

A photograph of two children walking on a paved residential street. The child on the left is a toddler wearing a bright yellow-green high-visibility vest over a red long-sleeved shirt and black pants. The child on the right is a young girl wearing an orange high-visibility vest over a pink long-sleeved shirt and light blue jeans. They are holding hands. In the background, there is a white and red motorhome with a license plate 'DCF 564' and a house with a red roof. The text 'Visibility clothing for children' is overlaid in white on the right side of the image.

Visibility clothing for children

Thesis work by Åsa Jansson at the Division of Industrial Design,
Lund Institute of Technology at Lund University, May 2006.

ABSTRACT

This degreework was initiated by a brief email send form the department of design science at Lund Institute of Technology, Lund University. It was an invitation from the company Reflectil Sverige AB about their interest to renew their selection of non-professional high visibility garment. The companies demand was to broaden their selection of non-professional high visibility garment. They wanted to improve their brand Sportlite towards a more attractive and modern design.

My intention was to make a more tailored product with personality without renouncing its main functions - to attract attention and safety. I wanted to see how I could improve Reflectil Sverige AB 's selection of non-professional high visibility garment without diverge from the European standard, EN-1150.

I choose to limit my target group to children, even though a product like this is something that can be of benefit to everyone. I wanted to work with children as the target group since children are less aware of dangerous situations, they are curious and likes to experience things. This sometime makes them unpredictable.

I assumed that this kind of additional accessory garment is supposed to be used any time and any where. This means it can be worn during the whole year. Since the choice of clothing differ from one season to another it affected the design. I came to the conclusion that the design of my visibility garment must be convenient and easy to put on and off. It must also be adjustable depending on what one is wearing under the accessory. I solved this by making my vest as an open piece that easily can be put on over the head, without having to pull the arms through any armpits. After that the vest is fastened with Velcro in each side of the waist.

Because I wanted to give my vest an own identity I also made a suggestion of a trademark. The inspiration for this was the cat species eye. The cat species have excellent night vision and their eyes also reflects light. The retroreflective area around the waist is also inspired by these animals. Of course this retroreflective decoration can be designed in many ways as long as it fulfil the European standard.

FOREWORD

This is the documentation of my diploma work in industrial design at the Department of Design science at Lund Institute of Technology, Lund University. The work took place during the spring semester of 2006, and is equivalent to 20 university credit points. I call my work Visibility clothing for children.

With the existence of this document I would like to give an insight and an understanding of the design methodology I have applied to solve the problem of visibility clothing for children.

When the time had come to decide a diploma work my aim was to make contact with a company that had a current task to solve. Through a circular email send from the Department of Design science at Lund Institute of Technology, I got to know about the company Reflectil Sverige AB and their interest to renew their selection of high-visibility garment. The project seemed interesting since I have an interest in clothing as a functional equipment. I contacted Petter Högvard, VD at Reflectil Sverige AB. We agreed on that within the frame of my diploma work I would develop and propose a prototype of a non-professional high visibility garment.

Furthermore I wanted to have an external supervisor, i.e. a working industrial designer, to receive more insight of the working procedures involved. Therefore I contacted Gert Hanner, Design Manager at Avalon Technology in Helsingborg. He accepted to be my external supervisor. My in-house supervisor at the Department of Design science was Eva Wängelin, Ph D student.

documentation

design

synthesis

solution-finding

intro.

research

presentation

December	January	February	March	April	May	June
	1 market research	company meeting final task target definition	design concepts supervision Avalon technology, Gert Hanner		18	
49	analysis & definition of target group	idea generation form & usage	10 company meeting Nordic fabric fair, Borås	14 usage technical description engineering	fully detailed mock up	23
	2 context analysis		evaluation validation correction	15 company meeting	19	final presentation of my diploma work
50	brief preliminary task	7	11		20	24
	3 supervision Avalon technology, Gert Hanner			16 <i>ESTER HOLIDAY</i>		
51	visiting company to get more information	8	12 selection optimization		final design	25
	4 function analysis requirements	supervision Avalon technology, Gert Hanner	mock up	17 supervision Avalon technology, Gert Hanner	21 presentation-work	
52		9	13			26
	5				22	

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Aim

The aim has been to analyse and define when it is suitable to wear a high visibility garment as well as who the target group is that wear this kind of clothing and also who the consumer is. The intention was to make a more tailored product with personality without renouncing its main functions, to attract attention and ensure personal safety. I had a vision of designing a product that defines a new family of products in the category of protective clothing for non-professional use. Furthermore my vision was to make a garment that separates from similar products on today's market.

