy to mount and remove
- It is a wish to have further functions incorporated like;
  - » Scratching
  - » Take home elements
  - » Playing/stimulating
  - » Exchangeable/eco friendly

It is an obvious step to utilize this removable element as a safety zone element for the shelter cat, to make it a bring-home solution. This has been a priority on more occasions during the ideation, but has never been compatible with the overall concept, but now it is.

Due to the curved surface of the cover (see illustration 72 for size) it can be used as a multifunctional toy for the cats. This idea was developed early in the ideation phase, but quickly dismissed because it was not compatible with the further work. Now it is brought back. Below you see an illustration of the different positions it can be placed in.

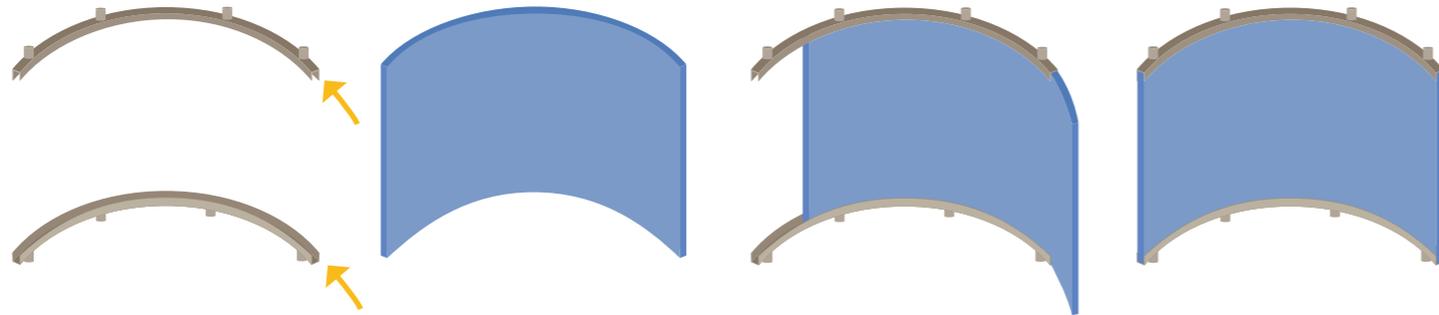


Fig. 98. Cover functions and construction.

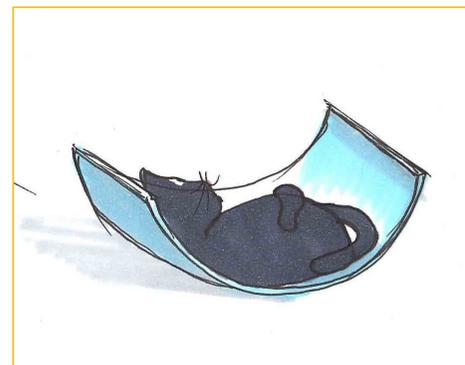


Fig. 99. Bed/playing function. The cat can lie in the cover or use the motion for playing.

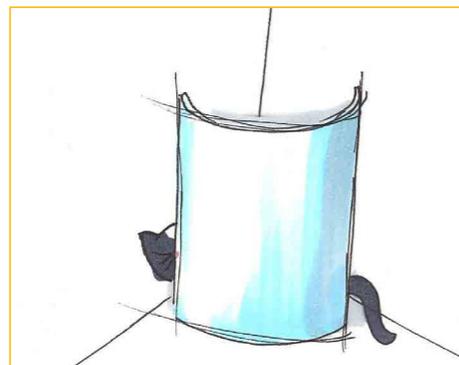


Fig. 100. Shield function. When placed in a corner or just against a wall, it can be used as a safe space.



Fig. 101. Stimulation/shield function. The cat can hide under the cover or play on it and be stimulated by scratching it.

There are two aspects to consider to ensure that the cover can be realized, and can be given the desired function - mounting and material.

**Mounting** – The cover will slide in the same kind of ridges as the gates, which are placed on the inner side of the gates. Therefore the sliding element of the cover must be equipped with the same kind of nylon taps. These are mounted on a frame in which the cover element can be slit into. The frame consists of a top and a bottom element as shown on figure 98. The cover is a supporting element of the overall construction and is by this what keeps the frames apart.

**Material** – The only requirement the construction sets for the material is that it is completely self supportive and there are many different materials to pick from. By utilizing recycled polymer felt, two of the wishes form above can be incorporated in the solution through the material. First of all, polymer felt can be used as a scratcher due to its rough surface, it is made from recycled plastic bottles, so it is eco friendly and therefore the elements can just be replaced with a clean conscious. Other great features are its stiffness, easy manufacture and cheap price. To see all materials considered, see appendix 17.

The idea is that a new cover is installed when a cat arrives at the shelter, and this cover will follow the cat through its entire stay so that it can leave its scent marks on the cover. When it is purchased the new owner pays a small amount for the cover to take it home to ease the transition from shelter to home for the cat. This ensures a flow in the shelters material and minimizing the risk of elements looking used and damaged.

## 4.7 Cat tray

The objective of this project is to create a compartments system with all a cat needs integrated in one solutions, which is why the cat tray also requires some attention. As the cages currently are, the tray is one of the biggest issues because it is not incorporated, it takes up space that the cat could use, it is highly visible, the litter spreads all over the living space and it smells.

All of these issues can be solved by taking a few initiatives. First, the tray is moved to the bottom floor of the compartment system and is kept in a closed off level to avoid that the customers pay it too much attention. By keeping it in a closed space, the smell and residue from the tray is also easier to control. The smell can be controlled by installing carbon filters with a simple venting system.

Because of the shape of the compartment and the spine, it is evident to create a solution that turns inside the level, to open and expose the tray. The way the cat tray slides in this solution is through a revolving cover which leaves the tray open. The idea of this solution is that the sliding wall and the tray, is sliding together as seen on fig 102. After opening the tray, the employee can pull out the part of the tray with litter in it.

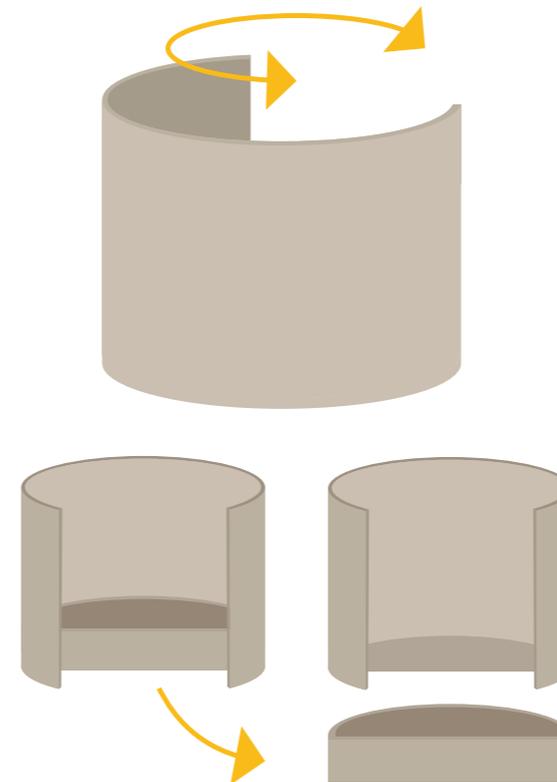


Fig. 102. First suggestion of how the cat tray should be constructed.

After the development of the gates and the covers, it is evident to reconsider the cat tray solution, and try to use the same kind of frames for the shielding wall as in the gates. This way it can easily be removed from the compartment for cleaning.

The shielding wall will cover 2/3 of the compartment, and will therefore have an opening on 1/3. The wall is independent form the tray and will hold the carbon filter in the side. An illustration of the wall can be seen in figure 103. The carbon filter are slit in from the side and the space for it will be made in standard measures to ensure that the shelter can acquire filters cheap and easily. A set of three filters have the price point of 30 DKK in retail stores and the filters must be changed every 3-6 months. [web8]

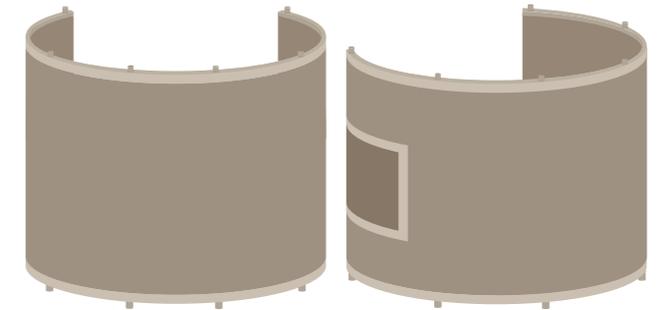


Fig. 103. Construction of the final wall solution.

To ensure that the wall is easy to interact with and that it can be locked in place, an ideation of different ways to open it is made. The different ideas can be seen in the sketches in appendix 18.

A simple locking method has been chosen, because it has to be easy and intuitive for the employee to unlock the wall, which are done through a hook system in each side of the wall (fig. 104). The opening of the wall consist of a rim handle in the right side, which the employees can pull to move the wall along the sliding direction.

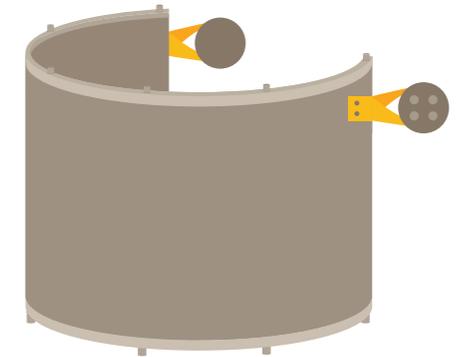


Fig. 104. Lock of the tray wall.

The next step is to develop a tray, which is why a size study has been made (app 19). A cat tray should be 1.5 times the size of a cat to have the optimal size, this is if it is a closed cat tray as wanted in the compartment. [web9] As investigated in the research (page 13) there are different sizes on cats, but an average has a body length of 46 cm and a height of 25 cm. This is the sizes, which are held against the size of the tray room. The room is 50 cm high and around 50 cm in diameter which shows that the room is not quite the optimal size, but smaller will do.

The tray is placed in the room according to the holes, to ensure that the cat can jump down on the disc and not right into the litter (fig. 105). Furthermore, it is placed and shaped so it will be easy for the employee to remove it for cleaning. The tray is placed into a hole in the bottom disc with the sides of the tray hang on the disc to create a plane with the rest of the disc. Two handles are formed in the tray to make it easy to remove. See the tray in figure 107.

The tray must be made from plastic to ensure that the hygiene is kept at the desired level, and the chosen of material will be described in the manufacturing phase.

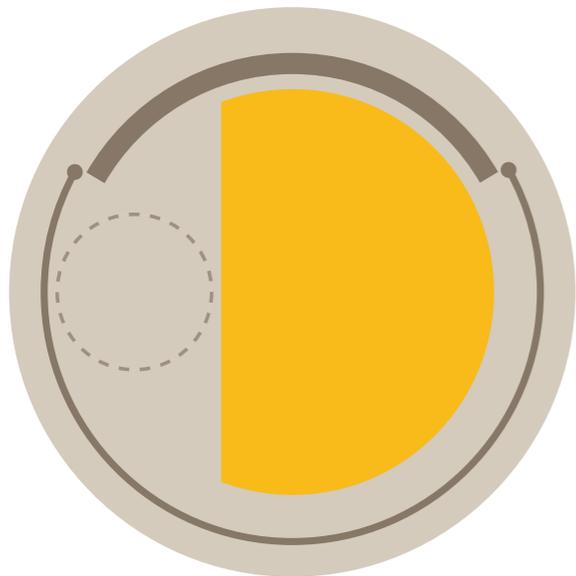


Fig. 105. Placement of the cat tray, in connection to the level holes.

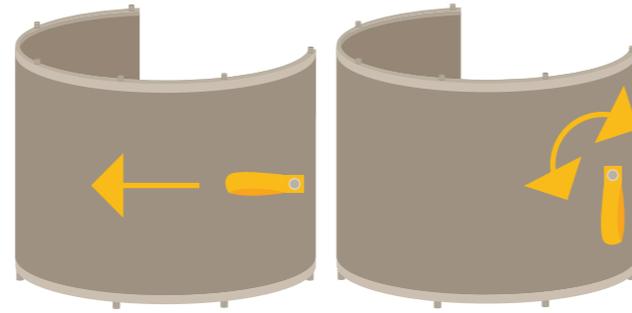


Fig. 106. Handle to interact with to open the tray wall.

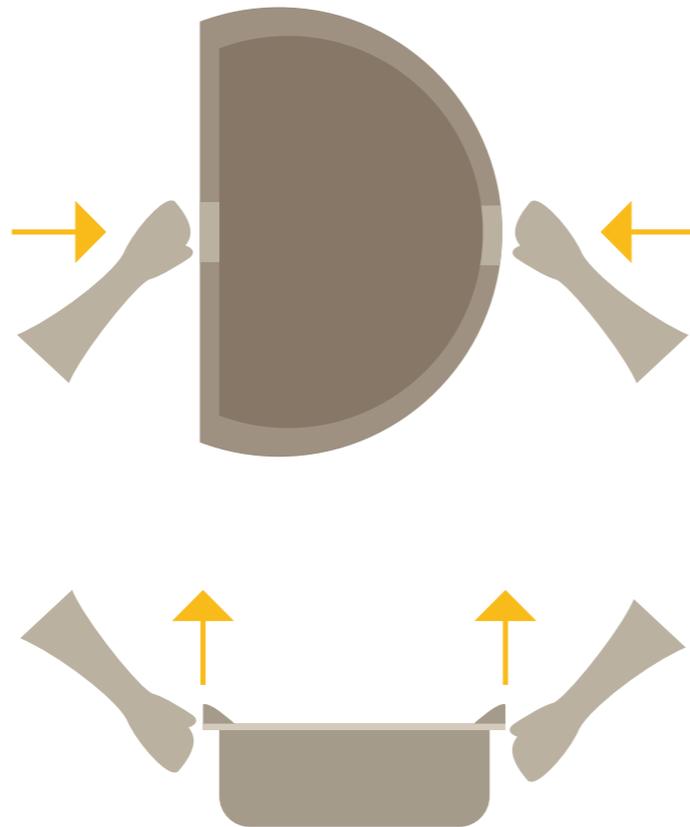


Fig. 107. How to interact with the cat tray, to get it out of the disc and foundation.

## 4.8 Assembly

A big consideration through the detailing of the components has been to keep in mind the assembly of the system. It must be easy to mount and the shelter must still have the option of moving it around and even taking it apart if a component breaks or need thorough cleaning. Below an instruction to how the system is assembled.

**Assembly instruction**

# 5.0 manufacturing

## 5.1 List of components

To initiate the manufacturing phase a gathering of information is done. Below is a list of the main components, describing their features. This is an overall view of what will be presented in the following section. All of the prices gathered are based on a production number of 2000 units and further elaboration of this will follow in the business phase.

In the following phase, the previous decisions regarding materials will be further specified as well as the method selected to handle the materials. Some of the production methods will be presented in depth in this section. All of the manufacturing data from the components will be combined to present a full list of components and a price point for the system.

Component name	Materials	Production method	Number of units	Size	Weight	Price pr. unit
<b>Spine</b>	Glass fiber composite	Pultrusion	1	0.0057 m <sup>3</sup>	10.4 kg	880 DKK
<b>Foundation</b>	Steel (sheet)	Bending & welding	1	1.07 m <sup>2</sup>	~15 kg	220 DKK
<b>Disc</b>	Compact Laminate	Sheet work	4	0.039 m <sup>3</sup>	3.7 kg	274 DKK
<b>Cover</b>	Polymer felt	Vacuum shaping	2	0.83 m <sup>2</sup>	0.4 kg	15 DKK
<b>Gate</b>	Steel & Plexiglas	Welding, bending & sheetwork	2 sets	-	-	140 DKK
<b>Frame for sliders</b>	Steel & nylon	Sheet bending	2 sets	-	0.45 kg	145 DKK
<b>Handles</b>	Steel	Standard component	4	-	0.15 kg	23 DKK
<b>Tray wall</b>	PET	Bending	1	-	-	-
<b>Tray</b>	PET	Vacuum moulding	1	-	-	127 DKK
<b>Total:</b>					~42 kg	<b>2.838 DKK</b>

Fig. 108. List of components.

## 5.2 Spine

Based on the decisions made in previous phase, the spine has to be manufactured in a low density but high strength material, which is selected to be fiber glass composite.

### Composites

Composite materials have, in the last years, become more popular in almost any field of production because of its great abilities to adjust to the expected circumstances. Composites always consist of two materials, which in themselves are not necessary great for construction, but by combining them, they work together and acquire new strengths. The two materials are often presented as a fiber material (glass, carbon, wood) and a plastic material used as the binder. The fibers can come in different length depending on the desired function. The fibers in the material are used to withstand pulling or compressing forces where the plastic transfer the shear stress to avoid breakage. One of the biggest advantages with using composites is the option of controlling the weight by selection light density compositions. For example composite can offer up to 80% weight reduction in common to steel and even 30% to aluminum (making it p. 101)

In the text above it is described what a composite is and what its properties can be but to get a composite that is adjusted to the specific properties needed in a shelter environments a deeper look at the materials must be taken.

The fibers: there are many different fibers to choose from, all with different properties, costs and strengths. By using wood fibers, which are

short fibers, that material does not obtain an extreme level of stiffness but instead it maintains some degree of flexibility. Wood fibers are fairly heavy in relation to other fibers, and therefore the composite containing wood fibers would have a higher density than for example glass fiber. Glass fiber is the obvious choice. Because of the high level of stiffness it can contribute with in a composite, with its long fiber though it is not especially flexible, and might crack; therefore it is crucial that the right polymer to support the glass fiber is selected.

The polymer: Polymers are most often used as binders in composites, but it can also represent the fibers. In this case it will function as the binder. To explore which polymer is best for the environment, the specifics for the conditions must be defined.

- Surface: Risk of slightly acidic liquids and fats  
Scratching  
Grease
- Core: Point force implication  
Constant torque (low force)

The first polymer that pops to mind is ABS (acrylonitrile butadiene styrene) because of its high surface resistance and its incredible material strength [Lefteri 2, 2013]. Another polymer that would be advantageous to use is PET (Polyethylene terephthalate). Which possesses many of the same properties as ABS, but is less scratch proof and have a slightly lower shock absorbent feature [Lefteri 2, 2013]. After contacting Fiberline Composites in Denmark, Middelfart, they suggest that the binder are made from polyester because it posses the needed features.

The composite will be a combination of polyester/PET and fiber glass, which will be pultruded [Lefteri, 2013, p. 99-101]. Pultrusion is a very similar process to extrusion but here the material is pulled through the mould, due to the use of fibers. If a composite, which always contain fibers, are extruded the fibers will not be stretched and they will lose their purpose [Lefteri, 2013, p. 99-101].

The process of making the profiles happens through multiple steps as the illustration below shows [Lefteri, 2013, p. 101]. First the fibers are organized and stretched to be combined with the binder before it is heated. This prepares the material to go through the die and get shaped, with the pull coming from the end of the die.

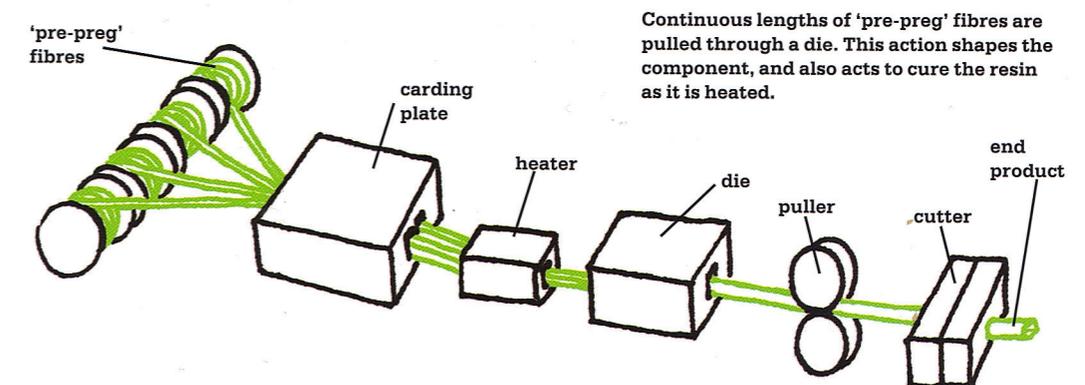


Fig. 109. The process of pultrusion.

Now the profile is created and just need to be cut in the right size. After the shaping there is often a bit of cleaning up of the profiles which is mostly done manually. Pultrusion is a fairly cheap way to mould materials, but since it still requires a mould there is a high startup cost and often manufactures will not set up a new line for less than 500 m profile [Lefteri, 2013, p. 100].

Here in Denmark there are a big manufacturer company called Fiberline Composites [web10] who can easily manufacture the profiles needed and at an affordable price.

To prepare the profile for moulding, it is suggested that some supportive cross sections are inserted, but after contacting Fiberline their engineers suggest that it is made as a solid component because the mould is cheaper to manufacture and due to the low production numbers, but due to the total weight of a solid element, the profile will be made as a shell.

It is expected that 2000 pieces have to be manufactures within the first three years (p. 69) so Fiberline suggests:

Mould cost: 500.000 (can withstand up to 50.000 m of pultrusion)

Price pr.m: 350 dkk/m when 5.000 m is pulled.

Total price pr. spine:  
 $500.000/2.000 = 250\text{dkk}$   
 $350*1.8\text{m} = 630\text{dkk}$   
Total 880 dkk

This estimation of price is based on the profile provided to Fiberline with the cross sections and after a calculation of the weight of the solid profile, which is on 23.74 kg (see calculations in appendix 20), it is decided to maintain a profile with cross sections, however with less sections. The new weight is approxametly 10 kg (see appendix 20), which is more optimal.

When the profiles are cut and finished off, the holes for the binding screws are drilled and the surface is powder coated to ensure a proper finish.

## 5.3 Foundation

The foundation, in which the spine is secured, has to be manufactured from a fairly heavy material to ensure stability and therefore steel is selected. The foundation will be produced from sheet material and have the profile that is in page 42.