Definition

There is a difference due to the European Standard between professional and non-professional visibility garment. To a less versed person there is no noticeable difference between these two categories. In the design I wanted to improve Reflectil Sverige AB's selection of non-professional high visibility garment without diverging from the European standard, EN-1150. The company wanted an attractive product. I believe that the meaning of attractive is not the same among all generations, so I decided to define a target group based on one generation.

Condition

During the work Reflectil has helped with valuable information about the European standard as well as technical information about possible manufacturing methods. To evaluate the work during the design process regular meetings were arranged with the company. My external supervisor Gert Hanner was also able to give me an insight of what design methods that could be used as a working industrial designer.

INTRODUCTION // THE COMPANY

Reflectil Sverige AB form a part of the Reflectil Group, which is a Norwegian based company that operates in the area of personal visibility in several countries throughout Europe. Their business areas are high visibility garment and to convert reflective material.

The company has both production and logistic services in Portugal and China. Their export market is mainly concentrated to Norway and Sweden. Reflectil owns the brand Sportlite, which is their trademark for non-professional high visibility garment.

The company has also for many years been involved in the development of the European standards for high visibility garment.

The waistcoats of today >>
and their package.



To improve Reflectil 's brand Sportlite towards a more attractive and modern design.

Reflectile Sverige AB wish to refresh their selection of privately used visibility garment to improve their market position of protective clothing. The company has a vision of a conspicuous commodity, desirable to the consumer.

INTRODUCTION // FACTS

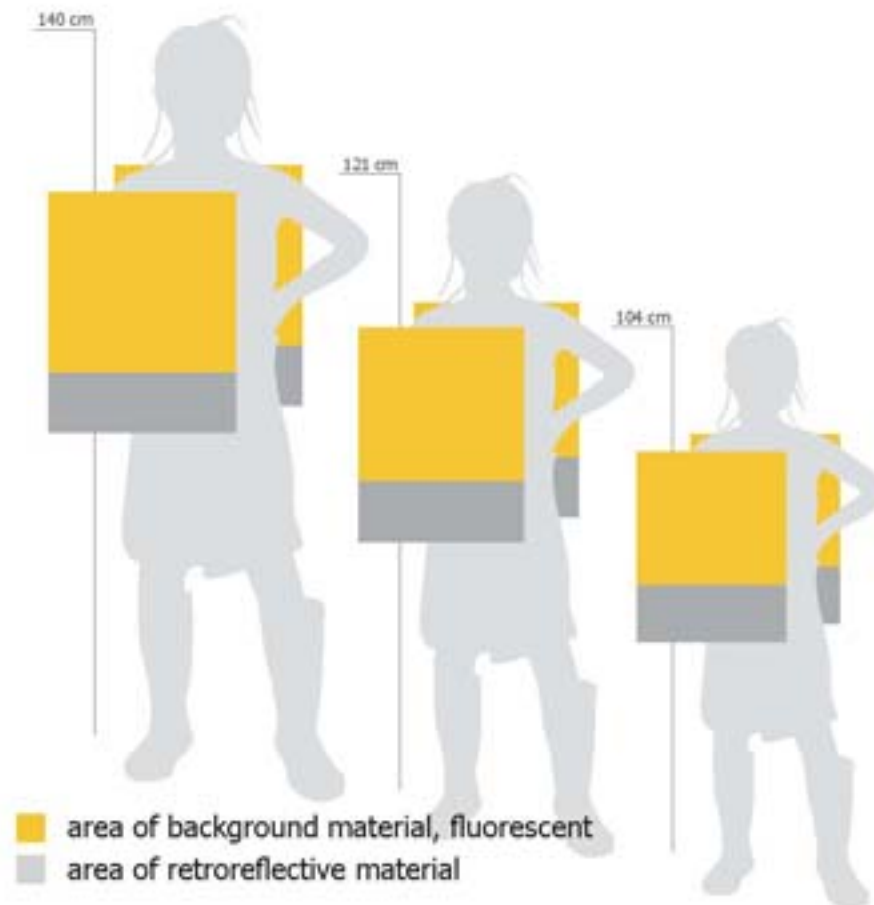
European standard

Accordingly to the European standard EN-1150 there has to be a visible area of fluorescent material as well as a visible area of retroreflective material equally divided on the front and back. Further more there has to be a 25 mm wide stripe of retroreflective material that extends around the waist. If it is impossible to avoid a gap in the stripe it can not be wider than 50 mm.