This element can be produced by Danpres [web19], which is located slightly outside Aarhus and it is a very simple process consisting of bending and welding elements together.

It is selected that the foundation will be done in 2mm steel sheets, but it could probably be manufactured in a smaller thickness but due to the importance of the weight in the foundation a 2mm galvanizes steel sheet have the right weight properties measuring in the area of 15 kg pr m2 (app 20) [web20].

With a cost between \$/kg 0.6-0.8 [Lefteri, 2013, p. 200] the material cost is close to 75 DKK, but this is only for the raw material which still needs to be made into sheets and turned into the foundation. With the low level of manual work required by this element it is suggested that it could be manufactured for minimum 3 times the material cost, which leaves the component at 220 DKK.

It was also considered to manufacture the foundation form Polysan which is a composite that has the same properties of concrete. After calculations on the weight properties it is realized that the material is not heavy enough and would not provide enough stability to the construction. Polysan can still be used, but it will need a heavy counterweight to be moulded into it, to stabilize the product.

## 5.4 Discs

The discs are to be manufactured from compact laminate because of its great stiffness and its abilities in withstanding moisture and chemicals.

### Compact laminate

Compact laminate, as all other laminates consist of a core and a top layer. The top layer can have whatever look is desired since it almost always consist of a metal or plastic layer that is glued on top of the core. The different core materials are what set laminates apart since conventional laminates usually consist of a finer or MDF core. Compact laminate is composed from layers and layers of thin paper, which is glued together under pressure, and therefore it has a very high strength [http://www.riisfort.dk/produkter/laminat].

The manufacturing of the discs are ultra simple since they are just cut out from the laminate sheets, the edges are rounded and the slider ridges are milled.

To ensure that the nylon taps mounted on the gates, cover and cat tray wall slide as desired, a sheet containing an aluminum sheet is selected. This has no effect on either price or weight it only provides further strength and a smoother movement because of the metal vs. plastic constellation.

To explore the price level for these elements a Danish manufacturer called Dansk Dekor Laminat [web12] is contacted and they have given a price suggestion.

Using a 14 mm white core, white surface with aluminum lining, cutouts and mills: 274 DKK per unit when the production number is 8000 discs. Each disc have to be manufactured different, because of the ridges, the holes, the cat tray, and this can give a variation in the estimated price.

## 5.5 Cover

Since the cover is “disposable” it is a wish to manufacture it in the eco friendly polymer felt which is made from recycled plastic bottles that are spun into fibers and then needled together to form a thick felt.

The thick felt is brought to the factory that will shape it. First they heat the felt to just below its melting point and then place it in a vacuum mould to shape it while it cools. Excess material is cut away with a high pressure waterline. The manufacture method is fairly simple but no company in Denmark does this method, therefore the component must be produced in Sweden.

The Swedish company has not been able to provide a price suggestion for the covers and therefore this is still uncertain.

The price of 1 m2 of the polymer felt range from \$0.1-0.9 [web11] and for each cover 0.83 m2 are needed. This means:

$0.9*6.5*0.83=4.8 \sim 5 \text{ DKK}$

The m2 price depends on the thickness of the felt and the size of the fibers, in this case the felt must be 8mm thick to support itself, and it is wished to have a more course structure than the one that is well known from HAYs Nobody chair. The reason for this desire is the purpose of scratching and scent marking.

This is the material cost which is the cheapest part of this product. In the further production a mould to vacuum form the cover must be manufactured, and even though the complexity is not high, the price might still be. It is expected and needed that the overall manufacturing price of the product does not exceed 15 DKK to ensure that the markup factor and the sales price does not obstruct the shelter customers form purchasing the element.

The cover have to be slit in-between two metal sliders which are manufactured from sheet steel with a thickness of 1mm. This is an element that Danpres could easily supply.

# 5.6 Gates

The gates are developed to ensure the simplest manufacturing possible by only consisting of few parts; bars, Plexiglas, metal frame, nylon taps and handle.

Dansk Dekor Laminat has suggested that they also manufacture the gates because they work in other materials than laminate and thereby also have the option of delivering this part.

**Acrylic**

Acrylic is a very popular material often used to replace glass because of its excellent clarity, low density (in common to glass) and ABS like properties. It easily withstands high force impact and has a hard to scratch surface, which makes it a good solution to use near animals with claws [KILDE]. Below are some examples of how it is used in animal context.

The manufacturing is simple with the main component being the bend acrylic sheets with a thickness of 6mm. To bend the acrylic sheet vacuum moulding is to prefer, due to its cheap start cost. When the sheets are bent and cut, holes for the bars will be drilled and the bars will be glued into those. The metal slider frame is glued onto the top and bottom.

Dansk Dekor Laminat has given an offer that is on 140 DKK for a set of gates.

The handles are a standard component that can be purchased from Chinese suppliers, ready to be weld onto the two closing bars [web13].



Fig. 110. Plexiglass exhibition cages.



Fig. 111. Plexiglass gate in cat condo.

# 5.7 Tray and tray wall

It is ideal to manufacture the tray from a chemical resistant plastic which is fairly cheap and can be combined with some of the production types which are not as heavy in start costs. A good suggestion is to manufacture it in PET which is a thermoplastics with a high durability and stability as well as being chemical resistant, which is of high priority in this specific area.

Since there is a slight focus that some of the elements are manufactured in eco friendly materials, it is in line with that to select that the PET must be recycled PET which. To avoid the milky color it is re-dyed. The cover is made from a bent sheet with cutouts for filters which then are mounted in two metal bars. The actual tray is also made from recycled PET sheets

and is vacuum moulded. Here in Denmark there are multiple suppliers for this kind of elements, and Dan Hill Plast A/S [web14] have the capacity to supply these elements, unfortunately, they have not been able to provide a cost therefore an estimation is made.

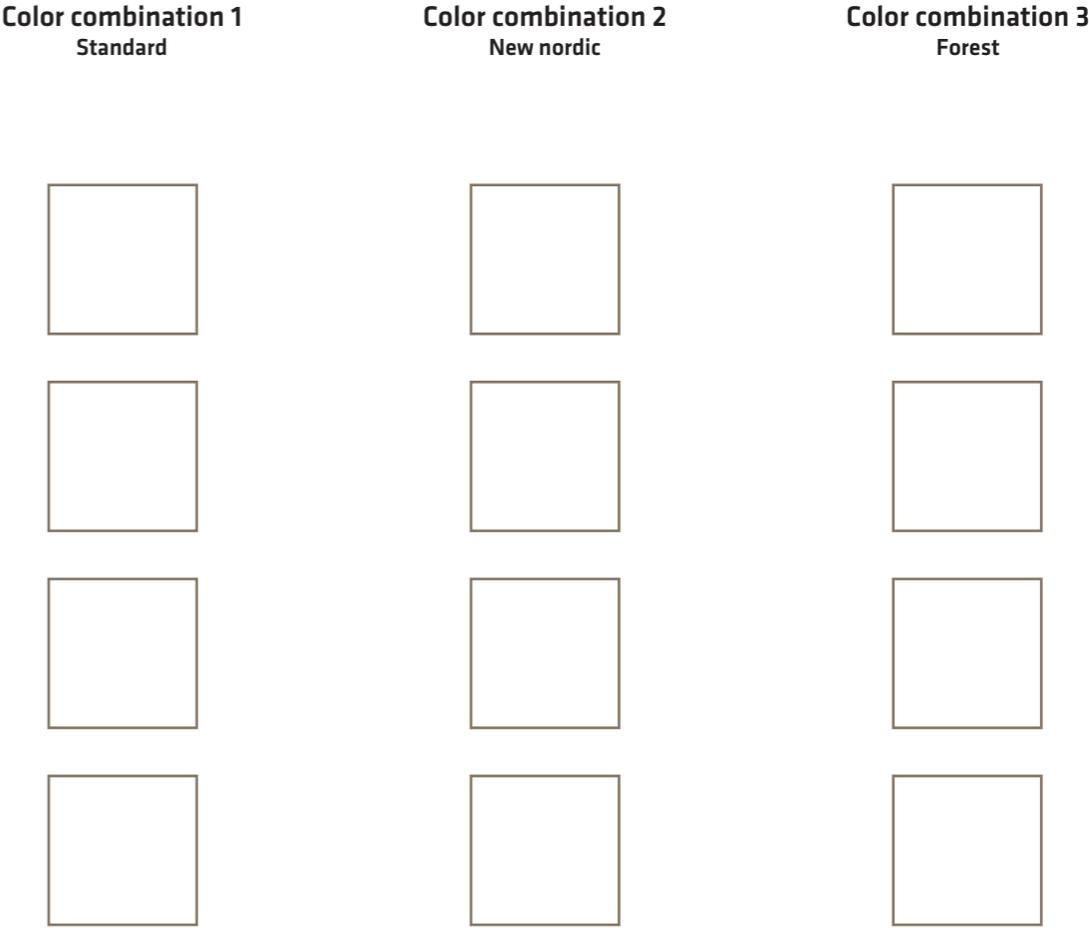
3 mm PET sheet (120\*150 cm) are priced at 26 DKK [web15] a sheet and one is enough to manufacture one set. The labor and mould costs are estimated to reach 150.000 DKK. This plus a double in the material cost (due to shipping, storage, handling, etc.) leaves the total cost at 127 DKK for both parts.

# 5.8 Colors

One of the deciding factors in selecting materials and production methods is the level of customization the element allowed. By utilizing plastics and powder coating, all ranges of color can be chosen for each element, and the laminate even allows for surface structures like wood.

The suggestion is that the compartments, if the purchaser does not desire to change anything, it is delivered in grey tones (color combination 1). To ensure that the combination of colors look premeditated it is advised that the spine and the discs are kept in separate colors, because the two different surface structures and two different manufactures can contribute to small indifferences in the color.

If it is wanted, the purchaser can get the compartment in other color combinations. Below you see a suggestion for the basic combination and two other suggestions to a luxury and an energetic combination. The customization of the product is a part of the business strategy, which will be further described in phase 6.0.



# 5.9 BOM

A bill of materials is collected to illustrate how many items a complete system consists of. To find exploded views of the cover, gates and tray, see appendix 22.

Number:	Part name:	No. of units:	Material:
1	Spine	1	Fiberglas composite
2	Top disc	1	Compact laminate
3	Middle disc 1	1	Compact laminate
4	Middle disc 2	1	Compact laminate
5	Botton disc	1	Compact laminate
6	Foundation	1	Steel
7	Rubber band	1	Scilicone
8	Tray	1	PET
9	Brackets	6	Standard component
10	Screws	36	Standard component
11	Bolts	36	Standard component
12	Plexiglas	8	Plexiglas
13	Bars	4	Steel
14	Bar frame bottom	4	Steel
15	Bar frame top	4	Steel
16	Nylon taps bottom	18	Nylon
17	Nylon taps with magnet	4	Nylon + metal
18	Nylon taps top	22	Nylon
19	Springs	30	Steel
20	Nylon taps bottom 2	8	Nylon
21	Nylon taps top 2	8	Nylon
22	Lock	4	Steel
23	Cover	2	Polymer felt
24	Cover frame bottom	2	Steel
25	Cover frame top	2	Steel
26	Tray cover	1	PET
27	Filter frame	1	Steel
28	Filter	1	Carbon filter
29	Tray frame bottom	1	Steel
30	Tray frame top	1	Steel

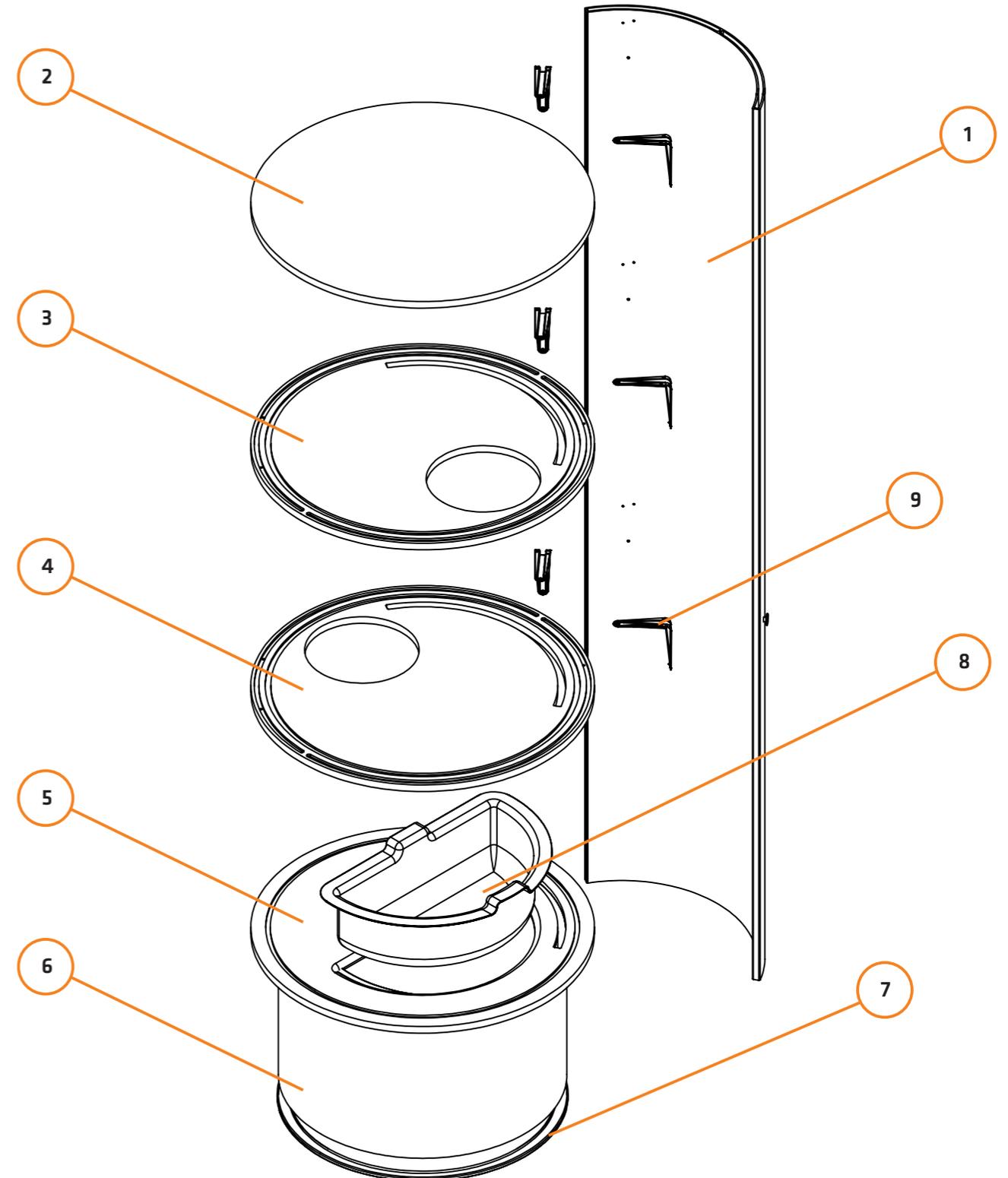


Fig. 112. Exploded view.

## 6.1 Ketty system

In the initial research, a competitor analysis is conducted and it left some open areas presenting some strong opportunities for developing a product that sets itself apart from others. To investigate if Ketty actually does fill these areas, an S.W.O.T analysis of the product is done (fig 114).

The S.W.O.T analysis is combined with the spiderweb analysis based on the caging types in the research. By inserting Ketty, it shows that Ketty is strong in the fields where the competitors fail.

To get a better understanding of what the Ketty System actually offers its buyers, a gathering of all its value propositions are made below:

- Provides a healthy residence for the cats as well as giving them a space where they can feel safe and secure.
- Allows the shelter to tailor the perfect solution for them both interior and look wise as well as ensuring that the shelter never must repurchase a compartment when a part breaks.
- Eases the daily routines regarding cleaning by having a closed of tray that minimizes the spread of litter and no corners in which dirt gathers.
- Allows the customers to enter the room and instantly form an impression of the cats.
- Makes it easier for the customer to have control over the cat when interacting with it.

To realize this project a liable business plan is required, consisting of a product analysis to understand what sets apart this product from its competitors, which core values it possesses and most important of all, how many that can be sold. In this section, such analysis will be conducted and used to develop a three and ten year plan, including investment, revenue, development and expansion.

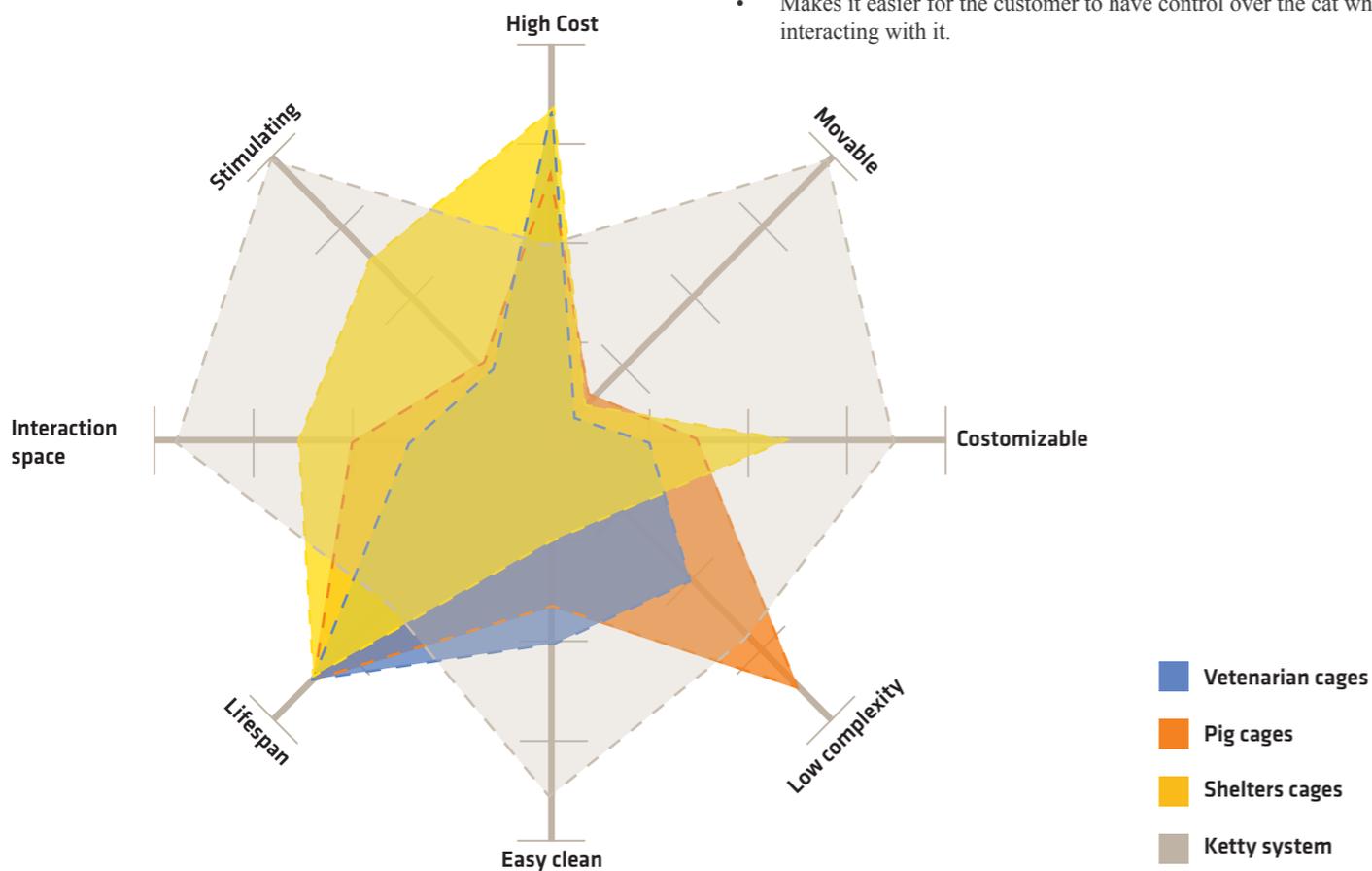


Fig. 113. Spiderweb analysis of current market and Ketty system.

### Strengths

The flexibility, freedom to place and move ketty as pleased. Customization, Ketty can be customized to fit any concept or world region aesthetically. Lower cost than competitors. Can be disassembled to do a thorough clean if needed. Cheap to renew vulnerable element. Broken elements can be easily exchanged. Changing the perception of shelters. New way to keep cats in captivity.

### Weaknesses

Expensive to do a complete new installation. Not suited for isolation of sick animals. Does not integrate perfectly with other systems.

### Opportunities

Expansion for other pets. Tool to help weak cats or kittens climb the other floors. Further elements for customers to bring home. Food bowls which integrates in the system. Integrated carrier tool.

### Threats

Unwillingness from shelter employees to try new solutions. Might feel a need to acquire a complete system at once.

Fig. 114. S.W.A.T analysis of Ketty system.

These values are used as sales arguments to ensure that the purchaser understands exactly why Ketty is better.

Throughout the process of developing the Ketty system multiple ways of approaching the distribution and continuing the revenue have been discovered. There are two main tracks; customization and add-ons or providing a service. Since Ketty is a highly customizable, it is an ideal service to provide the buyers with and by creating different additional products an even higher level of tailoring can be reached. The question here is if these products are enough to keep a continuous revenue stream going and if it can create a strong enough flow. The second option is providing a complete shelters service. This would include interior organizing, staff education, website set up and certifying to ensure that customers can trust the shelters quality. Here the question is the same as solution one, but another aspect to take in consideration here is also the level of credibility a brand need to set up a certificate.

The initial approach is to get the Ketty system on the market to build some credibility surrounding the brand and product and after that a line of add-ons can be launched. When Ketty is a known brand in the industry the second option, the service, can be introduced and thereby the total amount of customization and service should provide a large enough business to keep the cooperation going.

# 6.2 3 year plan

Based on the previous analyzes a suggestion to a business focus for a three-year plan - based on Ketty as a startup company - is developed. The reason for approaching the market as a new company is that Ketty takes the shelter cages to new areas and that it is a solution which does not perfectly fit the already existing companies.

This is the first suggesting to how Ketty system can be introduced to the market. Below are a timeline and a description of what is needed to accomplish this plan.

The first step of the process is to gather some investors, because the project will need a start capital of 7 mio. for 2000 cages, which should cover the expected sales of the first three years.

While gathering the start capital it is of highest priority to reach out to different shelters to create some interest for Ketty systems to ensure that there are actual buyers for the product. This will be done through consultant visits presenting the prototype of the Ketty compartment system. Meanwhile a cooperation with Dyrenesbeskyttelse Denmark must be established to increase the credibility level of the system. By having their recommendation or stamp of approval it is easier to proof to shelters that this is the perfect solution for them.

The first year will focus a lot on creating awareness for Ketty as a foundation for sales and credibility.

The starting point for distribution is Denmark and this is the main priority during the first year. During the second year the expansion to Scandinavia-

via will start and on the third year Germany will be opened as a marked.

A parallel track, which will start its course during the first year, is the development of Ketty tools. Ketty tools are a line of clip on accessories for the shelter to increase the life quality of the cats and it will consist of four main products, which is:

A ladder for kittens or disabled cats (fig. 116).

A food- and water bowl set (fig. 117).

A hammock (fig. 118).

A dangly toy (fig. 119).

The concept is that these solutions only fit the Ketty system and can be strapped onto the spine.

They are set to launch in the third year. During the third year another line of product will be set into motion, these are called Ketty Home. This is a line of add on product for the cover toy customers can purchase and bring home from the shelter to ease the transition for the cats. When bringing this element home, the cat will find it its safety zone and probably grow attached to it. The line of add-ons will include elements like:

A foundation, food bowls, heating device, brush element and lid to transform it into a carrier (app 23)

## 3 year plan

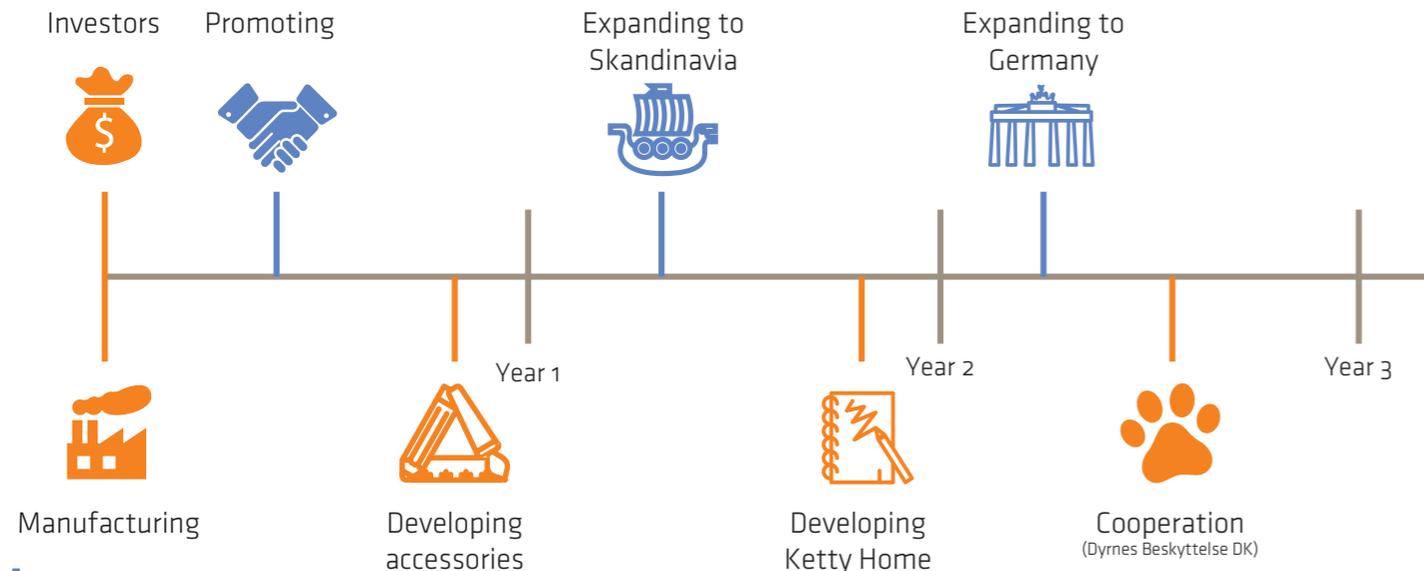


Fig. 115. Ketty systems 3 year plan.

### How many cages can be sold?

Within the first three years, it is suggested that an expansion to the marked outside Denmark is conducted. This expansion could be done to our neighbor countries, Norway, Sweden and Germany.

No. of shelters in DK	20
No. of shelters in SE	110 [web16]
No. of shelters in NO	28 [web17]
No. of shelters in DE	1500 [web18]

It is estimated that 15% of Danish shelters might purchase Ketty systems, 10% of our Scandinavian neighbors and 5% of German shelters.

$20 * 0.15 * 50 = 150$  compartments  
 $110 * 0.1 * 50 = 550$  compartments  
 $28 * 0.1 * 50 = 140$  compartments  
 $1500 * 0.05 * 50 = 3750$  compartments  
 Total: 4590 cages.

The 50 cats per shelter is an estimation based on the capacity the visited shelters have, therefore there is an uncertainty in the calculations because other shelters might have a smaller capacity. Another factor that might affect the final sales number is that the percentage estimations might be too optimistic.

These factors combined with the feedback from the suppliers make it more realistic to manufacture 2000 cages. This allows the price to be affordable and still provides a unit number that are sellable within the first three years.

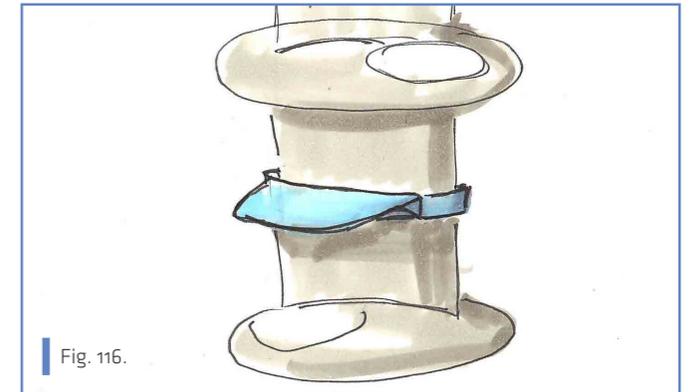


Fig. 116.

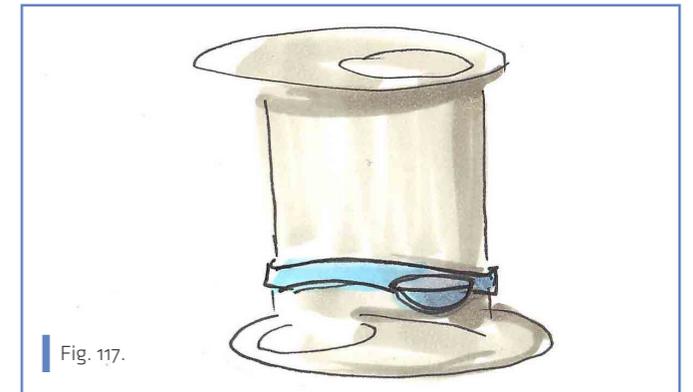


Fig. 117.

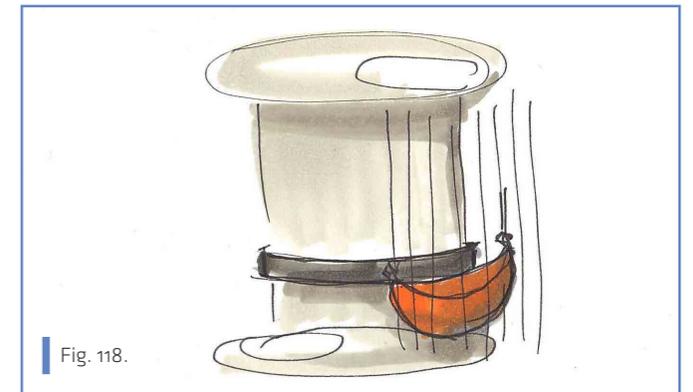


Fig. 118.

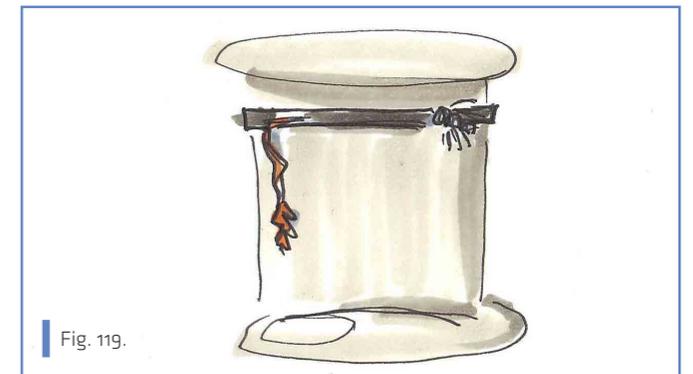


Fig. 119.

## Economic plan 2015-2018

A budget based on the feedback from the manufactures and the needed necessities to run a company is conducted to have a horizon for the break-even time and to know how much money to gather from investors. The total budget is to be seen below.

The total startup costs are 5.862.230 DKK but because there are more expenses than income during the first year it is the costs of the first year which must be covered from investors. 7.000.000dkk is the amount which must be collected from investors to ensure that the operating costs can be covered. It is expected that the income during the first year will be close to 1.000.000 DKK and these will be used to cover the expenses for the following year.

	Montht costs	Start up costs	Year 1	Year 3
<b>Office rent</b>	4.411 DKK	4.411 DKK	52.932 DKK	158.796 DKK
<b>Storage space</b>	580 DKK	580 DKK	6.960 DKK	20.880 DKK
<b>Interior</b> (5 tables, 5 chairs, 10 lamps, 5 bins, 5 organizers, 5 cabinets, 2 shelves)		17.213 DKK		
<b>Electronics</b> (5 computers, 1 phone, 3 headsets)		31.491 DKK		
<b>Office eqiupment</b> (fridge, coffee, maker, radio)		4.895 DKK		
<b>Business cards</b> (5 sets)		300 DKK		
<b>Brochurs</b>		500 DKK		
<b>Badges/pens</b>		250 DKK		
<b>Tees</b>		500 DKK		
<b>Posters</b>		2.000DKK		
<b>Website</b>		10.000 DKK		
<b>Manufacturing costs</b>		5.676.000 DKK		
<b>Phone/wifi</b>	1.090 DKK	1.090 DKK	13.080 DKK	39.240 DKK
<b>Ensurance</b>	-	-	-	-
<b>Promote employees (2)</b>	42.000 DKK	42.000 DKK	504.000 DKK	1.512.000 DKK
<b>Development employees (2)</b>	50.000 DKK	50.000 DKK	600.000 DKK	1.800.000 DKK
<b>Office employees (1)</b>	21.000 DKK	21.000 DKK	252.000 DKK	756.000 DKK
<b>Shipping</b>			10.000 DKK	30.000 DKK
<b>Accountant</b>	3 x 600 DKK	3 x 600 DKK	21.600 DKK	64.800 DKK
<b>Laywer</b> (first 6 months)	3 x 800 DKK	3 x 800 DKK	14.400 DKK	
<b>Total costs:</b>		<b>5.862.230 DKK</b>	<b>7.218.121 DKK</b>	<b>10.124.865 DKK</b>
<b>Total income with a unit price on 11.352 DKK</b>			<b>1.702.800 DKK</b>	<b>22.704.000 DKK</b>
<b>Revenue</b>			<b>-5.515.321 DKK</b>	<b>12.579.135 DKK</b>
<b>Total income with a unit price on 9.995 DKK</b>			<b>1.499.250 DKK</b>	<b>19.990.000 DKK</b>
<b>Revenue</b>			<b>-5.718.871 DKK</b>	<b>9.865.135 DKK</b>

Fig. 120. Ketty system budget.

On year three it is expected that the business can create a profit but the size depends on the retail price of the Ketty system.

With a production price of 2.838 DKK and a markup factor of four, the sales price for one compartment is 11.352 DKK, this price is a lot lower than the prices of the existing products (20.000 DKK), but an initiative to make Ketty even more attractive for the customers is to retail it at 9.995 DKK. This will mean that the total earning, when the investors have been paid back is a little shy of 5 million.

## 6.3 10 year plan

The idea of establishing Ketty Systems on the market as a new brand which focuses on cats, and are present in any given situation involving cats, also make it a obvious move to take it a step further and how that can be done is suggested in the 10 year plan.

The first two steps are presented in the three year plan, which is introducing Ketty and developing the customizing aspect of the product. The third step is to develop Ketty Home which is begun on the three year plan. By developing products for the private market more credibility among the potential customers are created and that credibility and awareness is needed for step four, which is to introduce Ketty Certificate. This is an organization that will be set up in cooperation with animal rescue organizations, veterinarians and even known pet feeding companies, to ensure that animals at shelters are thriving. The certificate can only be awarded to any shelter as long as they fulfill the requirements setup to deserve a certificate.

Bronze: Have proper cage sizes and professional personnel to advise the customers to ensure that every cat gets the home it deserves and that every family get the cat they need.

Silver: Uses the ketty system but are strongly dependent on volunteers who does not necessarily know each cat, and can therefore not provide the desired advice for the families.

Gold: Uses the Ketty System and have had the proper education in dealing with cats. A shelter rewarded with a gold certificate must work in collaboration with a veterinarian and have experienced employees to advise the customers to ensure that every cat gets the home it deserves and the every family get the cat they need.



Fig. . Ketty systems certificate. Depending on in which level a shelter fulfill Ketty systems standard, they will get the certificate in either bronze, silver or gold.

### 10 year plan

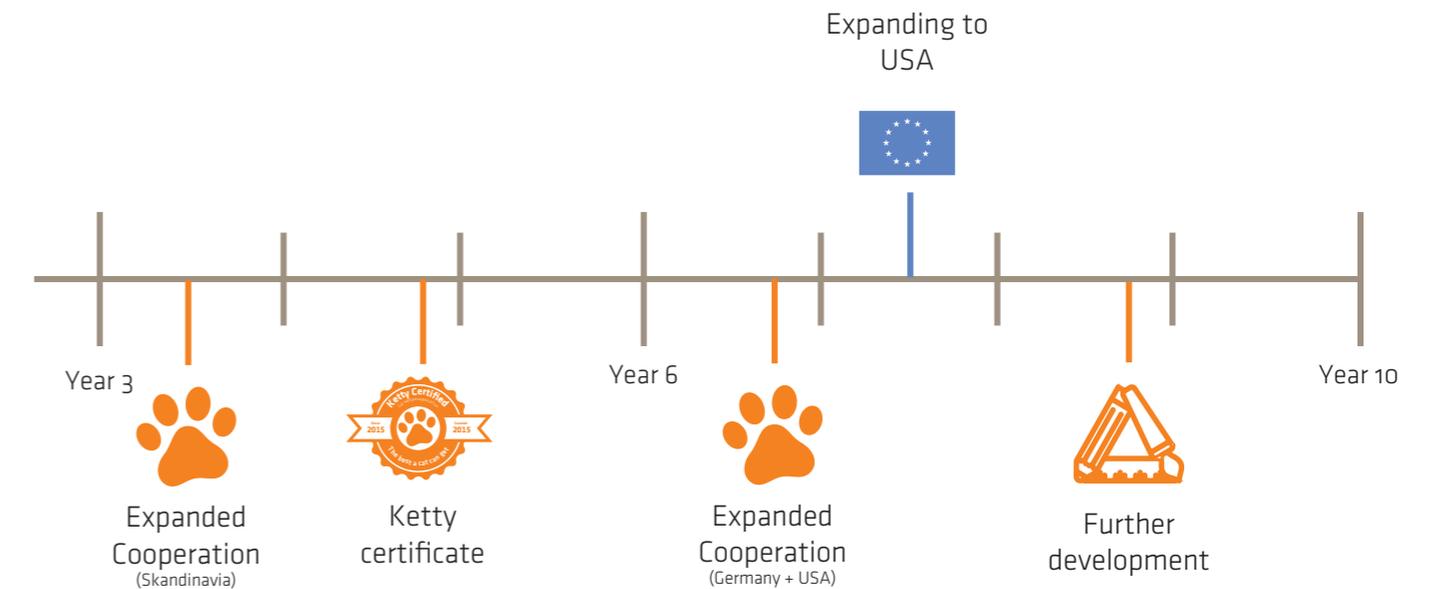


Fig. 121. Ketty systems 10 year plan.

# 6.4 Structure

The three and ten year plans are showing the company strategy and plan, but to execute these plans the structuring of the company must be addressed. As mentioned, Ketty will be a startup company and the plan is to have five employees when initiating the business. First a buyer in control of the manufacturing and customer service is needed, a sales promotion team (two employees) and two product development employees (us). The buyer has to take care of all connections to the suppliers and coordinate the storage and shipping (in general an office person). The two sales employees have to establish contacts to the shelters to present the Ketty system and make the sales. The two development employees are in charge of the further development of both the products and the service. The product line can easily be expanded - throughout the years - to other animals than cats which will need new research, experiments and development in general. The development employees will as mentioned be us which is reflected in the low salary estimated in the budget, this is based on the nonprofit startup and the salary will increase as the revenue increases.

## Customization

The first step is to contact the different shelters and organizations. Here a representative of The Ketty system will introduce the product and its advantages. Ketty will also be a present participator in fairs and exhibitions, where the product can be presented to representatives of shelters, organizations, pet shops, veterinarians and a target that is equally important, new potential cat owners.

While presenting the Ketty system, it is important to convey the values a system like Ketty can provide a shelter with and which features are open for customization. A folder presenting Ketty systems should be provided, which also can be found on the Ketty system website. This magazine should convey the product options and have an order blanket the shelters can fill out to order the compartment combination they want.

Due to the endless options of customizing the look of Ketty, three standard combinations are set up for the shelters to pick from and these can be ordered in any number they want. These combinations are as said standards and will be in stock to ensure a fast delivery, but if the customers want a completely customized system it is made to order. When a customer creates a made to order system a minimum of 25 cages must be placed.

## Delivery and setup

Because the Ketty system is more than just a product, also a service, it is important to consider how the products are delivered to the shelter. The product is developed to be shipped in parts which will be the way of the deliveries.

When an order is requested, the customized parts will be packed and sent to the shelter. A delivery person will always help bringing the packages to the need room, but from this point there will be two solutions for the shelters.

- The shelter can choose to mount and setup the compartments themselves. This can be done because of all the considerations of an easy construction of the product.
- The shelter can choose to pay for the extra service Ketty system of having people hired by Ketty to mount the compartments.

## Additional services

When a shelter has purchased a compartment from Ketty systems, there is focus on a great service and this is why it is possible to get spare part for the compartments. Every part can be replaced if a problem occurs, for example if a part has to be replaced because of normal wear it can be purchased at a decent price, whereas parts that breaks because of accidents or construction errors will be replaced with no charge.

### covers

The covers that the customers can purchase together with the cat, does also have great importance for the business strategy, because this will create ongoing additional sales. While the shelter purchases the compartments, they will get an extra set of covers for each compartment (to provide a great service), but when they are out they have to order new covers.

The ordering of covers is an important service too and the aim is to be able to have a delivery time of 1-2 business days. When ordering new covers there are no preset amount which must be ordered, except if the covers are of customized origin, then there will be a minimum order of 100 covers, to ensure that the delivery will be worthwhile.

CONCLUSION: By providing an extraordinary high level of customization certain precautions must be taken to ensure that merchandise can be delivered on time and that it is not an economic disadvantage to the business. Therefore a set of rules deciding which purchases qualify for the customization are setup.



Order Sheet

# 7.0 wrap-up

This section is the concluding episode of the project and will contain an analysis of the product in relation to the requirements and expectations stated in the beginning of the project to reach a conclusion on the product. The second part is a reflection of the process and the decisions made during the project.

## 7.1 Conclusion

The starting point for this project took based in the current environment at shelters where cats are kept. Here there were issues of different character connected to having multiple cats kept in a smaller space like the territorial instincts, lack of personal space, difficulties with interaction and an unfriendly environment to enter as a customer. These problematic have been analyzed and turned into a set of requirements which are fulfilled by Ketty Systems, a compartment system that can be tailored for any shelter and helps the shelter to deliver a much better service due to the systems tangible interaction.

One of the biggest priorities when developing a caging system for cats were the cats welfare and this have been investigated through many different possibilities. On step were to create a larger product, to divide the needs of the cats into different places, and the larger space would also give the cat opportunities for exploration, which is an important matter for a cat. The system have different levels in between which the cat can freely jump, covers for personal space, scratchers for stimulation and a covered tray to increase the cats privacy. To create a compartment focusing on welfare does also reflect the choice of materials and construction, which have been in focus all through the process, to ensure a cleaning friendly product. In connection to cleaning and daily use, it has also been important to focus on the shelters needs.

Another big priority in this process was the customers of the cats, based on the service they get and the impression they leave the shelter with. This is why interaction both with the compartments and the cat has been in focus. A step here was to analyze the current customers and an issue was the unknowing feeling of, if they could go into the cats and/or open the cages. This issue has been solved be an easy interaction with the Ketty system gates that gives control over the cat and keeping the cat in its compartment.

Ketty Systems are a great solution for shelters as we know them and this system are going to help the shelters disseminating even more cats than they do now.

## 7.2 Reflection

To initiate this project two different shelters carrying cats were visited to gain a deeper understanding of how shelters work, and though the staff was very helpful and friendly they take very much pride in the way they do things and there are only one right way to do it and therefore the shelters visited have not be as involved in the development at initially wished because they disregard changes. This resulted in a product which has yet to be approved by the shelters.

Another factor which was brought into the project early in the project was pet dumping. This subject is highly topical in the media and is so much on the rise that it had to be taken in consideration. The character of this problem makes it hard to solve because it is a general attitude in the society and that there also is a economic factor in this issue. The project solution might on a longer term have an effect on this problem, but to solve it instantly is close to an impossible task. This problem was introduced, but to challenging to handle and therefore it got partially neglected or degraded to the theory that if the shelters provide a more luxurious experience more people would respect the shelter and use them for their unwanted pets.