A fluorescent area

A retroreflective area





The European Standard provides details on the performance of high visibility warning clothing for nonprofessional use together with minimum areas and placement of material to achieve enhanced visibility against most background conditions found in urban and rural situations both day and night.

The area of material is dependant on the height of the wearer and visibility is enhanced by high contrast between the garment and the ambient background.

This standard specifies the optical performance requirements for high visibility clothing to be worn by adults and by juveniles, and design for non-professional use. High visibility clothing for non-professional use is intended to signal the users presence visually in any daylight condition and be illuminated by vehicle headlights or search lights in the dark as well as lit up in urban roads.

The standard is not applicable to accessories that are carried by persons or attached to garments.

RESEARCH

Visibility garment certificated due >>
to the European standard EN-1150.



In my opinion the today's vest is rather impersonal and lack strength of character. The vests ability is to attract attention and make the user more visible. It is also these properties which demands for a product that the user can identify with.

Is there a demand for high visibility clothing?

According to Reflectil Sverige AB the demand for high visibility garment for non-professional use has increased in the last couple of years. They believe in a tougher market with a lot more competitors ahead.

What is high visibility garments?

High visibility garment is protective equipment to make people more visible, which can be desired in many situations.

You can observe these garments on people in exposure situations as for example on people working on the road, policemen, firefighters, etc. These days it is also common to see groups of kindergarten children wearing these visibility vests during excursions.

Where can you observe high visibility garments?


non-professionals >>



professionals >>



Where is the market?



As mentioned earlier it is the Nordic countries which are the principal market to Reflectil Sverige AB's non-professional visibility garment. Current retailers are distributors of company gifts and company clothing as well as sports retailers. Through my market research I found out that there are also possibilities to buy vests on the internet.

The market for my product will probably be the most common sports retailers in Sweden: Team Sportia, Intersport, Sportringen and Stadium.

These retailers are associated with sport items within different categories and to a certain extent also outdoor life. They have a wide range of brands. You can find these dealers over the entire Sweden, mainly in smaller and medium-sized towns, with the exception of Stadium which have their sales activity located in medium-sized towns to bigger cities.

Reflectil Sverige AB also want to see local retailers of children clothes as their future retailers

RESEARCH // MARKET product competitors

I have concentrated the market research to products and brands that in one way or another compete on the market for outdoor equipment which somehow makes the user more visible. This since the advantages of using a reflex is outdoor.

The consumers meet the brand Sportlite through retailers. Therefore the brand has to compete with a number of other brands.

When the consumer is about to buy a visibility accessory I think she or he care more about how to wear it; how it will look on; if it complements the personality more than what kind of standard it fulfil and what that means.



RESEARCH // MARKET
product positioning



The red cross indicates where I would like to position my product among other outdoor equipment with the purpose to make the user more visible.

My intention has been to make a product that attracts the target group as well as the consumer. I wanted the result to be a functional garment and also a garment which the wearer feel proud to wear.

RESEARCH // CONTEXT ANALYSIS

Why should you wear high visibility garment?

to inform of your presence
to feel secure
to warn

Because you care about your life

Applications of a high visibility garment.