Throughout the ideation multiple ideas concerning changing the format of the shelter occurred and those were of a very interesting character, especially in relation to the abovementioned issue, but present a big issue for the shelters. Generally there is not money in this industry and therefore suggesting bigger constructional changes for the shelters would be unrealistic because they don't have the economy to execute the solutions. Therefore a more classical approach was selected.

A key focus during the entire project has been the development of better options for interacting with the cage to make it easier to interact with the cat. This is yet again done through a more conservative solution of the simple reason that the product is aimed at the broad spectrum of shelters which all have different capacities. By having developed a different interaction surface some shelters might not have been compatible with the system because they operate in small rooms.

Another factor which concerns the success of Ketty is if it manages to make a gradually entry to the shelters because the majority won't have enough capital to acquire a complete set at once. Here it is important that the shelters see how Ketty can easily be placed with other cages without looking too alienated in the room. This is a great advantage and by allowing the shelters to customize their own cages they can be developed to match any currently used solution.

Throughout the project the degree of freedom provided by the system have been of highest priority and considering that it is surprising that the final product is only free in the look and placement fields whereas in the transformational aspect is left out. It could have been a solution to develop a completely flexible system, as suggested in the ideation, but this is not really a factor which the shelter needs and therefore it was left behind for the idea of developing a freely movable system.

By developing the system with a lot of focus on the customization feature, a lot of requirements come along for the business strategy and for the suppliers as well because they must be able to supply units made in smaller numbers but still at costs which are not remarkably higher than the basic designs.

The construction of Ketty has been one of the biggest challenges in the project because there were two strong priorities and these were hard to combine. The first demand was that the solution was easy to assemble to make sure that any shelter employees could set up or take apart the system, the second one was the need for sufficient strength to make sure that the system was stabile. Therefore two solutions was developed and the one which was strongest construction wise was the selected one even though it was not perfectly in line with the wishes for this part.

During the entire process it have been extremely challenging to test ideas and models because of the slight resistance met at the shelters and the challenges it brings to work with cats. Mario, the test cat, clearly have a mind of his own and would therefore not participate in our experiments. A last aspect which must be considered for further work is the certificate. There are two vital questions for this idea. One is if certificates even hold a value in our society today, with all of the certificates available and all of the stories of how you can just pay your way to a certificate, are they even credible. The second question is quite resembling to the first one, because here the question is if it can really change anything? Would people care and would they consider going to a shelter instead of a farm. These are questions which needs further investigation before they can be answered and before the final approach to the certificate can be taken.

## 7.3 Further work

There is a list of further work to be done before Ketty is ready to be launched. First the tray needs a bit more attention to make sure that the interaction is all right. Specifically the locking handles and the handle needs some attention to make them more integrated in the product as well as finding a solution which, like the gates, allows the employee to operate the tray with one hand.

Another task lies in developing some of the accessories like the ladder, because it can be a contributing factor to the shelter only getting Ketty cages. Here they have a cage which can be modified to the specific cats need to ease the daily challenges.

Another crucial factor for Kettys survival is a prototype testing. In the current stage the system have yet to be tested in shelter use. This is an important documentation to get, especially when showing Dyrenesbeskyttelse the product in hopes of getting their approval.

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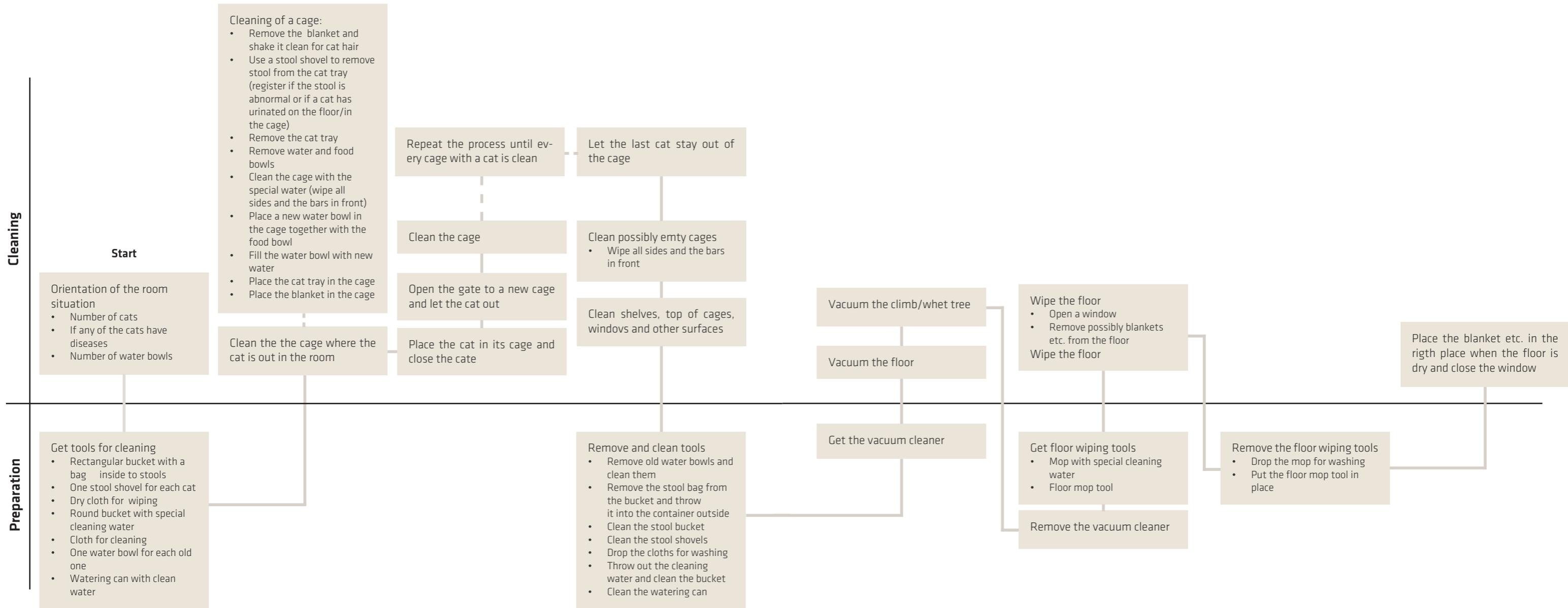
# Illustrations

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# 8.0 appendix

## 8.1 Cleaning

Below is an illustration which shows a tracking of the daily cleaning at Kattens Værn Aalborg.



## 8.2 The cages

At the cat shelter they have a few different kinds of cages and in the following you can find a description of their selection.

### The old ones

The old cages are more than 20 years old and are constructed of a wooden frame where the inside is covered with a layer of durable glass fiber. The door is a bar door with a circle lock to ensure a safe keep of the cat.

Pros:

The cage is very durable, and after 20 years they are still highly functional. The lock is very safe, and it is impossible for cats to open it. The cages are very neutrally looking. The corners are easily cleaned and there are not many gatherings which causes any hygienic issues.

Cons:

The fiber glass layer has a few cracks and scratches, but still, they are 20 years old. The bars are hard to clean, especially in the weld post an issue. The area where the fiberglass meets the wooden frame, that area is practically impossible to keep sanitary. The locks are hard to keep clean as well as a little challenging to handle, even for humans.

### The Australian ones

The Australian cages were some the shelter was offered for a good price. They came as a do it yourself offering, and they looked pretty good.

The cages are built of a metal frame, with two separate rooms, connected by a small hatch, which allows the cat to have two spaces or allows the personnel to help more cats in one cage. The door is built of a Plexiglas window and a metal grid to let air penetrate the door. The lock mechanism is a “slam and lock” kind of lock.

Pros:

The cages look nice and have no bars which pose a challenge to clean. The cage mainly consists of big plane surfaces which are easy to clean. The cat has the possibility of living in two rooms (most often a living and a pooping room) or the personnel can choose to store more cats.

Cons:

All of the holes in the cage (the ones which ensure air circulation) are impossible to clean. There are many ridges and gatherings in the cage and it poses a big challenge when it must be cleaned, patience is needed. The locking mechanism is too weak, and the door is constructed in an insufficient way. After a few years of use the door is hard to close and the lock is so weak that the cats, by pressing against the door, can deactivate it. There is also the fault that the doors aren't fastened enough, so even if the lock is secured perfectly, the edges of the door will flip open if pushed correctly.

### The new ones

The new cages are very similar to the old ones; they have just gotten a bit of an update. The frame is still constructed of wood but instead of using fiberglass, the inside is a laminate and the corners and gatherings have been covered with a rubber joint to ensure the easiest clean possible. The door bars have been made slimmer and so are the welds to make sure that hair and dust does not get stuck. The lock mechanism is a very classical solution of a turn and lock pole.

Pros:

The cage is super easy to clean because the entire inside of the cage has been turned into one big surface with no ridges and holes. The lock mechanism is smooth and very safe, because the turn only can be opened from one specific position.

Cons:

There aren't really any strong cons for this cage, only that it still has bare as the door, which always are more challenging to clean than a plane surface.

### The big cages

The shelter also has some bigger cages for special circumstances, which can be a mother with kittens or a pair of cats which should not be separated.

These cages are pretty similar to the new ones, just twice as spacious. They are a clasp lock mechanism, which are perfect for cats, because it needs to have two points pressed at the same time to unlock.

Pros:

The cages are perfect for cats with special needs and this increases the level of life quality for the cats. The cages are also easy to clean and have a safe but still easy to use lock mechanism.

Cons:

The cages are quite high, but there is no way for the cats to utilize that extra space, so it just seems a bit wasted.

## 8.3 Interview with Pia Bisgaard

The interviews are initiated with a conversation on what the project is about and which shelter we have investigated (Kattens Værn, Aalborg & Dymes beskyttelse, Hjøllrup). Pia Bisgaard is the connected cat doctor to Kattens Værn and knows their cages.

### Can more cats that are not used to each other go together?

Yes and no. Some cats can go together, but they are very territorial and can be threatening to each other.

“If we are thrown into a small apartment to live together with 20 people we don't know, we would be very uncomfortable, too.”

It is a good idea to divide the cats, into smaller groups so each cat only has to be concerned of a few other cats. Another reason for dividing the cat is to avoid contamination.

### Is there a minimum size one cages for shelters?

There are no rules for a minimum size, but Pia states that the cages at Kattens Værn are too small. The cat tray are too close to the food and water bowls, which also should be separated from each other. She mentions the cages from Australia (which are places in Kattens Værn's emergency department) are cages that have a good size, also because they have the possibility of adjustment, but there are also bad solutions at these cages. The gate is too large to handle properly and the glass/plastic gate lets too little air inside the cages.

### Is there a minimum size for the length between bars or holes in the construction of cages?

There are no rules as far as Pia knows, but she would recommend a maximum hole on 5x5 cm, at this way, kittens are secure too.

### Can a cat get an affiliation to an object?

Yes. Cats create scent trails and leave them on different objects to communicate by. It is important for the cat to have their own space with their scent trail to feel comfortable, which is why the shelter tries to let the cats have the same blanket as long as possible.

There is a product for cats that they can live in at shelters, which can be folded to a box it can be transported in too. Pia could not remember its name. But Pia thought it would be a great idea to design an object that could follow the cat.

### Is there some other important subject about caging that you see potential in?

It is important that it is possible to reach the cat in all positions at a shelter, both for the customers but especially for the employees, which shall take care of the cat. Pia mentions this because cats have a tendency to hide and go to high positions, but it is good for the training of the cat, that they cannot hide. However, it is at the same time important that the cat can go to high places.

Pia has through the interview mentioned several places that can give inspiration to the project. First she mentioned an organization in England called: icatcare.org which should provide the users with a lot of information on cats and everything for cats. She mentioned that the cages at “dyresospitalet svenstrup/hobro” should be good - a good solution. As a last thing she mentioned a product called Filine Ford that should be a good play/relax product for cats at home.

## 8.4 Questionnaire

A questionnaire is conducted and distributed through multiple pet forums, cat forums and dyrenes beskyttelses facebook site. In total 64 replies were received. Below is a review of the data.

Vi er to piger som studerer industrielt design, som er i gang med at lave et projekt om hvordan man kan optimere burene på katte internater. I dag bruges der ikke mange bure, som er udviklet til katte og deres meget specifikke behov, på internater, hvilket vi synes er en skam. Efter besøg på flere internater ved vi hvordan de frivillige og kattene har det, men vi mangler jeres oplevelser, kundernes!

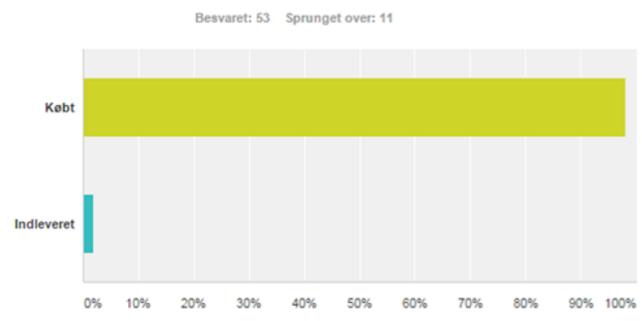
Vi har derfor brug for jeres hjælp til at beskrive den oplevelse man får af den måde man opbevarer kattene på, på internater, når man kommer som køber.

Alle besvarelser vil blive behandlet anonymt, men vil blive brugt i offentligt tilgængeligt materiale.

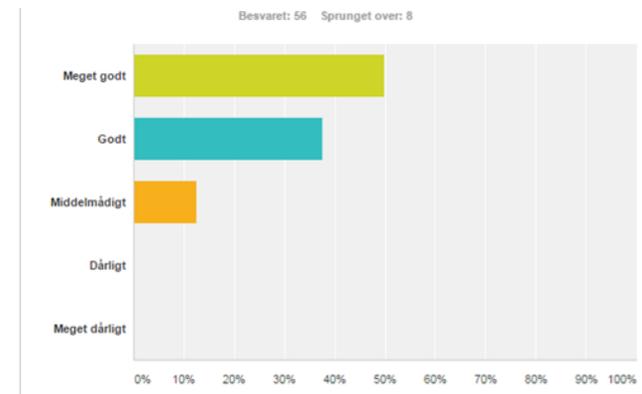
På forhånd tak for hjælpen!  
- Pernille & Suzette

- 1) Hvilket internat har du besøgt?  
Dyrenes beskyttelse Hjøllerup – 18  
Kattens Værn Aalborg – 10  
Inges Kattehjem – 8

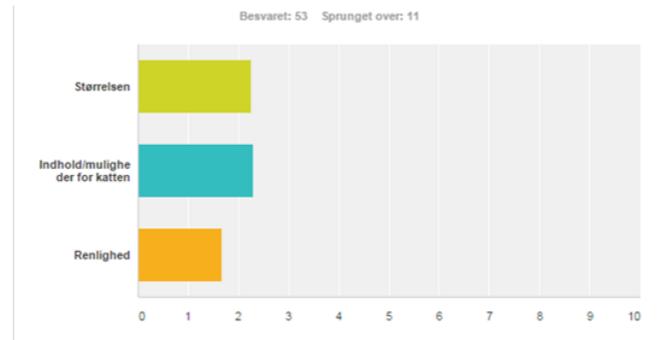
- 2) Har du købt eller indleveret en kat?



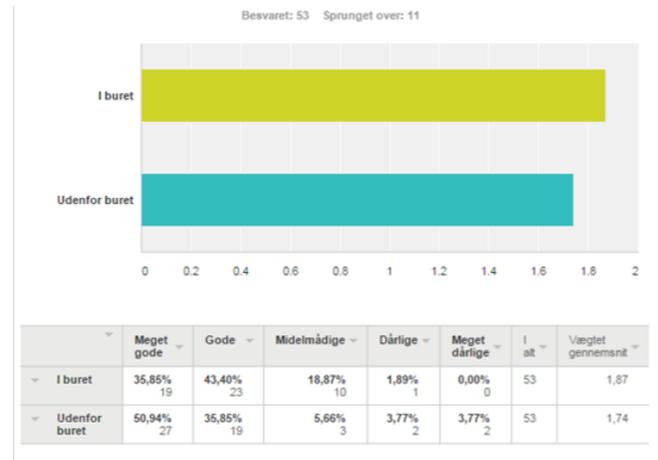
- 3) Hvordan er dit generelle indtryk af internatet?



- 4) Hvordan er dit indtryk af burene?



- 5) Hvordan var mulighederne for kontakt med kattene? (berøring, samtale, osv.)



- 6) Hvilke følelser fik du på internatet? ex: rent, hyggeligt, sjovt, sterilt, moderne, god betjening, osv.

*"Lidt småt i forhold til antallet af katte - der var mere end to katte i nogle af burene... Udenfor burene er der heller ikke meget plads til udfoldelser, når mange katte er ude på en gang. Manglede info omkring evt. problemer der kunne opstå, når katte får et nyt hjem... stress, reaktion på nyt foder osv."*

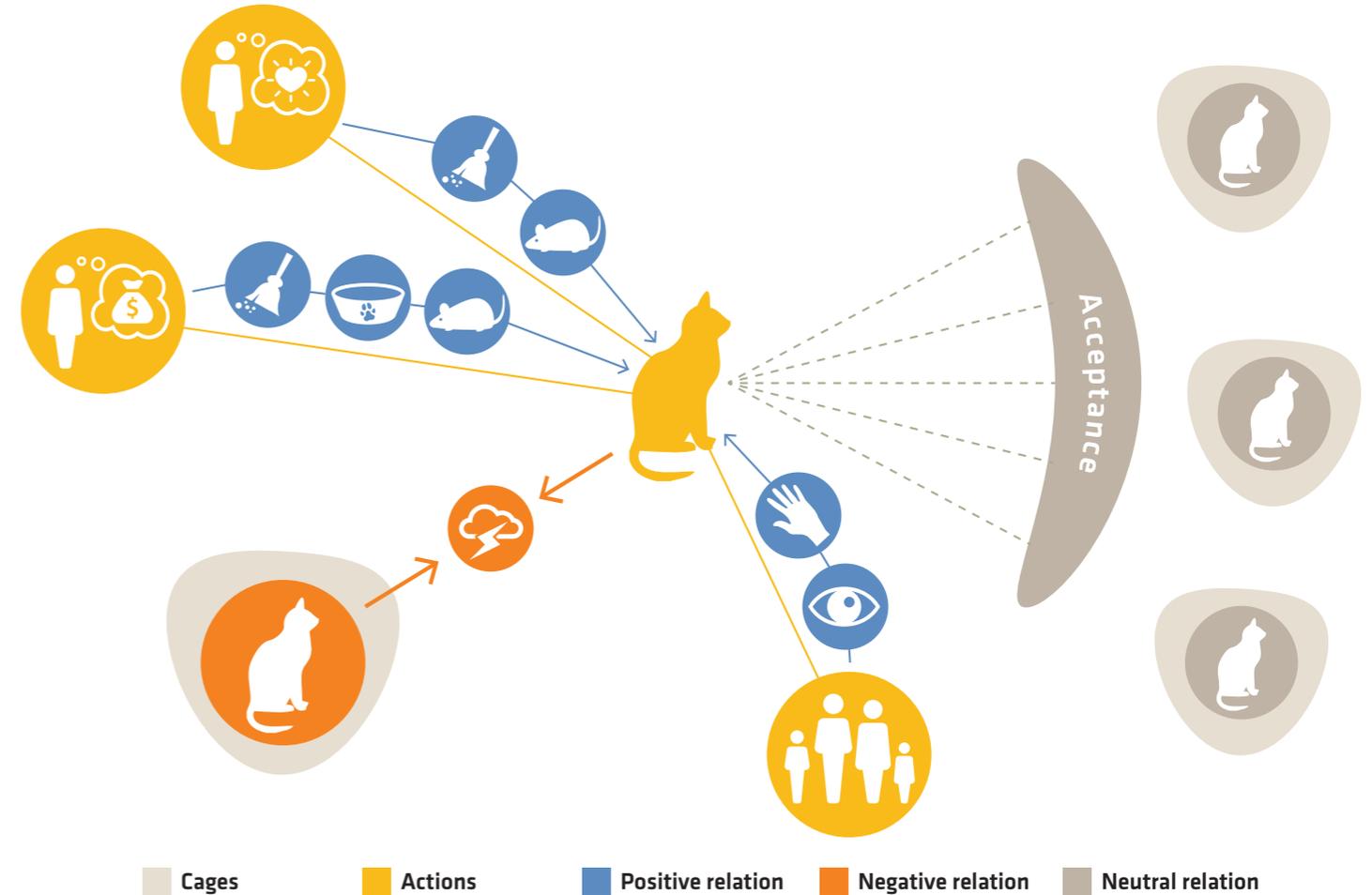
*"Trist at se så mange katte i så små bure"*

*"Rodet, sterilt, ikke imødekommende"*

*"Mine følelser? Afmagt, sorg og tristhed pga. alle de svigtede katte :-/ Det har dog ikke med indretningen af internatet at gøre - det er bare ikke til at bære, at alle de uskyldige katte er blevet til overs pga. menneskers ligegyldighed. Men ellers virker det nye kattehus sterilt - ok, for det er da også vigtigt at hygiejnen er i top."*

## 8.5 Tracking of environment

Below is an illustration showing the different elements which might affect a shelter cat at Kattens Værn Aalborg. Here there are fewer cats in the room and therefore it is harder for the cats to avoid confrontation.



## 8.6 Market actors

### Mason

Raintree Cat Condo is a luxurious module based caging system, which most of all looks like a classic set of cabinets. The units come in different sizes, materials like wood and they all have different functions to allow the user to customize as much as possible.

Shelter Cat Condo is a solution made especially with focus on shelters and the issues that often occurs in shelter settings. The cages are highly flexible and can be changed to fit any solution. They are easy to keep clean but do not have many transparent areas for the potential buyers to view the cat through.

Quiet Cottage Cage is a very simple solution and are quite resembling to the one currently used at Kattens Værn. They consists of a fiberglass box with metal bars as the door, they are easy to clean and very durable.



<http://www.masonco.com/animal-enclosures/cat-solutions/raintree-cat-condo.html>



<http://www.masonco.com/animal-enclosures/cat-solutions/quiet-cottages.html>

### Kruise

Ken Kage cages are very sterile and often used for veterinarian work, but in some cases also for shelters. These consists of a metal box with a bar door. They are easy to clean and very durable. The cages are not customizable and they only come in the same dimensions only scaled according to the animal.

BUSTER cages are produced and designed for dogs, but can also be used for cats if the right dimensions are picked. They are made of fiberglass and have a bar door. BUSTER cages are also easy to clean. They are not flexible in any way and only come in standard sizes.



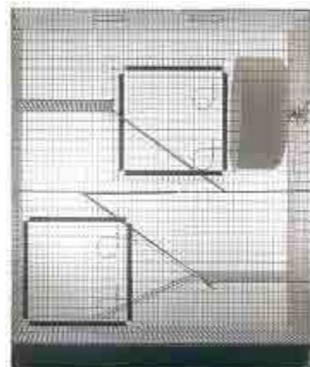
[http://www.kruise.com/da-DK/ecom/Til\\_klinik-ken/Klinikbure/BUSTER\\_bure/prod\\_280810.aspx](http://www.kruise.com/da-DK/ecom/Til_klinik-ken/Klinikbure/BUSTER_bure/prod_280810.aspx)

### Martins cages

Kitty Cabana is a low practical cage which can also be acquired by private persons. The cage is build of a grid which makes it cheap but neither pretty, hygienic nor flexible.

The map based on these different solutions shows a tendency on the market that either the product is luxurious and expensive or it is simple and non flexible.

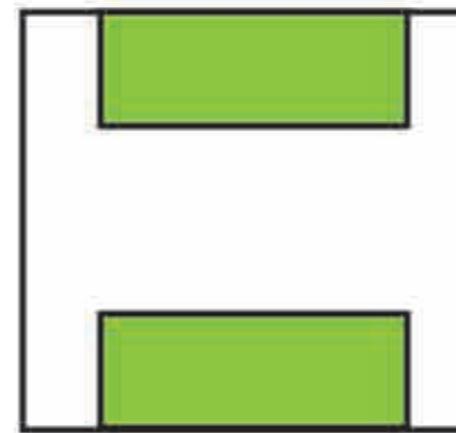
The aim for this product is to develop something which targets the flexibility, durability without remaining sterile and complex.



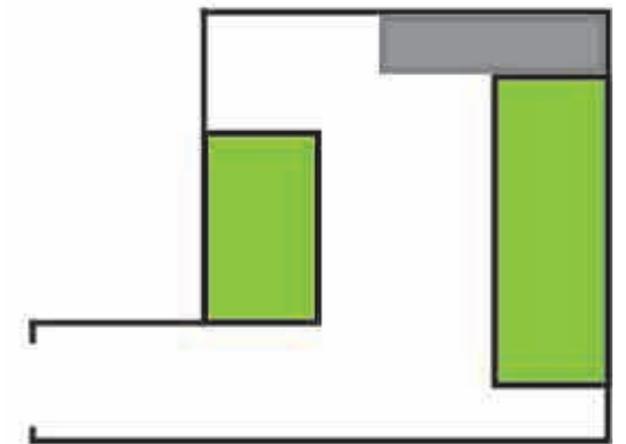
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## 8.7 Rooms at Shelters

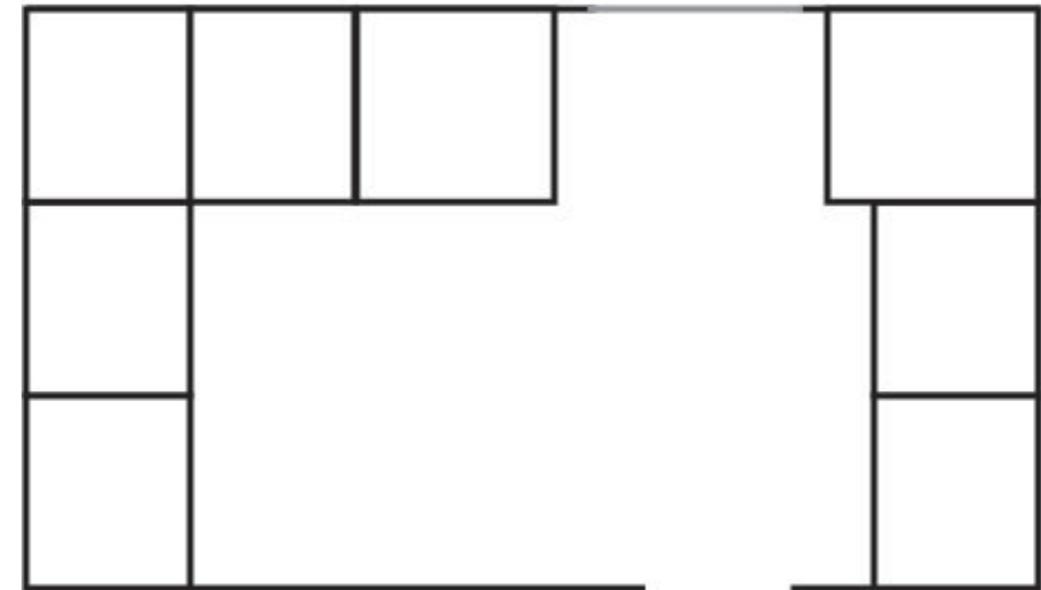
Due to the high level of variety of room sizes and shapes, a set of room-zonas are developed to have some standards to leap from during the development of the size and shape of the cage. The roomzonas are based on the rooms at the two shelters that were visited earlier.



Small room at Kattens Værn, Aalborg



Angular room at Kattens Værn, Aalborg.



Big room at Dyrenes beskyttelse, Hjallerup.

# 8.8 Shape matrix

A matrix assesses the features of each shape according to some preset variables.

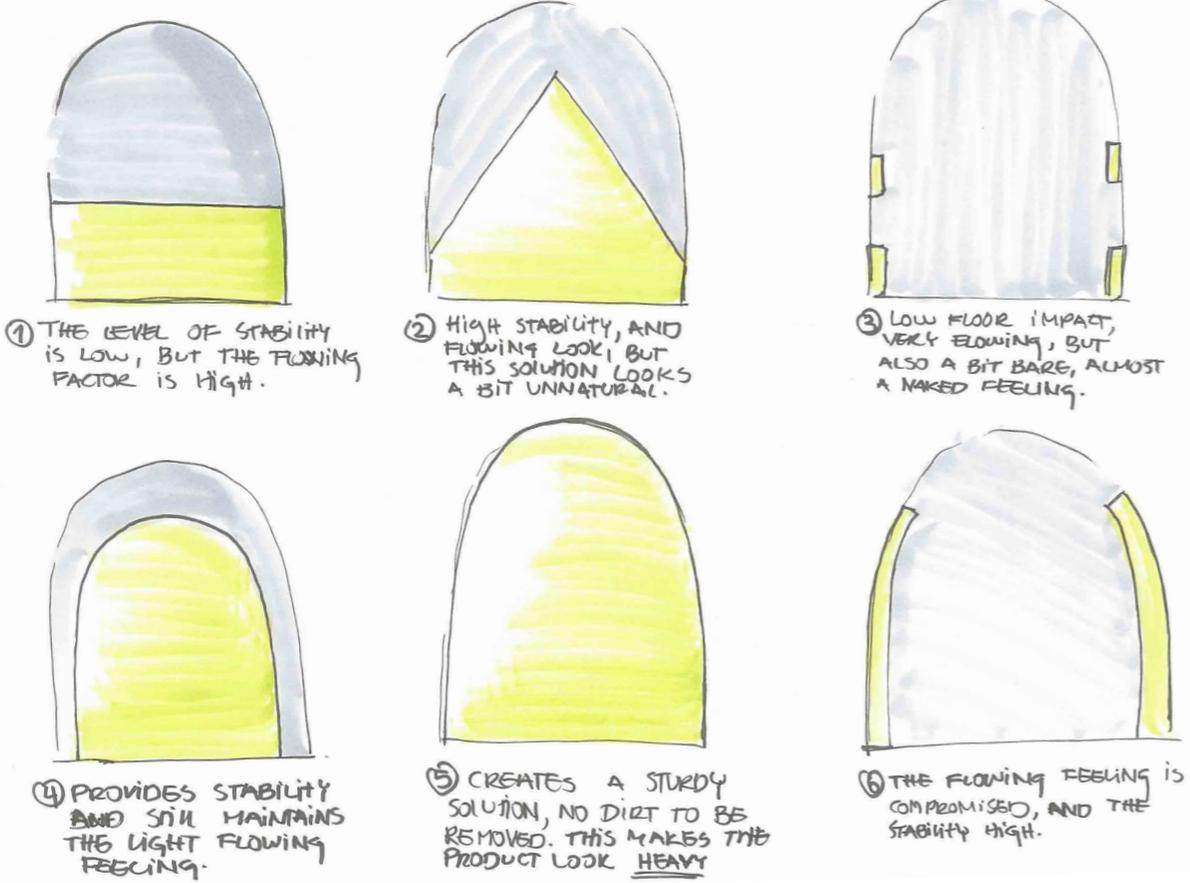
Shape	Max areal (60X60)	No. of corners.	No. Of surfaces	Flexibility	stability	Panoramic view	Transformation complexity	Exhibitional experience
	0.36 m2	4	6	medium	high	low	medium	medium
	0.18 m2	3	5	low	medium	low	high	high
	0.31 m2	6	8	high	high	high	medium	high
	0.28 m2	0	3	high	high	high	low	high
	0.3 m2	4	6	medium	high	high	high	medium

			Sides + Top + Bottom	The degree of freedom of placement and presentation sides.	How high the stability are according to affecting forces.	Assesment of the option of the panoramic view	The level of complexity required for the transformation to function succesfully	The level of exhibition feel provided by the compartment
--	--	--	----------------------	--	---	---	---	--

# 8.9 Footprint

The footprint was intially investigated for the fusion shape, but in this case the selected solution, solution 4, can be directly transferred to the circular product.

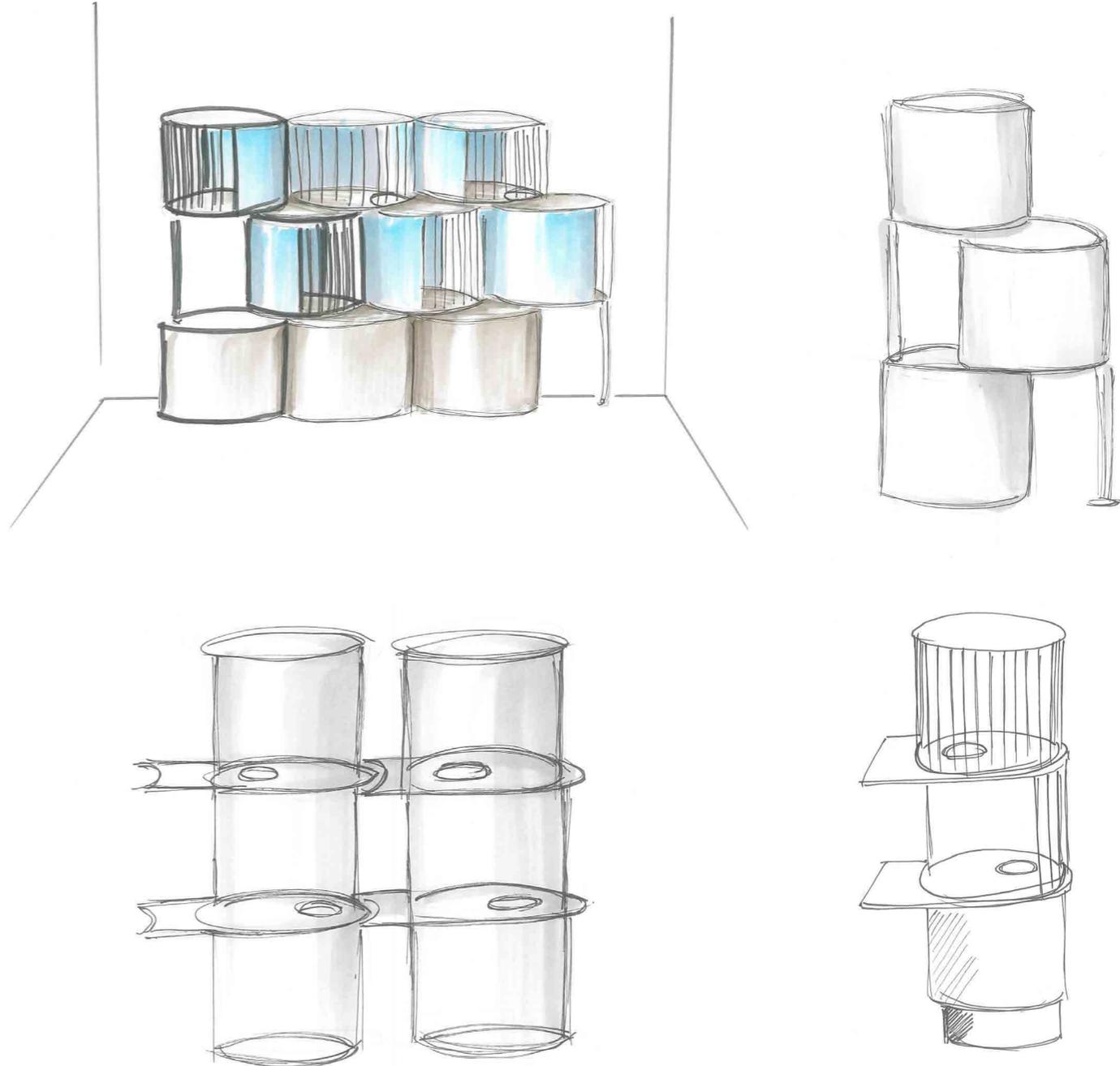


- ① THE LEVEL OF STABILITY IS LOW, BUT THE FLOWING FACTOR IS HIGH.
- ② HIGH STABILITY, AND FLOWING LOOK, BUT THIS SOLUTION LOOKS A BIT UNNATURAL.
- ③ LOW FLOOR IMPACT, VERY FLOWING, BUT ALSO A BIT BARE, ALMOST A NAKED FEELING.
- ④ PROVIDES STABILITY AND STILL MAINTAINS THE LIGHT FLOWING FEELING.
- ⑤ CREATES A STURDY SOLUTION, NO DIRT TO BE REMOVED. THIS MAKES THE PRODUCT LOOK HEAVY
- ⑥ THE FLOWING FEELING IS COMPROMISED, AND THE STABILITY HIGH.

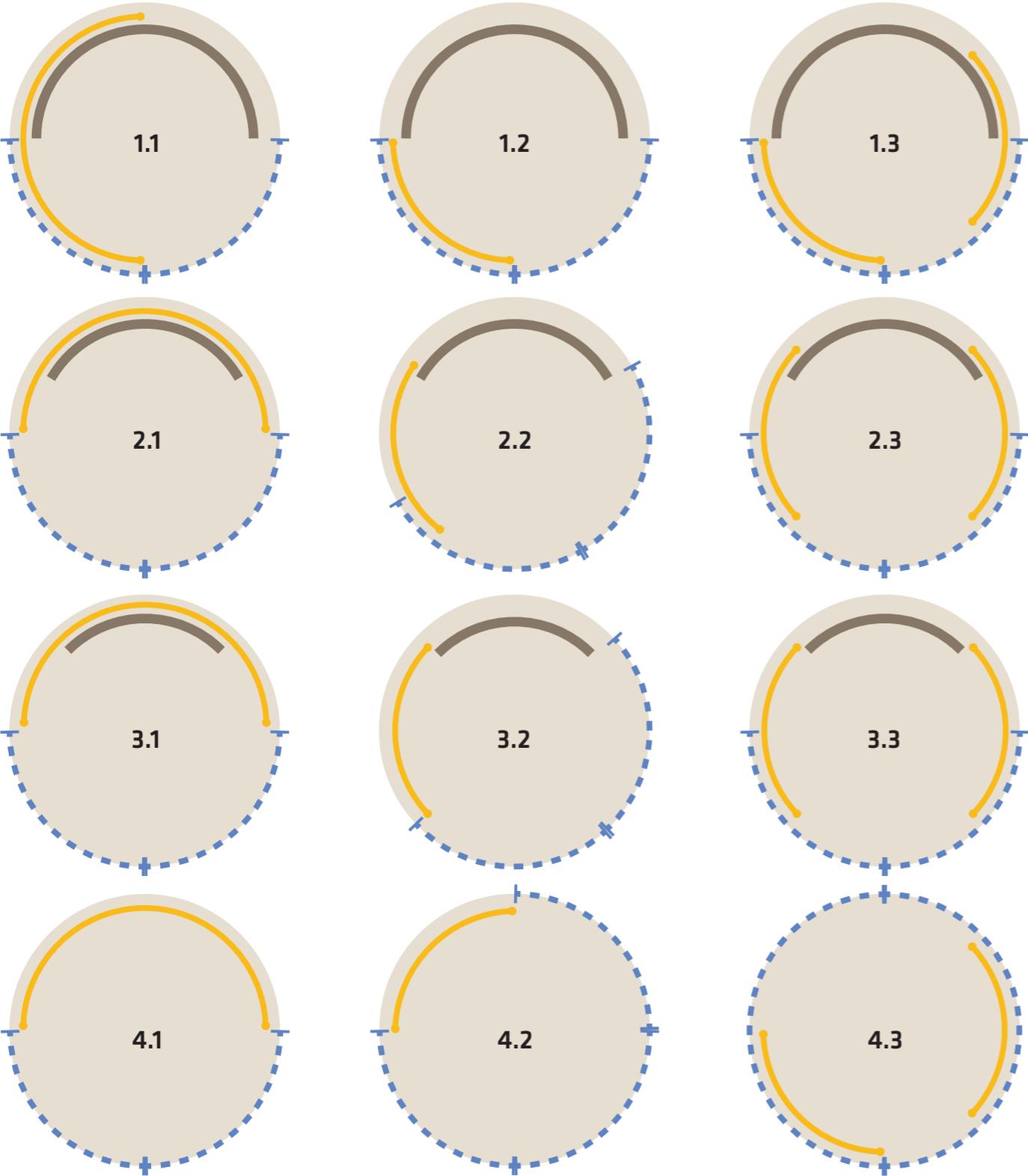
# 8.10 Connecting the cages

An investigation of how the standalone system can be converted into a integrated system is conducted.

Below are some examples of how sush a system can look.