outdoor activity

on in lines

cycling

running

going on scooter

active walking

walking the dog

when shovel

car breakdown

outdoor playing in the

residential area

play ground

learning to bike

on a day trip in preschool

going down the hill

with sledge

skateboarding

snow boarding

riding

When being mobile

public transportation

as a pedestrian

biking

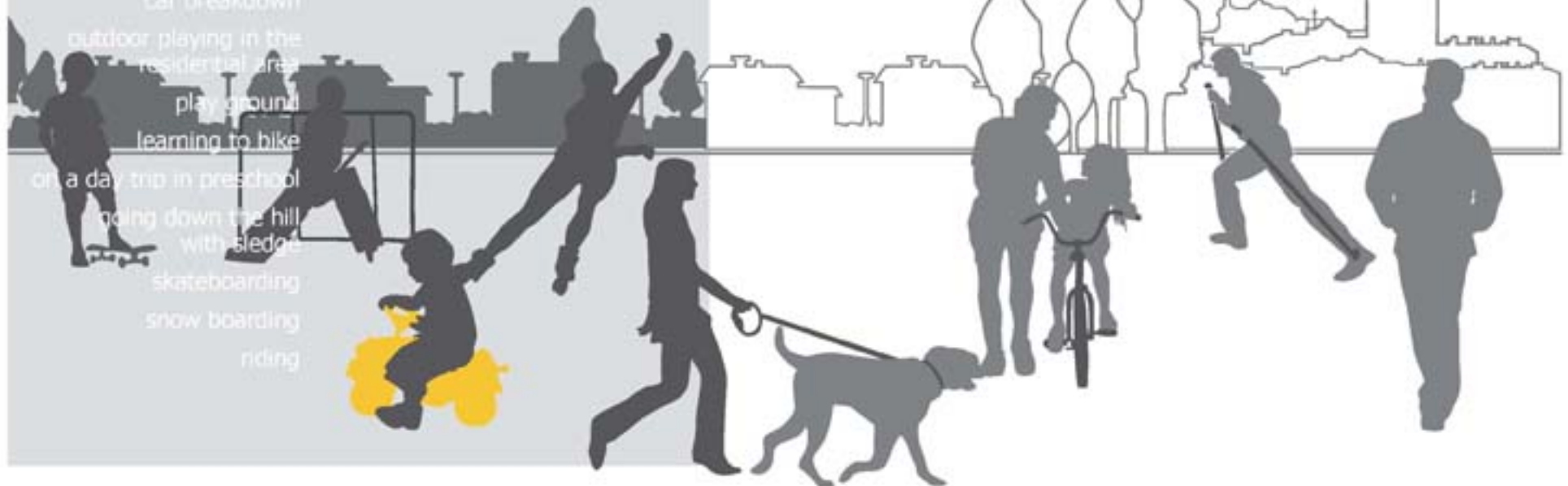
on inlines

going on scooter

When shall you wear high visibility garment?

High visibility garment has advantages when used outdoor at night as well as during any daylight condition and in low visibility situations. When it comes to the brand Sportlite it gives you associations to sport and activity. With this in mind I listed possible occasions where a high visibility garment can be of benefit to a private person. The answer was that a garment like this can be worn any time, any where.

Among all generations, young and old, there is a need to be able to feel safe whenever practicing any kind of outdoor activity. There is a need to be visible and to attract attention of the surroundings, and to make road users aware of the presence of a human being.



RESEARCH // CONTEXT ANALYSIS

product analysis

What is wanted and what is required for a garment that is supposed to be worn any time any where. I came up with several statements about what the product should be like and its properties. Before I had a meeting with the company to discuss the priority of these statements I analysed all functions and judged them in a functional analysis.

usage

carried outside the overgarment

attract attention during daylight as well as at night and in low visibility situations. attract attention

attract attention in searchlights

enhance the feeling of being safe enhance safety

easy to take on and off permit handling

make it possible to manage by oneself

be convenient and something the user approves to wear permit convenience
..... permit movability

an accessory throughout various outdoor activities useful accessory

make it possible to use throughout the seasons utilize seasons

the product itself must not injure the user prevent injure

be able to keep and easy to bring along make storage possible
..... easy to bring along

format/design

the design shall invite to usage

interpret as a secure and up to date product

road users shall be aware of the presence of a human being

with believability radiate attention and express protective clothing for non-professional usage

communicate the height and size of the user

express affiliation to an attractive life stile of our time

both form and function shall invite to purchase

attract to the users and explicit show the field of application

be possible to mark who it belongs to

detail that is recognized as Reflectil

invite usage

communicate security

communicate modern

demand attention

express security

permit identification

express trendy

invite purchase

communicate to target group

explained usage

show belongings

communicate Reflectil

material

possible to wear in all kinds of weather conditions without getting destroyed

tolerate moisture

tolerate dirt

possible to clean

make cleaning possible

endure frequent usage during various outdoor activities

endure strain

retroreflective material (approved retroreflective material)

manufacturing

be possible to make use of all ready existing manufacturing methods

utilize existing manufacturing

economy

the product shall be affordable

reasonable sales price

environment

stand all kind of strains form the surroundings

tolerate external environment

standard

fulfil the European Standard, EN 1150, approved by CEN, European Committee for standardization.

CE- certificated

RESEARCH // CONTEXT ANALYSIS

functional analysis

functions	remark/ boundaries	judgement		
		unnecessary	desirable	necessary
head function				
attract attention	during daylight as well as in darkness with searchlights			
sub function: usage				
carried outside	the size of the outer garment varies with the season			
permit handling	users from 3 years old shall be able to dress on and off.			
permit movability	not be in the way, comfortable			
useful accessory	suit during various outdoor activities			
utilize seasons	use the entire year			
make storage possible	be able to pack, minimize the size			
invite usage	appeal to the target group			
explained usage	use outdoor			
show belongings	who is the owner of the product			
tolerate moisture	use during bad weather			
tolerate dirt	soil and clay, food, beverages			
make cleaning possible	tolerate detergent, a majority of laundries at 40 degree Celsius			
endure strain	daily usage during outdoor activities			
reasonable sales price	worth to invest in			
sub function: safety				
enhance safety	visible outdoor			
prevent injure	the product must not cause any serious injury			
express security	the user shall feel safe and secure			

RESEARCH // CONTEXT ANALYSIS

design demands

functions	remark/ boundaries	judgement		
		unnecessary	desirable	necessary
manufacturing				
CE- certificated				
communicate to target group	express identity and attitude through choice of material, shape and pattern			
invite purchase	function and design			
communicate modern	through form and material			
express trendy	influenced by the vogue			
communicate Reflectil	associate the product with the company			
permit convenience	ventilation			
utilize existing manufacturing	tailoring in China, printing in Portugal			
tolerate external environment				



At the end of this analysing process — after consulting with the company — I came to the conclusion that the design demands during my development phase must be:

A supplement to everyday clothes
communicate Reflectil
CE-certificated

easy to use
comfortable
adjustable

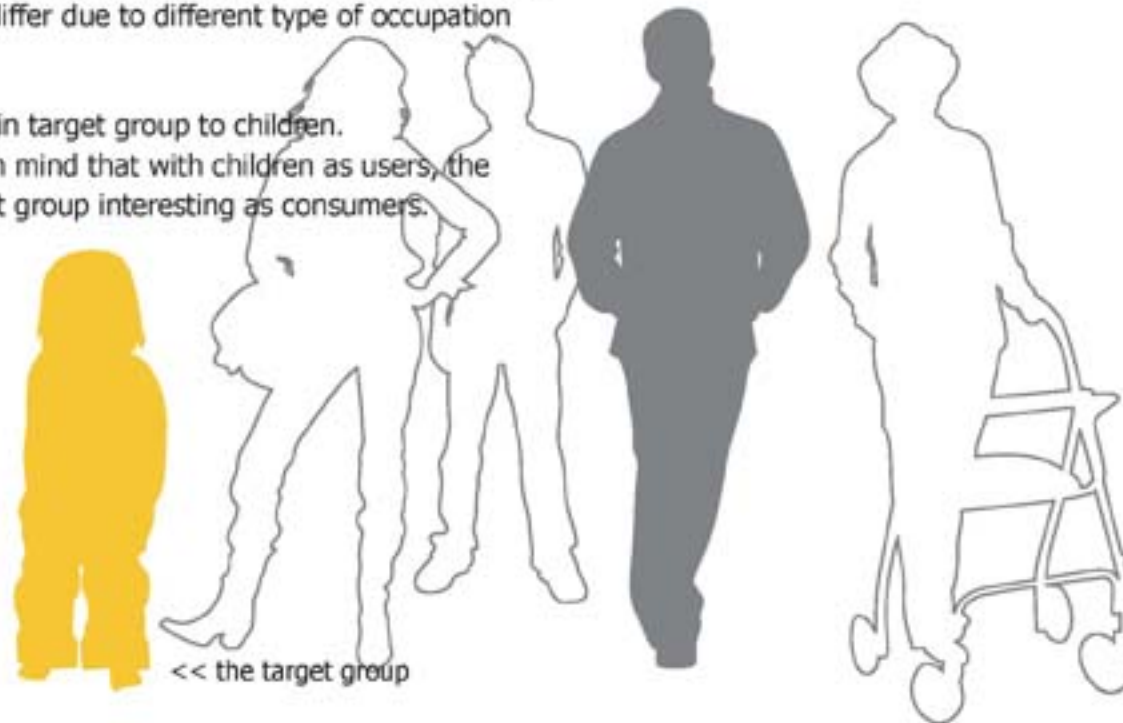
RESEARCH // TARGET GROUP

Who is the target group?