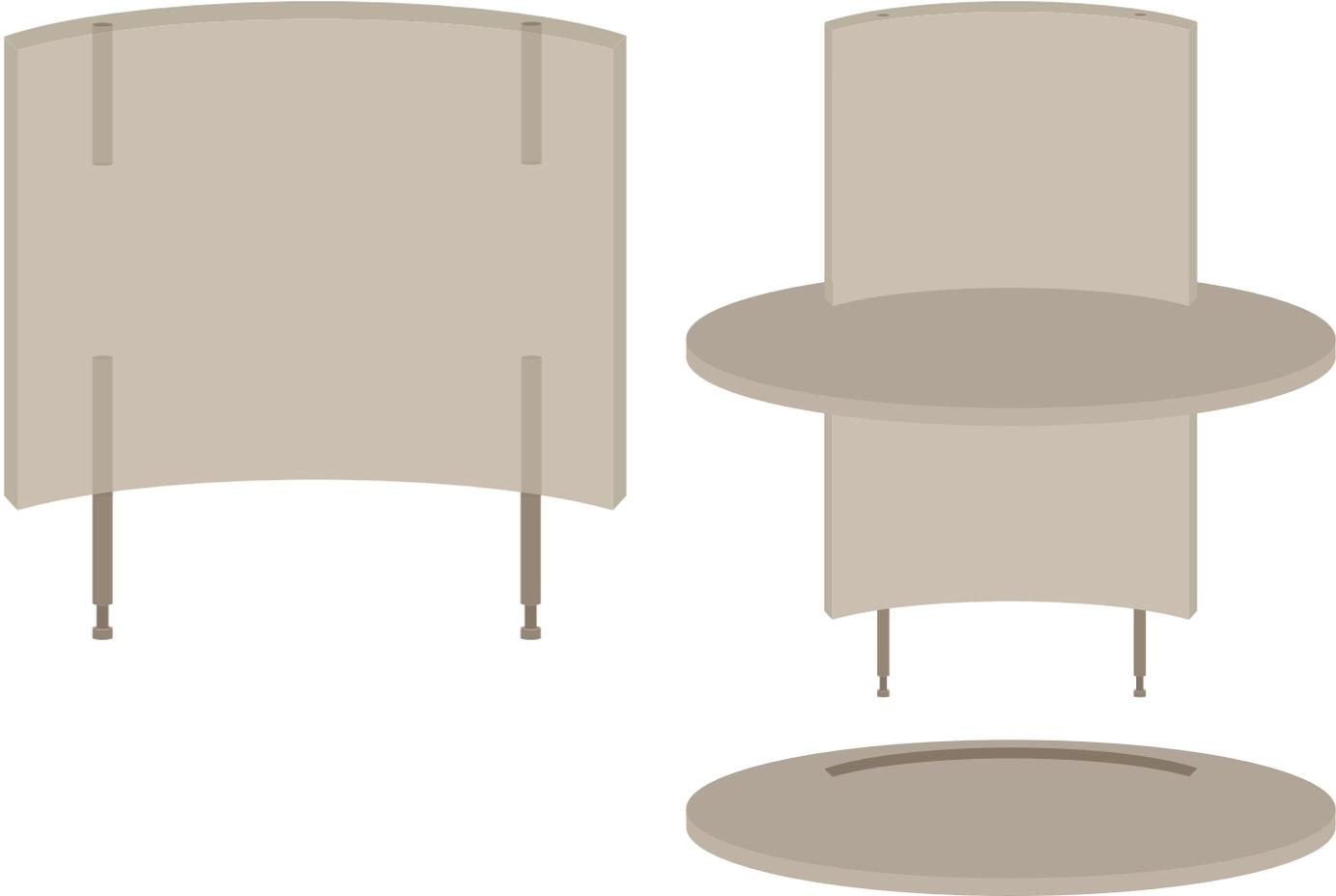


# 8.11 Composition of boundaries



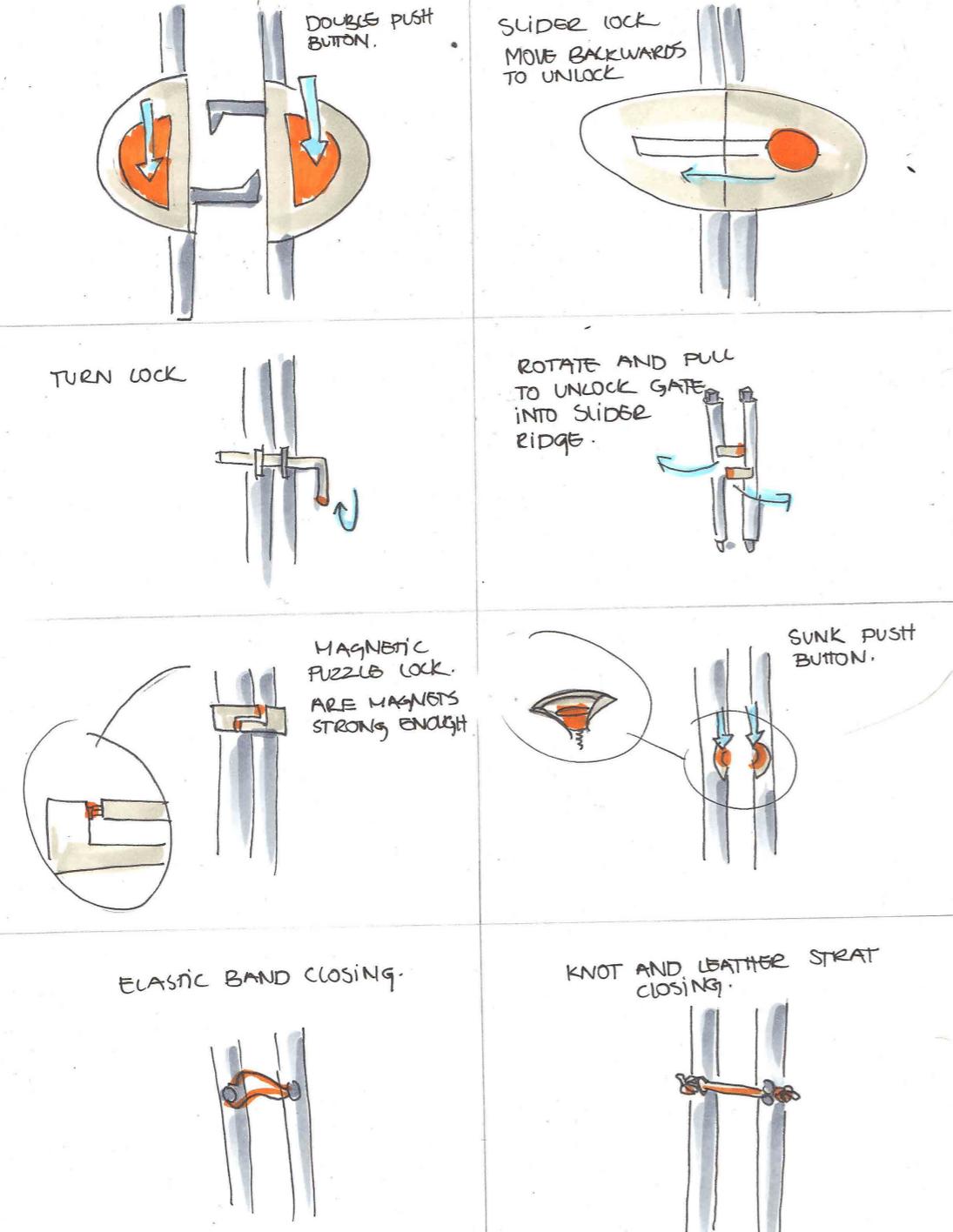
# 8.12 Seperated spine

Below is an illustration of how the system could look if it were to be made with a assembled spine. There are one big advantage to meking this solution and that is the simplicity in the assembly of the system, but unfortunatly this system cannot provide enough strenght and stability to support the system.

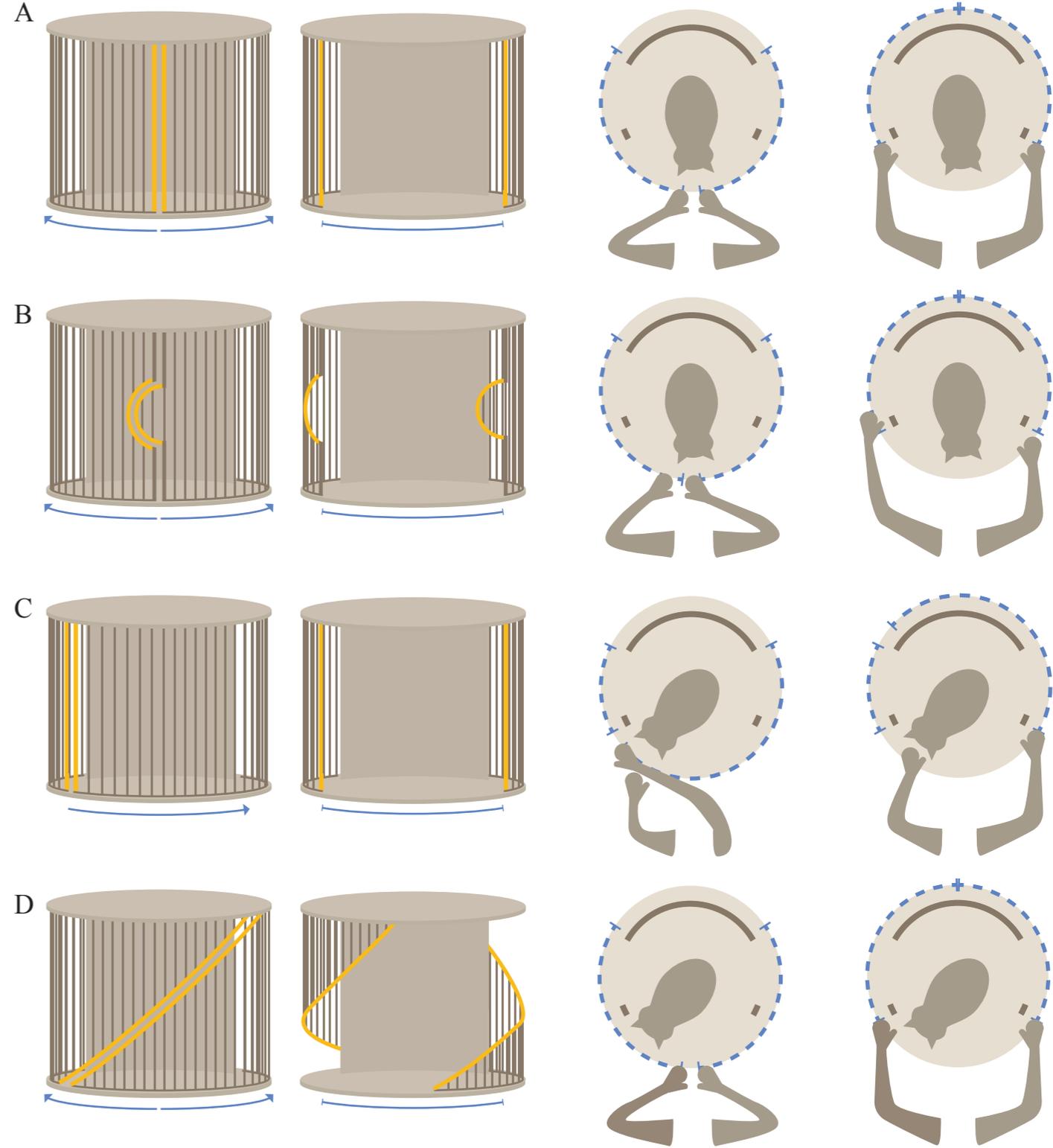


# 8.13 Lock schema

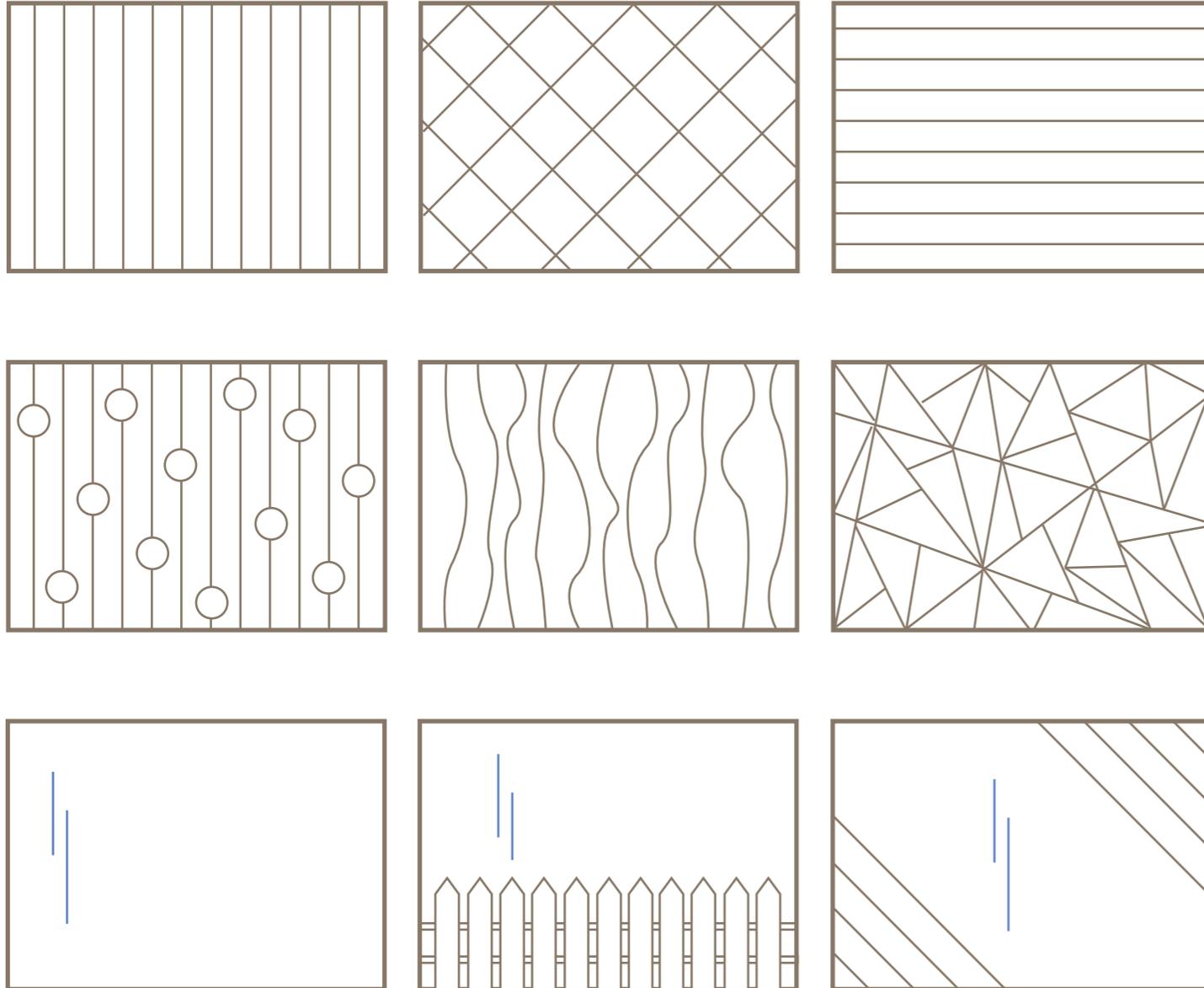
An investigation of different types of locks are conducted below. this study combined with the knowledge of how cats can coordinate and apply pressure have lead to a selection of the solution presented in the report.



# 8.14 Opening scenarios



## 8.15 Gate composition



## 8.16 Plexiglas resistance

Plexiglas is an obvious material to utilize when dealing with high visibility but low weight and therefore it is incorporated in the gate solution. Considerations regarding the wear of the acrylic material are mainly pointed towards scratches and static charging.

The first issue which is scratches cannot be completely avoided, but since Plexiglas is a hard material the scratches that cats can imply to the material are of superficial character and this can luckily easily be fixed. By applying a thin layer of normal household wax the scratches are filled and will seem less visible. Another tip which can be used is to blow the scratches with a heat blower to melt the scratches together but this can cause a slight distortion in the surface and thereby affect the visibility.

Concerning the static charging of the material, different solutions are available. One very popular solution is spray on anti static foam which can prevent small dust and hair straws from attracting to the surface. When the Plexiglas is cleaned with a wet cloth it is automatically de-charged and a new layer of foam must be given.

GENERAL INFORMATION AND PHYSICAL PROPERTIES, Altuglas International • Arkema Inc, 2006 p16.

<http://www.plexiglas.com/export/sites/plexiglas/.content/medias/downloads/sheet-docs/plexiglas-general-information-and-physical-properties.pdf>



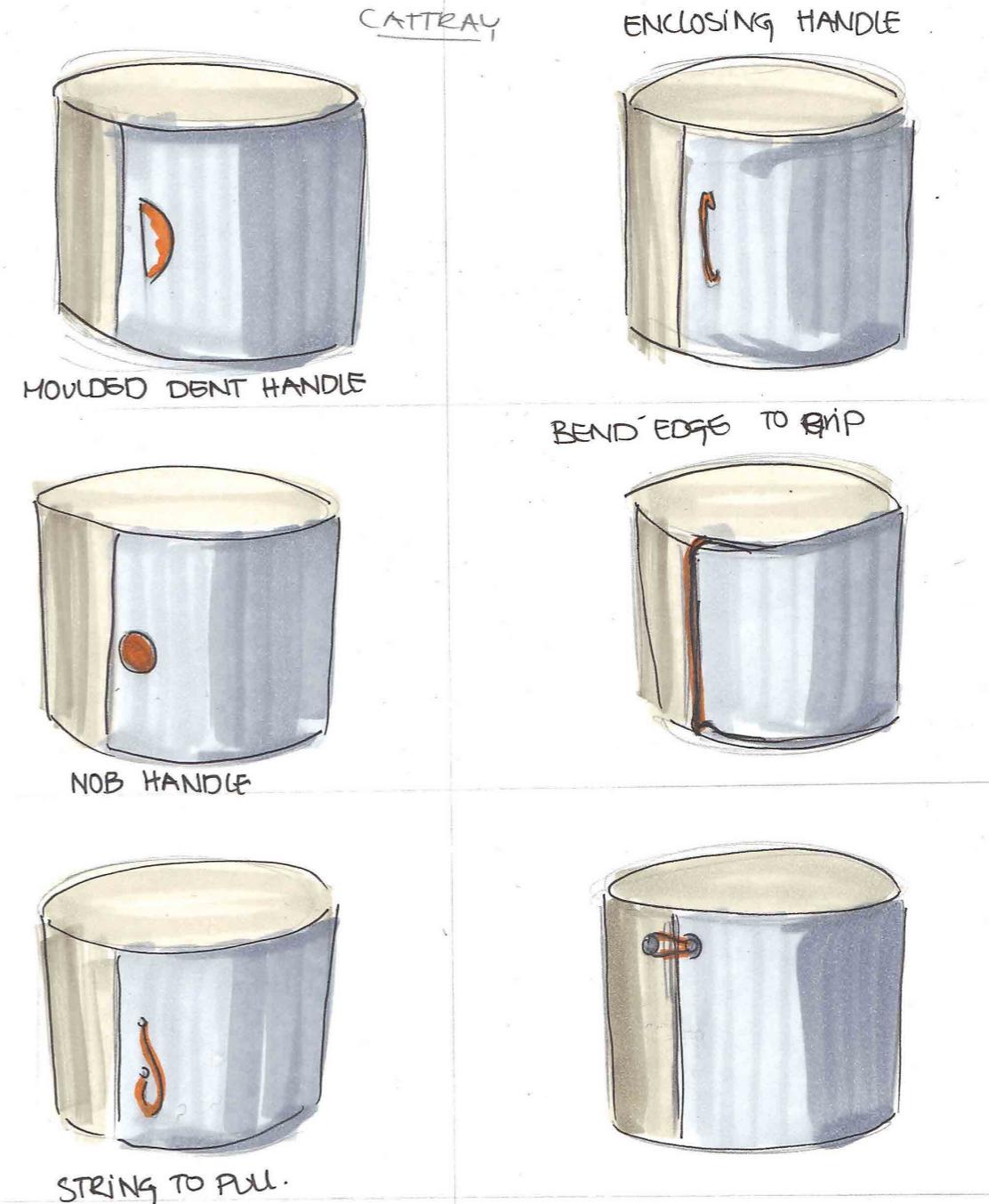
# 8.17 List of materials

Below is a list conducted in the initiation of the ideation, noting the properties of each material down. The list have been utilized to select specific groups of materials to look further into to find the right one for each component.

	METALS	PLASTICS	ORGANIC/WOOD	ALTERNATIVE	ALTERNATIVE	CONCLUSION
FRAME	High strength Easy manufacturing High density Cold surface Sharp edges	Light weight Highly customizable Cheap Fairly durable Fairly good strength	High strength Easy manufacturing Warm surface Absorbs liquids Not hygienic	Laminate Easy manufacturing Highly customizable Durable Light weight		Laminate posses a lot of the properties this element requires. It might not be strong enough to stand alone, but can easily be combined with metal to enforce the strength
GATE	High strength Simple construction Sterile look	Softer look High customizability Strength?	Low durability Soft look chewable	Rubber Flexible Low durability Easy to clean	Plexiglas Light look High strength Easy to manufacture	By combining metal and Plexiglas a lighter and more pleasant looking gate can be constructed.
COVER	High strength Easy manufacturing High density	High strength Easy manufacturing Customizable	Low durability Exclusive look Expensive	Polymer Felt Light weight Cheap and eco friendly Easy manufacturing	Fabrics Lightweight Cannot stand alone Low durability	Polymer felt is an ideal solution for this elements since it is cheap, durable, sound proofing and a scratch friendly surface
SLIDER	Easy manufacturing Good sliding abilities when combined with plastics	Easy manufacturing Good sliding abilities when combined with metals	Hard to manufacture Low durability when sliding	Nylon Self lubricating plastic Cheap to use		A combination of nylon and metal is very used when constructing sliders because the two slide gently towards each other.
TRAY	Easy manufacturing Chemical tolerant Not what cats prefer	Easy manufacturing Can be tailored to fit environment Commonly used in trays	Not considered			The tray will be manufactured from plastic to keep it light and ensure that it is easy to clean.
TRAY FRAME	High strength Easy to collect from standard sheets Cold surface and sharp edges	Light weight Highly customizable Many options of manufacturing Can be made to withstand environment	Not an option for element	Polymer Felt Incorporates well with filters Non hygienic Not durable		Plastics are the most obvious choice since it can be shaped, customizes and developed to withstand the conditions in the tray perfectly.

# 8.18 Tray opening

To ensure that the desired motion of the tray was accomplished, a study of how the handle affects the motion is done. Below is a selection of options for how this feature could work.



## 8.19 Tray size study

During a visit at a selection of pet stores in the area the general selection of cat trays was investigated to provide a better understanding of which sizes the cats demand. Below is a picture of three different trays, which presents the smallest and biggest in the selection. The smallest tray is designed for kittens and is not advised for adult cats. The two bigger sizes measure close to the 1.5 times the cat size which is recommended and this size is the aim to incorporate in the product.