It can be desirable to have a target group as broad as possible. A high visibility product is something that can be of benefit to everyone, to a child or a grown up person.

But what is seen as attractive and modern among one generation is not necessarily the same in another generation. The same thing with needs, they differ due to different type of occupation and activities.

I choose to limit the main target group to children. But also I had to have in mind that with children as users, the parents are also a target group interesting as consumers.



RESEARCH // TARGET GROUP thoughts and analysis

The awareness of a persons life and safety comes with the years. Children are less aware of dangerous situations than a mature person who has experiences of critical situations. Children can be unpredictable. They are curious and likes to experience things. This characteristics in combination with the fact that children not solely can take responsibility for their life and their safety, is something I would like to incorporate in my work.

Further more it is the characteristics of a high visibility garment, to attract attention and announce the presence of a person, which make me choose children as the main target group.

This causes an indirect target group of parents. They are the consumers, since they usually decides what to buy, and to some extent they decides what their children shall wear. The parents are also interesting as they serve as models to the children.

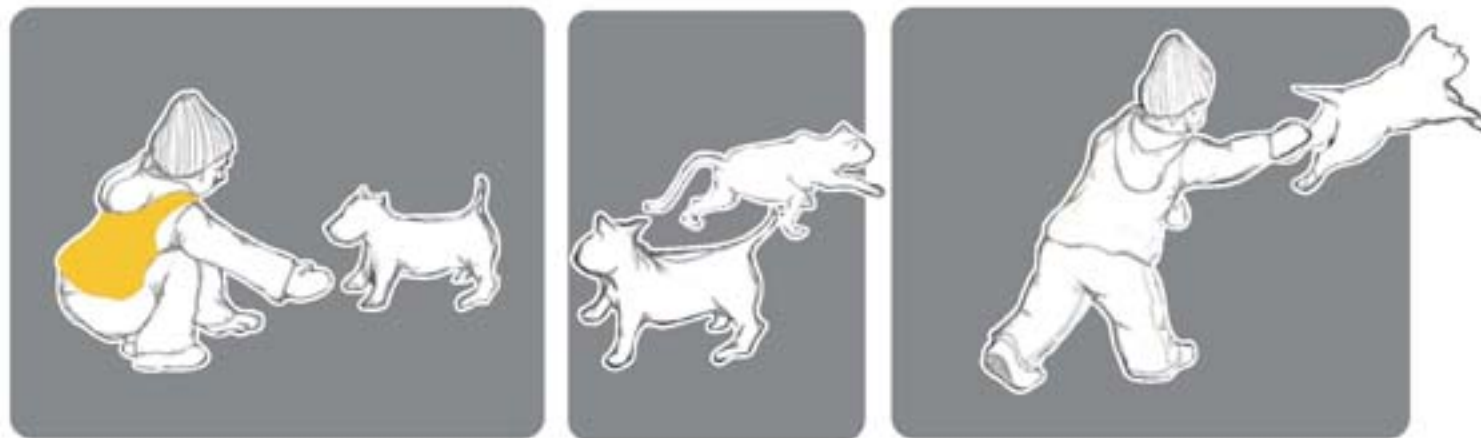
By introducing the product in the early years their is a possibility to create a behaviour, a need, which stays with the person, under the prerequisite that there are designed models that meet the needs of grown ups.

RESEARCH // TARGET GROUP

story board

There is quite a big difference between an three year old child and an eleven years old child. The latter one is closer to an teenager than to a child. What is attractive and wanted is not the same among these two age-groups. The following three scenarios where presented to the company. After discussion around these scenarios we agreed on limiting the target group to children of age three to eight years old.

3 years old



Kalle is out playing with the family dog, Findus. A cat passes by and catches the dogs attention. Kalle starts to hunt the cat. He runs after as fast as he can. Kalle is paying no attention to anything but the dog and the cat. Luckily Kalle is wearing his new visibility garment.

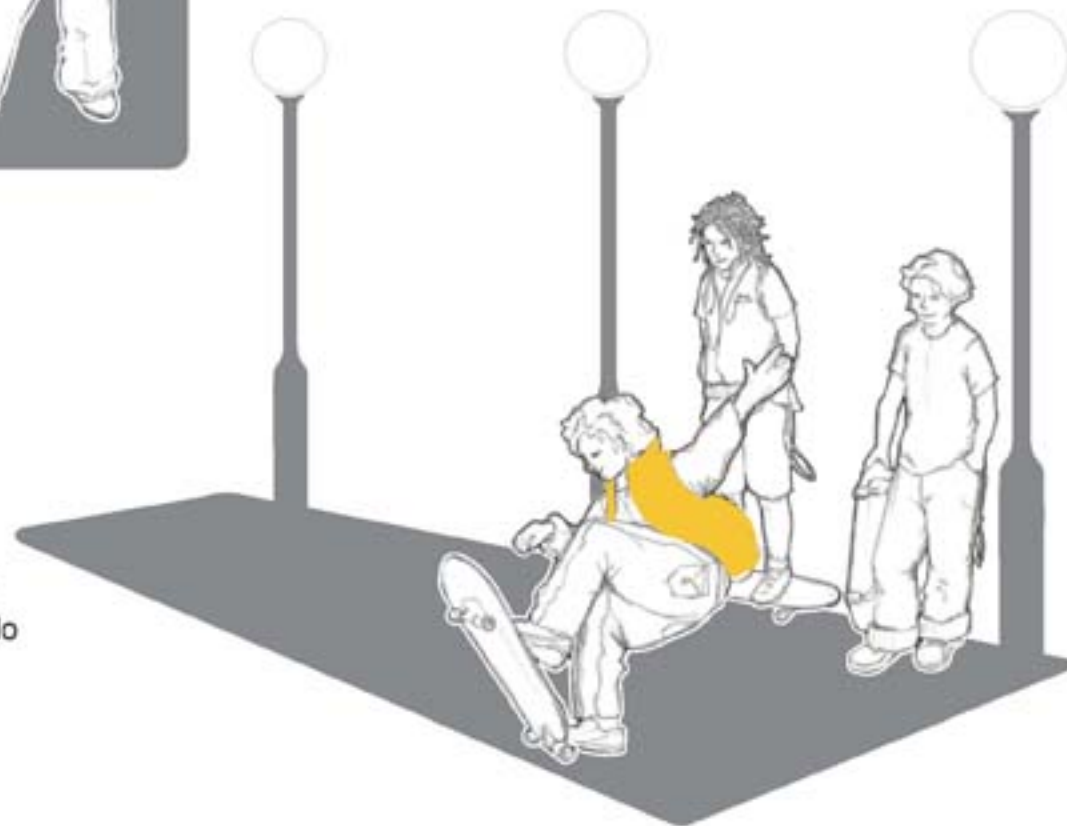


8 years old

Frida is out shopping with her mother. She finds a package with visibility accessorise that she has seen on kids in school. Frida really like to have one too. Her mother agrees because she is satisfied with the functionality of it.

10-12 years old

The cool skateboard gang is hanging around down town in the afternoon. They show each other their new tricks and do their best to impress on the audience.



Final target group >>
Children between
three and eight
years old.



DESIGN DEVELOPMENT

DESIGN DEVELOPMENT // SYNTHESIS

user scenario, time of the year

The additional accessory garment is supposed to be used any time, any where. This means it can be worn during the whole year. Since the choice of clothing differ from one season to another that will affect the design of my more tailored garment.

winter season

less sun hours

cold weather

many layers of clothes

transporting to and from preschool and school

break and excursions

group activities with supervision

time pressure



summer season

more sun hours

warmer weather

less clothes

many outdoor activities with go

independent activities

spending many hours outdoor

out late

Weather conditions affects the choice of clothing.



During spring time and the summer period one does not bother too much about layers of clothes. We are lightly dressed and enjoy just to slip in to the shoes and walk out.



During the dark and cold seasons of the year one is wearing rather a lot of layers of clothes, some quite bulky. There are also many accessories to put on, like gloves and scarfs among other things.

DESIGN DEVELOPMENT // SYNTHESIS

mood board

An additional accessory must be convenient and easy to dress on and off, also adjustable in relation to what one is wearing under the accessory. I want my product to have a feeling of being . . .

adjustable
time effective
flexible



DESIGN DEVELOPMENT // SYNTHESIS
image board



accessory
attitude
exciting
colourful
metallic
details
playful
pattern



DESIGN DEVELOPMENT // SYNTHESIS

sketch phase



The collar and the belt are connected in the back.