## 8.20 Spine calculations

Compact spine:

Size (measurments from SolidWorks):  
7121.7mm<sup>2</sup> -> 0.0071217m<sup>2</sup>

$0.0071271 * 1.852m = 0.01318m^3$

1800kg/m<sup>3</sup> (Dansheet Fiberline)

$1800 * 0.01318 = 23,74kg$

Material reduced spine:

Size (measurments from SoliwWorks)  
3129mm<sup>2</sup> -> 0.003129m<sup>2</sup>

$0.003129 * 1.852m = 0.0057949m^3$

1800kg/m<sup>3</sup> (Dansheet Fiberline)

$1800 * 0.0057949 = 10.43kg$

## 8.21 Foundation calculation

Weight calculations steel:

D1 = 50.2cm  
D2 = 48.6cm

$Pi * 50.2 = 157.7 \text{ cm}$   
 $Pi * 48.6 = 152.68 \text{ cm}$

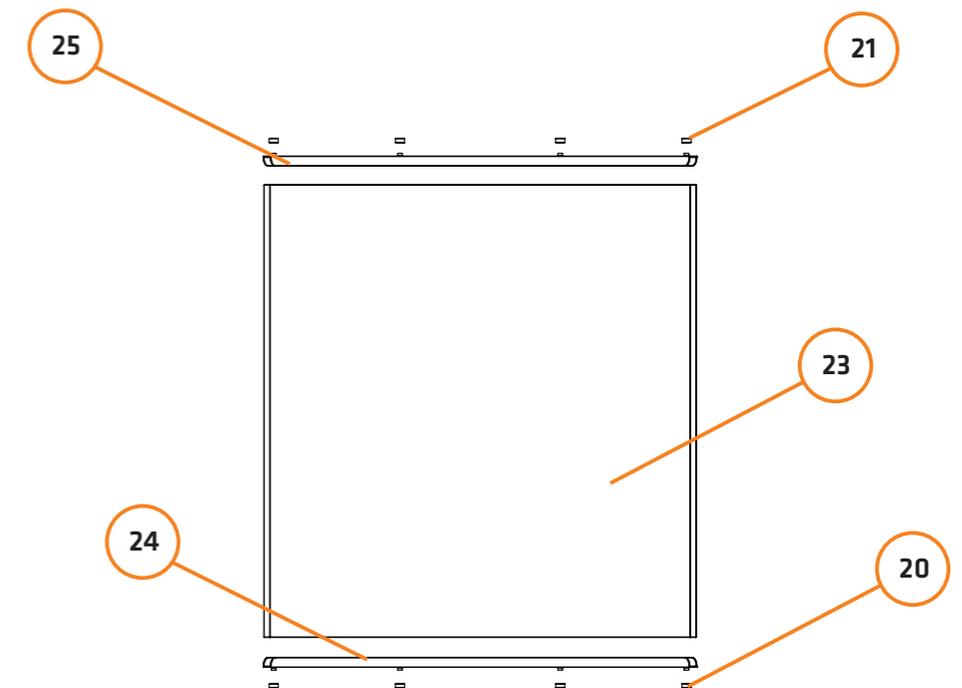
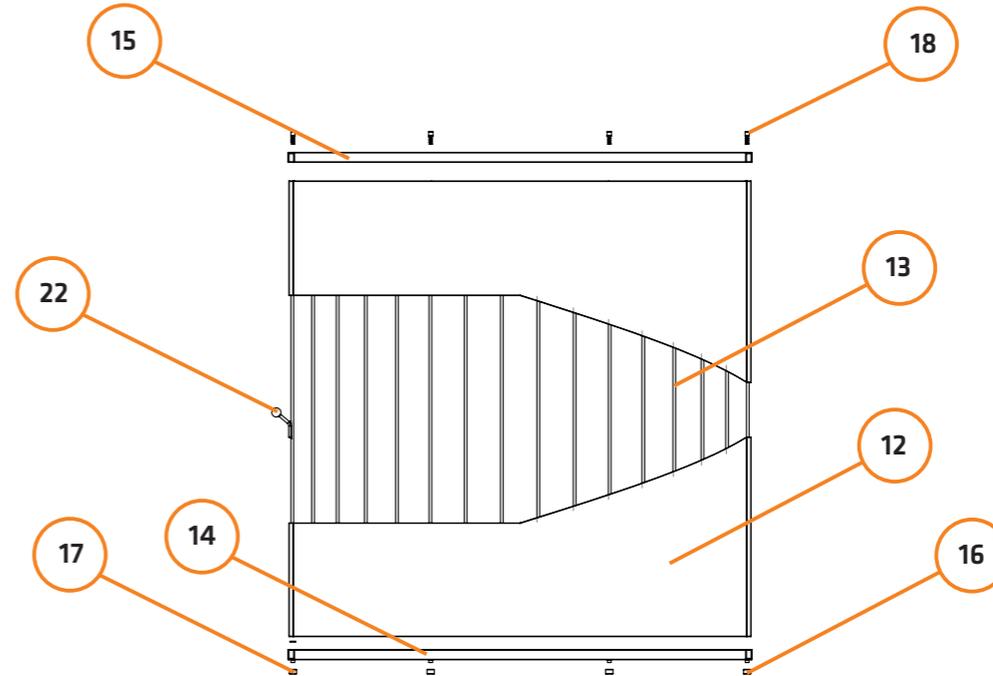
$157.7 + 152.68 * 30 = 9311.4 \text{ cm}^2$

$9311.4 \text{ cm}^2 \rightarrow 0.913 \text{ m}^2$

2mm sheet = 15kg/m<sup>2</sup> (kilde)

$0.931 * 15 = 13.96kg$

## 8.22 BOM part view



## 8.23 Ketty Home

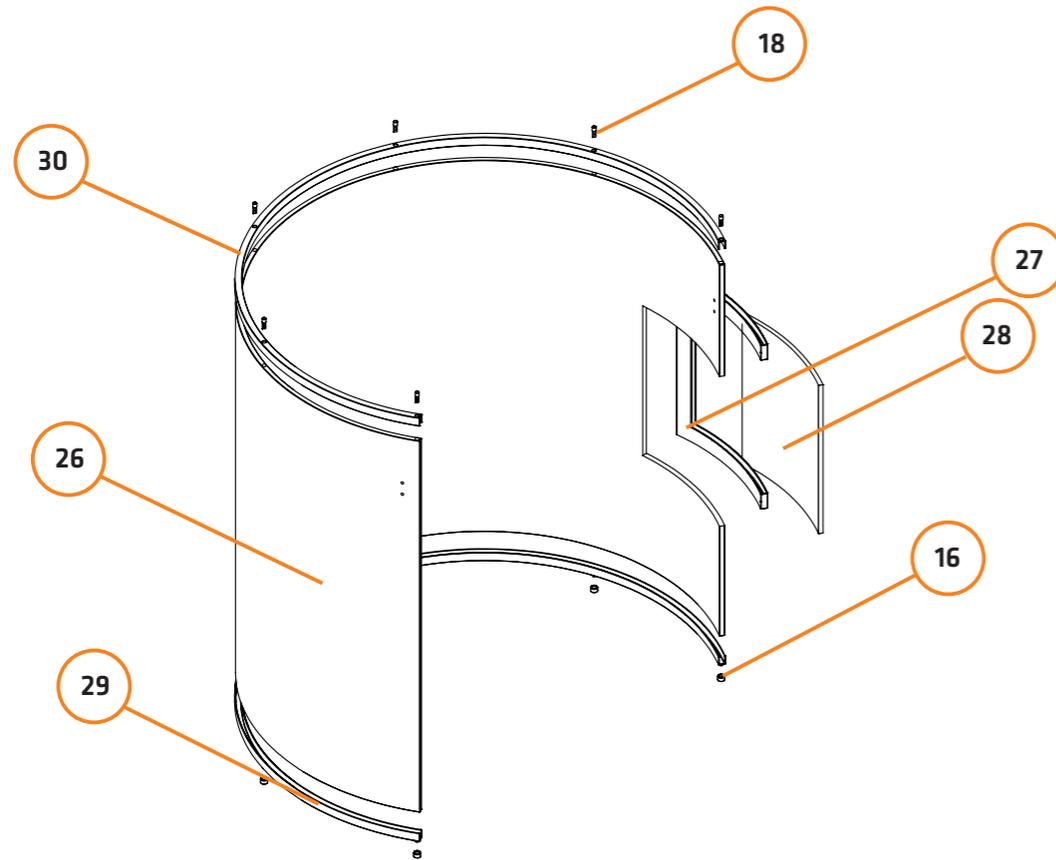
To bring the Ketty system into the private setting a project called Ketty Home is initiated. Below is a list of the first suggestions to what such a line must consist of:

A foundation designed with the purpose of bringing stability to the cover/wall and to form a small comfortable cat space.

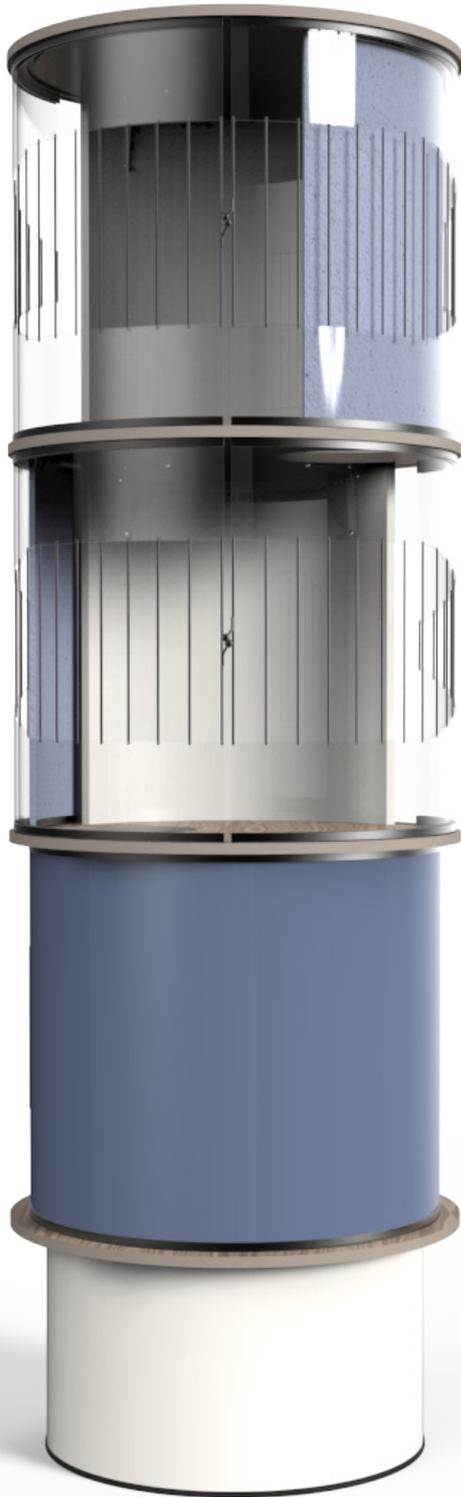
A heating device which can be inserted in the center hole to make sure that the cat always has a warm place to stay is designed. The heating device is solar powered and since cats love to stay in the sun it is ideal to place the small cat house in the sun to charge the heating device.

A set of food bowls which can be clipped onto the foundation and a brush tool which can be mounted on the edge of the cover to help the cat brush itself. The brush is made from silicone rubber and can easily be washed.

A cover for the little compartment is developed to make the small home portable. This allows the owner to bring the cat to the vet in its favorite place.

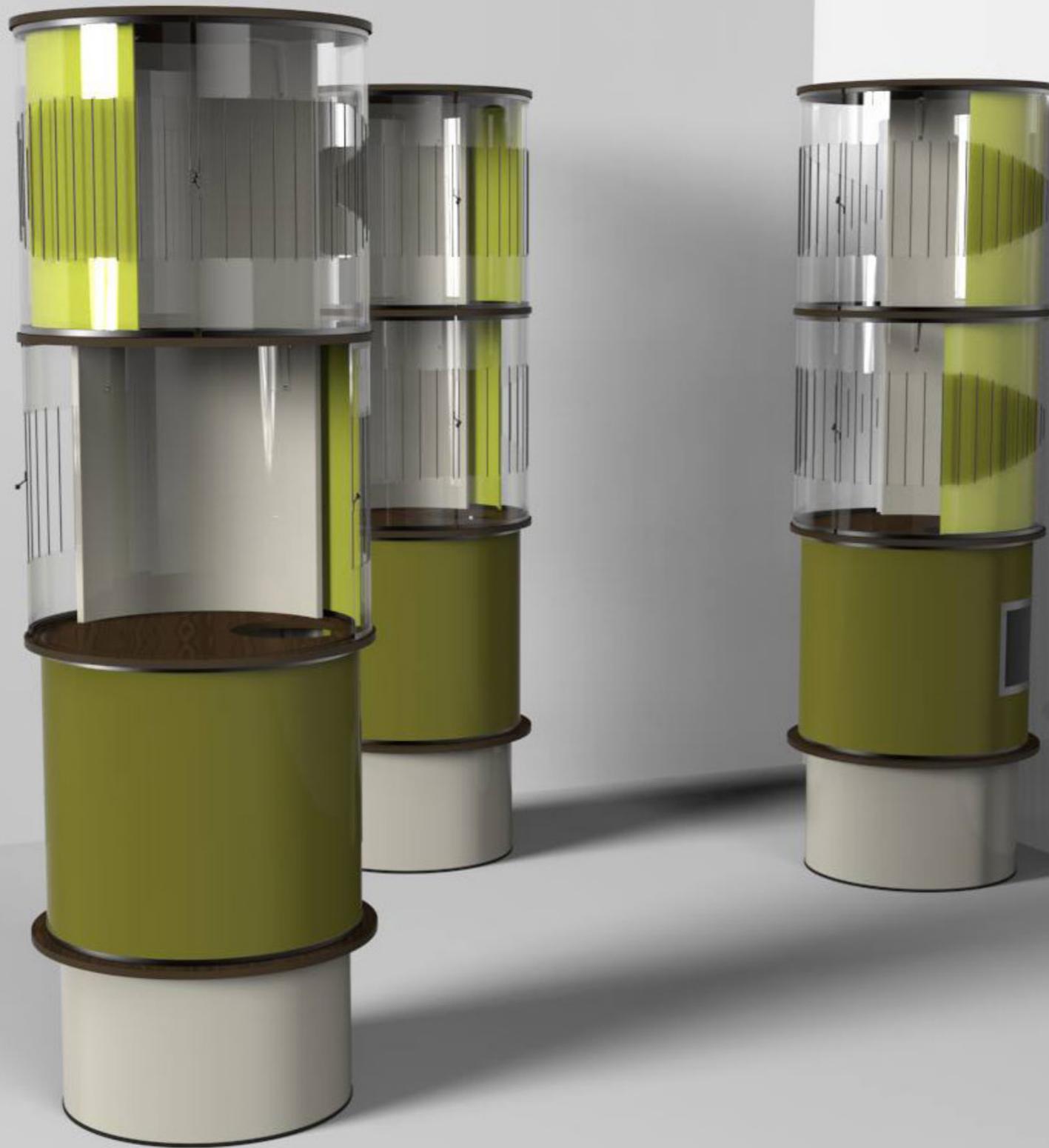






# Ketty

system



# Title page

Title	Ketty System
Project theme	Shelter compartments
Study programme	Master's thesis
Project period	02.02.15 - 27.05.15
Project group	MSc 04 - IDog
Company cooperations	Kattens Værn, Aalborg
Main supervisor	Kaare Eriksen
Technical supervisor	Mikael Larsen

## Synopsis

Ketty is a project developed to increase the customer experience at cat shelters as well as heighten the life quality of the cats that are living in the cages by having incorporated features specially developed to fit felines. The system also provides the shelter staff with many advantages which will make their daily routines easier.

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**Pernille Thougard Petersen**

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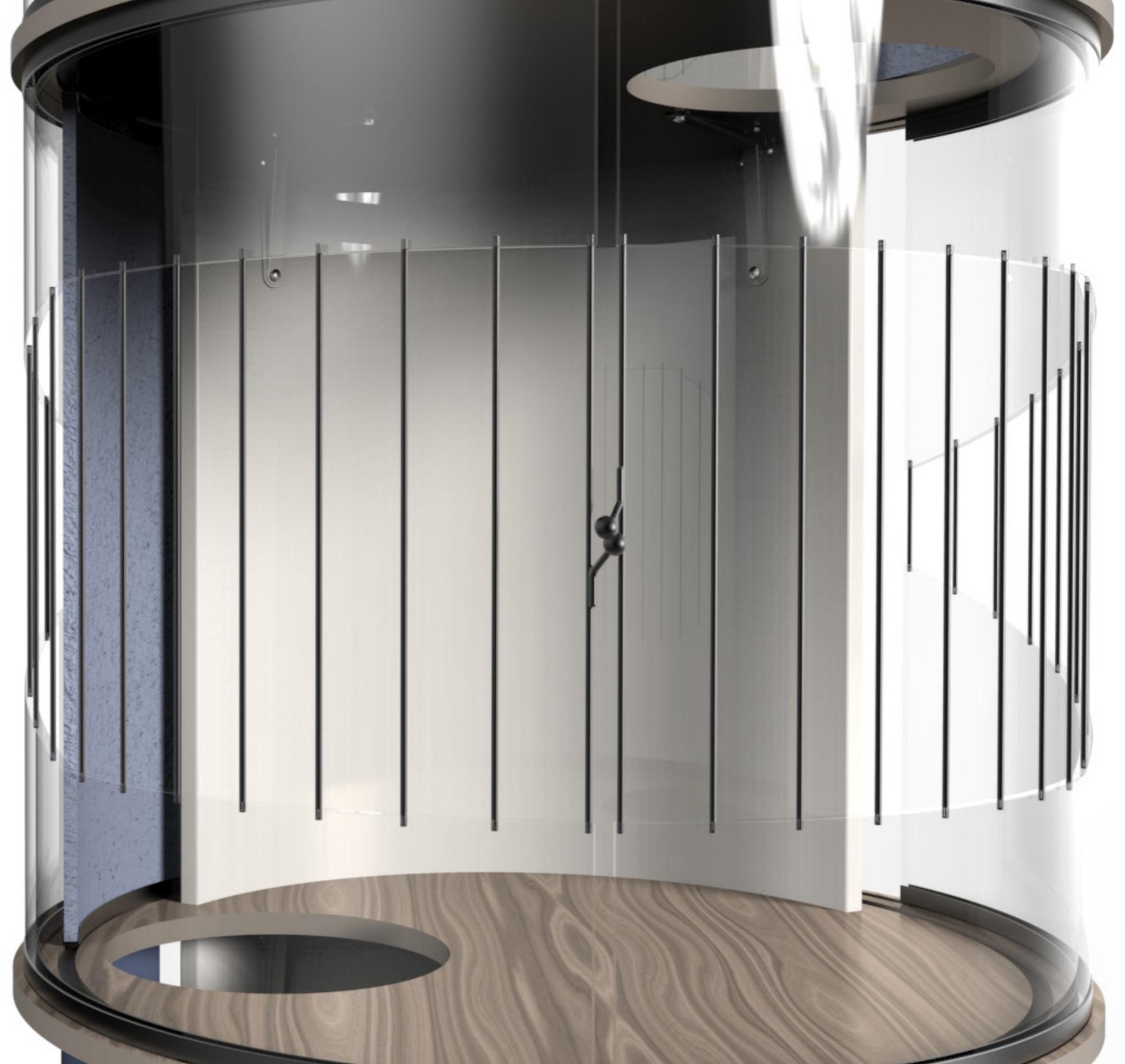
**Suzette Andersen**

# Ketty system

Ketty Systems is a flexible compartments system for cats at shelters that can be fitted for any room and any situation. The system is specially developed to give the potential new owners a much better experience when visiting a shelter, by having a panoramic view of the cats and a tailored opening mechanism which allows the user to have complete control over the cat while interacting with it.

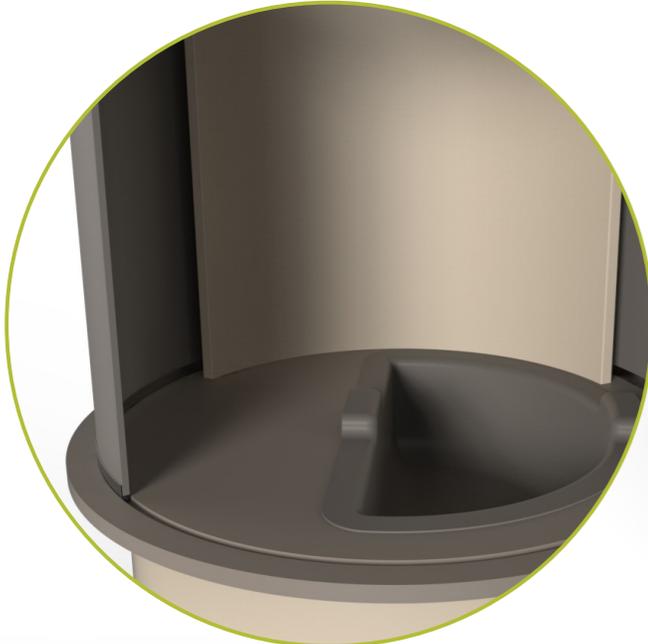
## Content

<b>Ketty system</b>	<b>4</b>
<b>Ketty a multiple compartment system</b>	<b>6</b>
<b>Ketty for Cats</b>	<b>8</b>
<b>Meeting the cats made easy</b>	<b>11</b>
<b>Ketty in any situation</b>	<b>12</b>
<b>Bring it home</b>	<b>14</b>
<b>No more mess</b>	<b>16</b>
<b>Customization</b>	<b>18</b>
<b>Product properties</b>	<b>19</b>

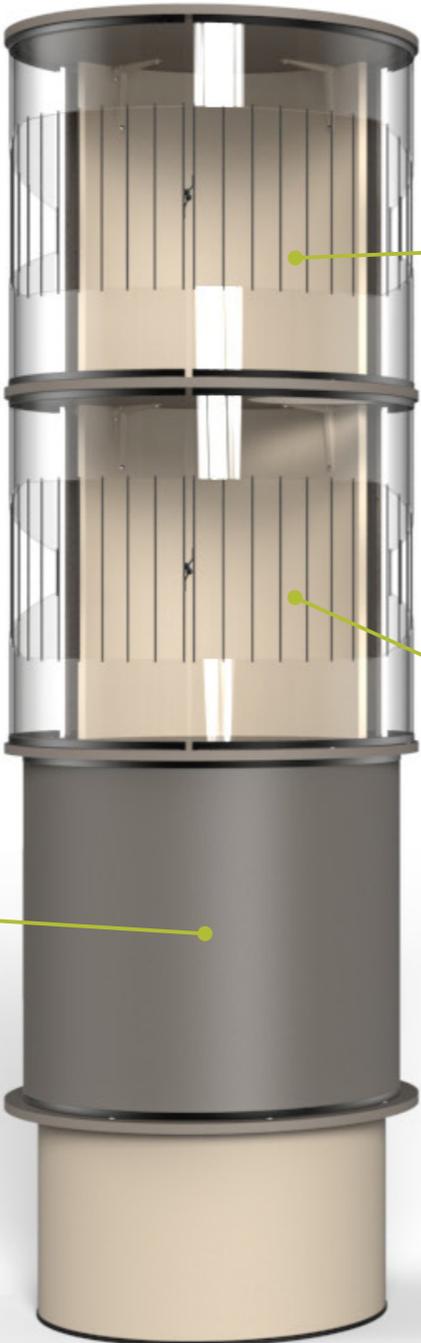


# Ketty a multiple compartment system

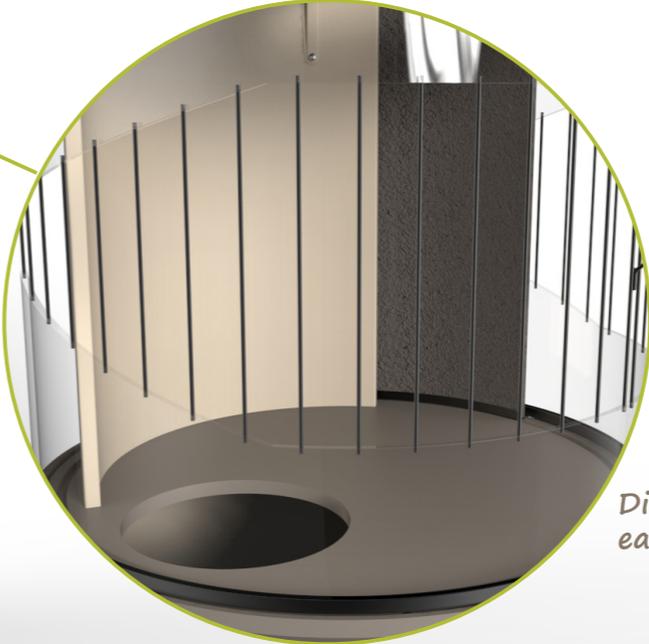
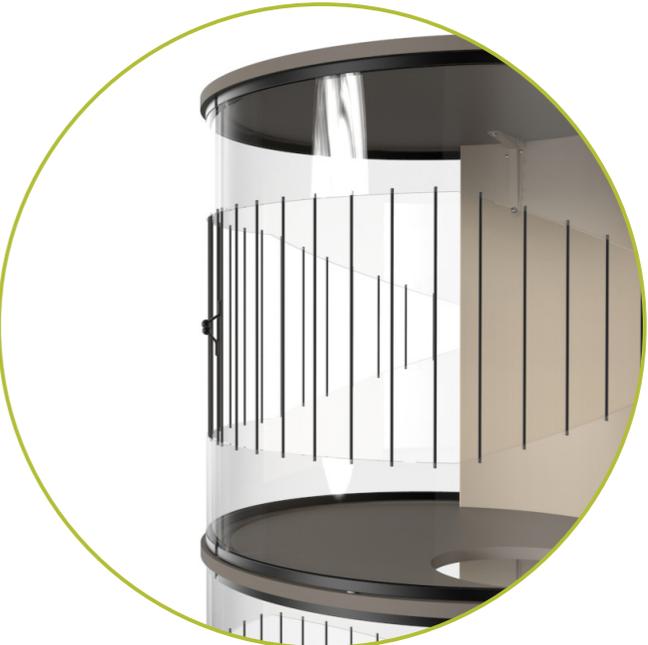
Ketty is a compartments system consisting of three levels which are all developed with a specific purpose. The bottom tier is used for the cat tray, to shield the unpleasant look of stools and to ensure that the smells are filtered before venturing into the room. The second tier is designed with the purpose of functioning as a dining area where the food bowl can be placed to separate it from the living space which is meant to be the top tier. This is a perfectly designed sectioning for cats because they prefer to stay in taller areas and they do not like to stay close to food or stools.



*Cat tray area, that are closed of from the rest of the compartment.*



*Living space, where the cat can lie and have e great overview of the situation.*



*Dinning area, a place where the cat can eat and have a living space.*

## Ketty for Cats

Ketty is a system specially designed to fit a cats needs because they are quite particular animals and have strong preferences and territorial instincts. Therefore, Ketty is a one cat system which allows the cat to explore multiple storages of its current housing.

The storages have multiple functions, such as earlier mentioned separation of routines. The system have an incorporated shielding mechanism which also functions as a scratcher to ensure that the cat always have something to scratch in.

Another feature which is incorporated to ensure that the cat stays stimulated is the jumping between the levels, which ensure that the muscles and tendons are used so that they don't go fragile.

The final feature is the use of the products tall silhouette to make sure that every cat has the option of staying at a great lookout position, even when it is in its cage.





## Meeting the cats made easy

Ketty is a completely new way to meet the cat at a shelter and is developed with a focus on improving the interaction between new potential owner and the shelter cat without the interference of the employee.

The first impression a customer form of a cat is at first glance and therefore Ketty is equipped with a panoramic interaction surface which makes it much easier for the customers to visualize all of the cats at once and thereafter they can approach the cat to come in contact with it. When the contact is established Ketty's safe open feature is brought to use.

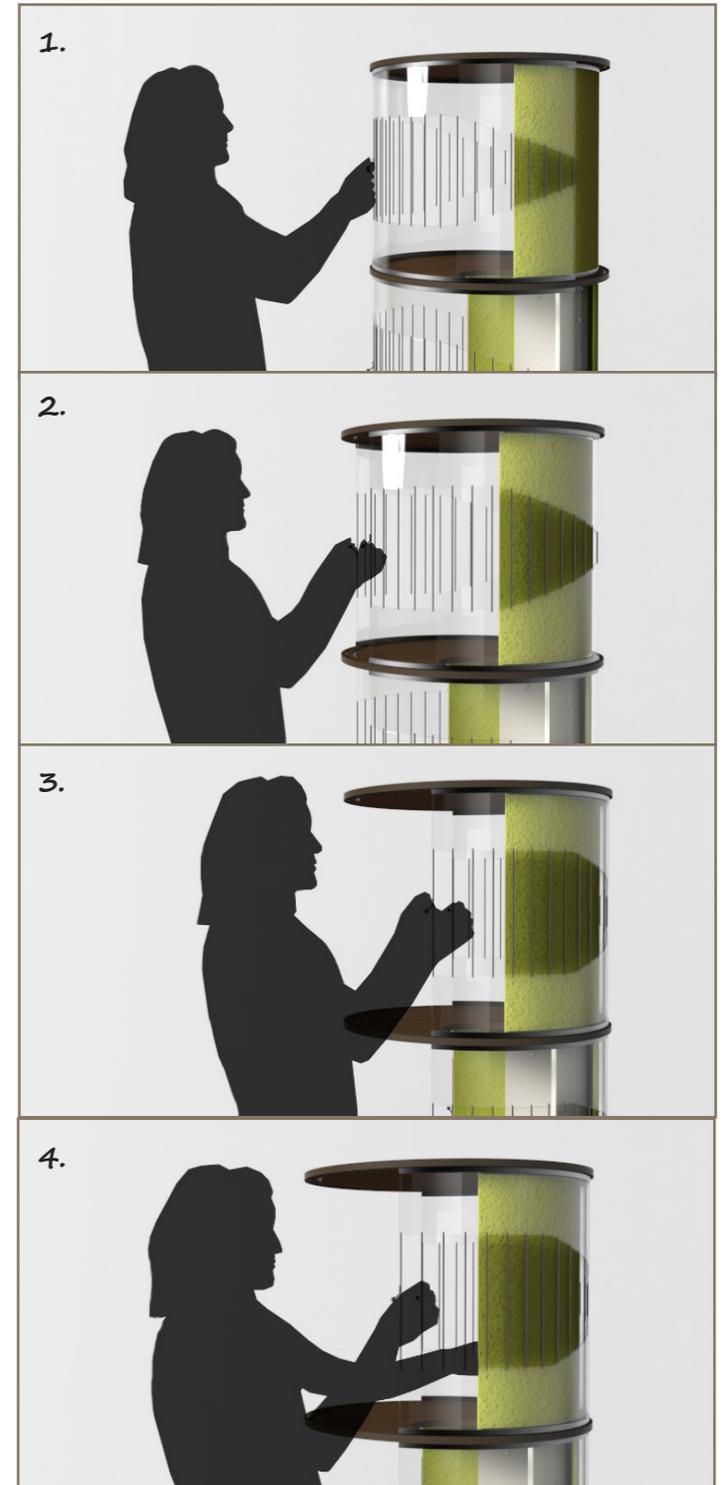
Safe open is a new way of approaching the motion of opening a cage. Here the gates split in the middle, making it easy to grab them and slide them backwards. This means that the gate does not take up space in the room and does not become an obstacle to the customer. When the motion of pushing back the gates are done the customer will automatically form an encapsulating circle with their arms which contains the cat. Hereby the control of the meeting with the cat is much higher.

*Step 1, unlock the lock.*

*Step 2, open until a snap, here it is already possible to interact with the cat.*

*Step 3, open the gates further - it will again snap when it is all open.*

*Step 4, Interact with the cat with full control.*

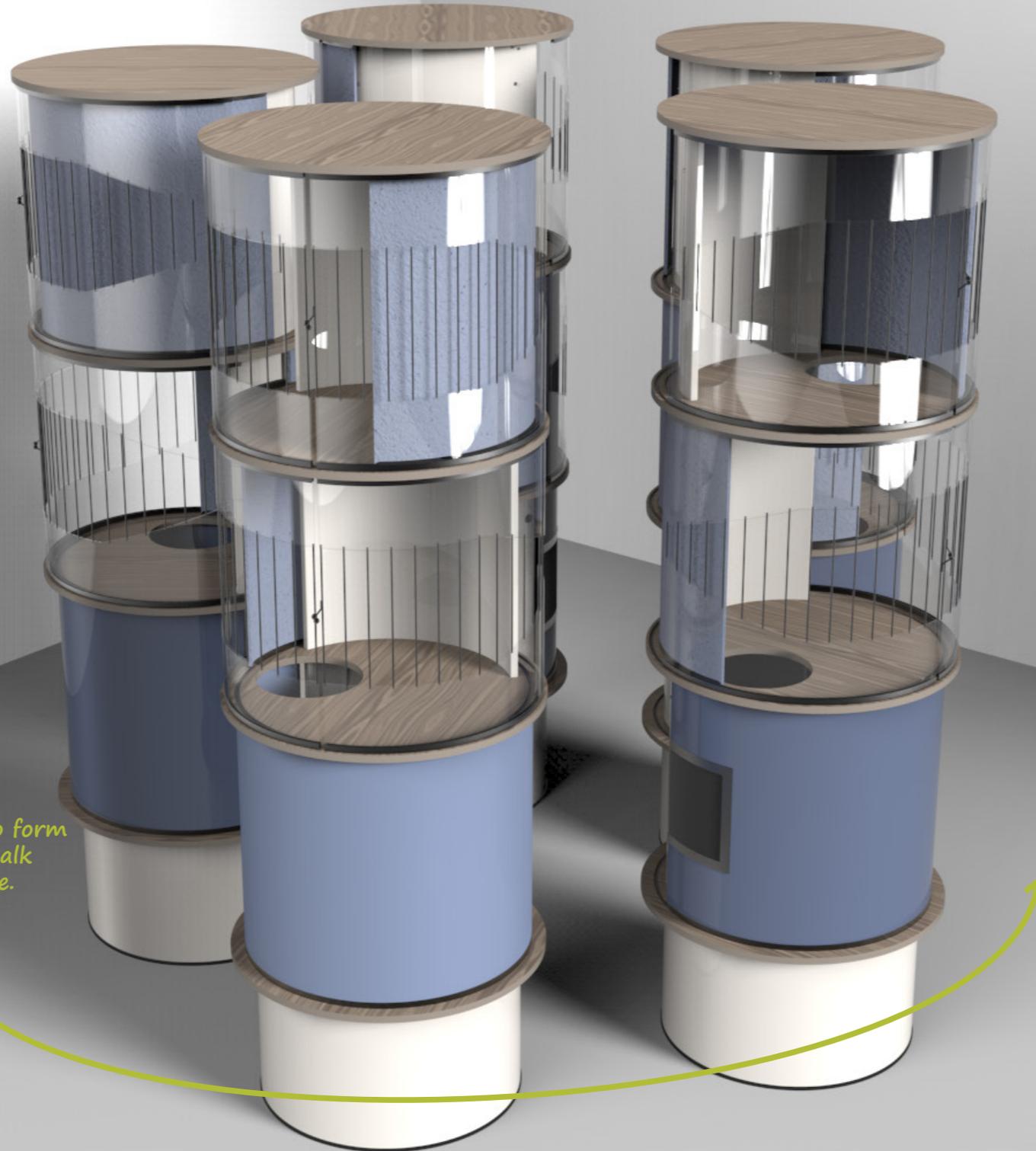


## Ketty in any situation

The system is constructed to fit into any shelter constellation no matter the amount of space available. By utilizing the vertical space, Ketty does not take up more space than any of the old cages, but it creates more.

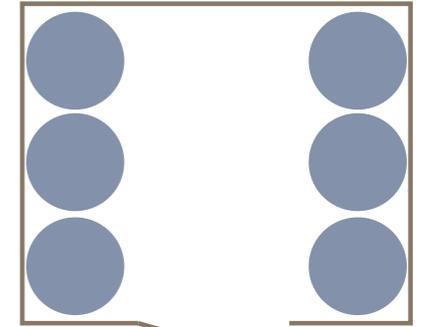
Because Ketty is a standalone element it can be placed wherever it fits and it can even be used to create a room dividing feeling because of its tall slim posture. To illustrate some of the suggested ways to position the system a collection of ideas are shown on next page, but only the imagination sets the limits.

An additional feature of ketty is that all of the elements are customizable so they can be made to fit any organization, desired expression or culture.

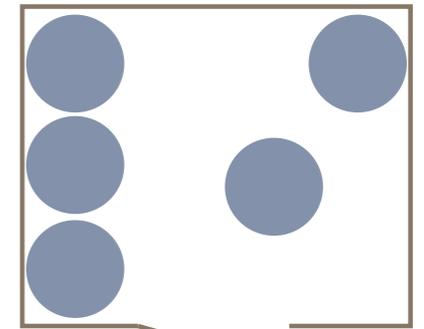


*Five New Nordic systems, placed to form a circle, which the customer can walk around to focus on one cat at a time.*

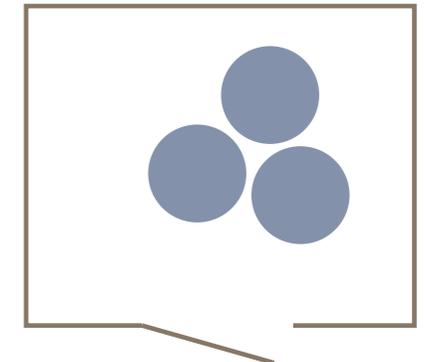
*Simple placement of the compartments.*



*Simple placement of the compartments, with a touch of imagination.*



*Dynamic and creative placement of the compartments.*

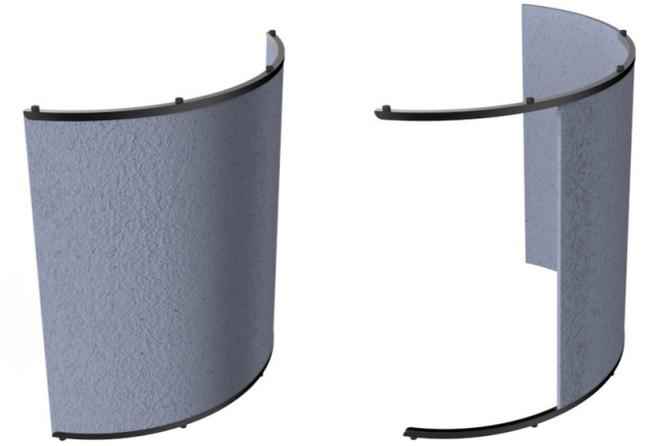
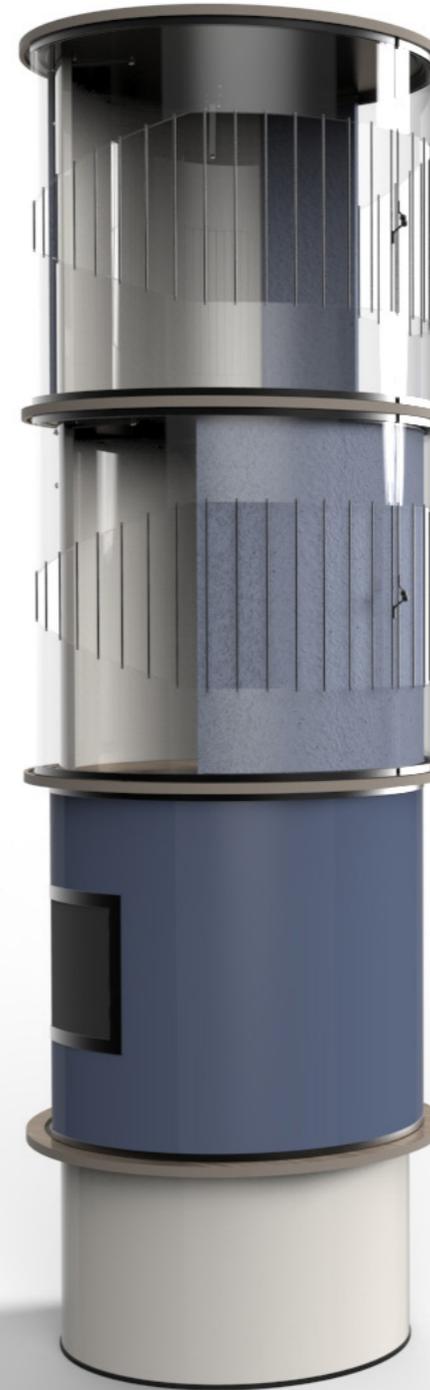
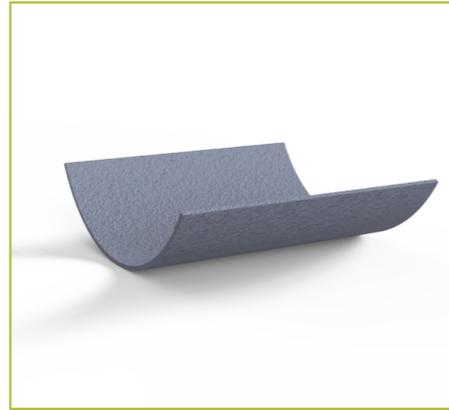
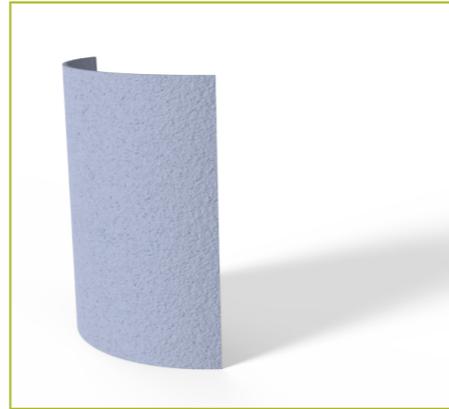


## Bring it home

When disseminating cats one of the biggest concerns is if the cat will get a good new home and by using the Ketty system you can take the first step in ensuring this by making sure that the cat already has a comfort zone when it arrives at the new home. This is done with the covers used to shield the cat, because these covers can be removed and sold to the customers when they bring home the cat.

Because the cat have had its daily life close to the covers it already marked it with its scents, and it is therefore its territory, and by bringing that into the new home, the cat will feel safe. The cover can be used as a multifunctional toy and have three recommended positions; used as a bridge to hide under or sit on top of, a rocking chair or a wall which can create a small room for the cat.

*Stimulation – the cat can hide under the cover or play on it and be stimulated by scratching it. The cover can also be placed in a corner to create a shield.*



*The covers are placed in frames when they are used in the compartment system.*

*The covers is a giveaway item, whereas the frames are ment to be kept at the shelter.*

*To give away the covers they are slid out of the frames and then given to the customers.*

## No more mess

All of the integrated features in the Ketty system are designed with the specific objective of making it easier to be a shelter employee.

One of the biggest issues at shelters now is the spread of litter from the cat tray, but in the specially constructed tray that is placed inside Ketty, the litter will be contained in the bottom section to ease the cleaning process. The tray features a pocket for a carbon filter to minimize the fumes from the tray and a complete cover, which hides the tray and lets the cat do its business in privacy. The tray is placed in a cutout inside the compartment and can easily be removed to be cleaned.

The cover, which shields the tray, are also developed with paying attention to cleaning and therefore these can be clicked out of the system to be given a thorough cleaning in the dish washer.

Ketty is constructed from materials which all can withstand normal wear like scratching, dirt, detergents and feces.



*Cats don't like to use a cat tray near where they eat and drink.*

*The litter won't spread to the two top level in the compartment, which will ease the cleaning situation and create a better environment for the cat.*

*Ketty system uses standard Carbon filters from pet stores.*



*It is easy to remove the tray from the compartment, when cleaning is needed.*

## Customization

Ketty comes in three predefined looks depending on the desired look for your shelter.

**Standard:** The use of classic grey tones ensures that the cage can be successfully installed in any context and by utilizing the different tones the cage have a visual depth which will assign all the attention to the cat.

**Forest:** The warmth of the nature of Scandinavia is brought into this combination with the green and earthy tones to make out a warm and

welcoming room. The compartment floors are covered with a deep dark wood surface to enhance the warmth.

**New nordic:** The new Nordic style gives a calming expression to the system with its soft, light and slightly dusty shades combined with the use of wood surfaces to bring the natural aspect into the room. The storages are lined with brass to create some light, reflections and dynamic in the look.

**Color combination 1**  
Standard



**Color combination 2**  
New nordic



**Color combination 3**  
Forest



## Product properties

### Installing the system

Ketty is a system which is developed to make sure that everyone can assemble it with no problem. It consists of a spine which must be mounted in the foundation and thereafter all that is needed to be done is to slide the discs onto the spine. If a larger number of compartments are ordered at the same time a craftsman can be sent to construct the systems.

### Moving it

The system can be moved, but due to its strong stability and high weight it is advised that the system is not handled by one person but two. There are two options when moving Ketty; either it can be carried to the desired position in its full weight or it can be disassembled to make the transport a bit smoother.

### Cleaning

Ketty is manufactured in materials specially fitted to the harsh environment of animal cages, and can therefore easily be cleaned with any detergent or sanitation appliances. Since the gates are made from Plexiglas it is advised that these are cleaned with a clean, moist cloth to avoid leaving stains and to decharge the material.

### Maintenance

The maintenance of the system is minimal but scratches can occur in the Plexiglas gates, these can easily be removed by the use of a bit of wax. By applying a thin layer of wax the scratches will seem less visible and won't be an obstruction to admiring customers. If any of the parts of the system is damaged or breaks, it can always be replaced with a new spare part instead of having to discard the entire unit.

Properties	
Size	H: 185.2 cm      W: 60 cm
Weight	42 kg
Materials	Fiberglas, Laminate, Plexiglas, Steel, PET
Chemical resistance	Resists all detergents
Water resistance	Resists water

## Pricelist

Unit	Price
Standard System	9.995 DKK
Forest System	12.995 DKK
New Nordic System	15.995 DKK
Customized System	Price upon request
Disc (spare part)	995 DKK
Gate (spare part)	895 DKK
Cover (minimum order of 100 units)	60 DKK pr. unit
Craftsman	150 DKK/hour