Popper to be able to adjust lengthways in the back.



Construction as a back pack, makes it possible to adjust the size.

The chest is covered by a big fluorescent collar and the belt consists of the retroreflective area. It closes with Velcro.

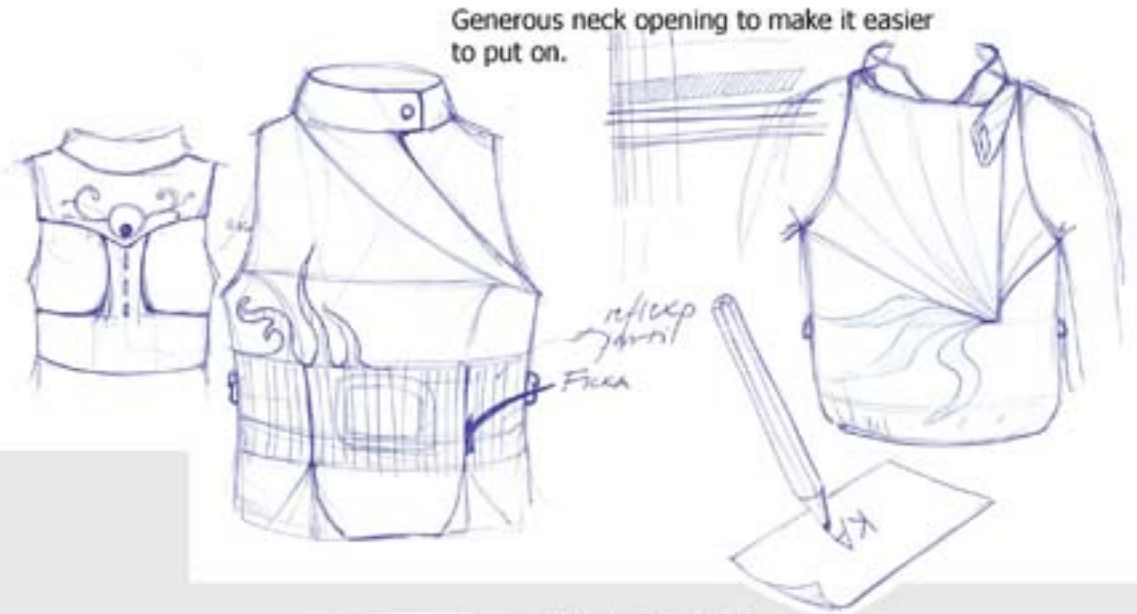


Wrestling back, facilitates movability





Sporty look with spacious armholes.



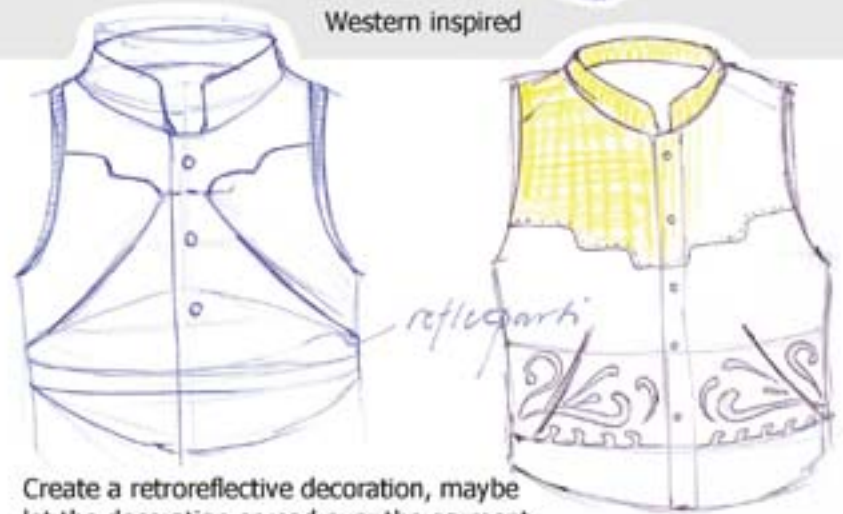
Generous neck opening to make it easier to put on.



Loops on each side as an alternative storage.

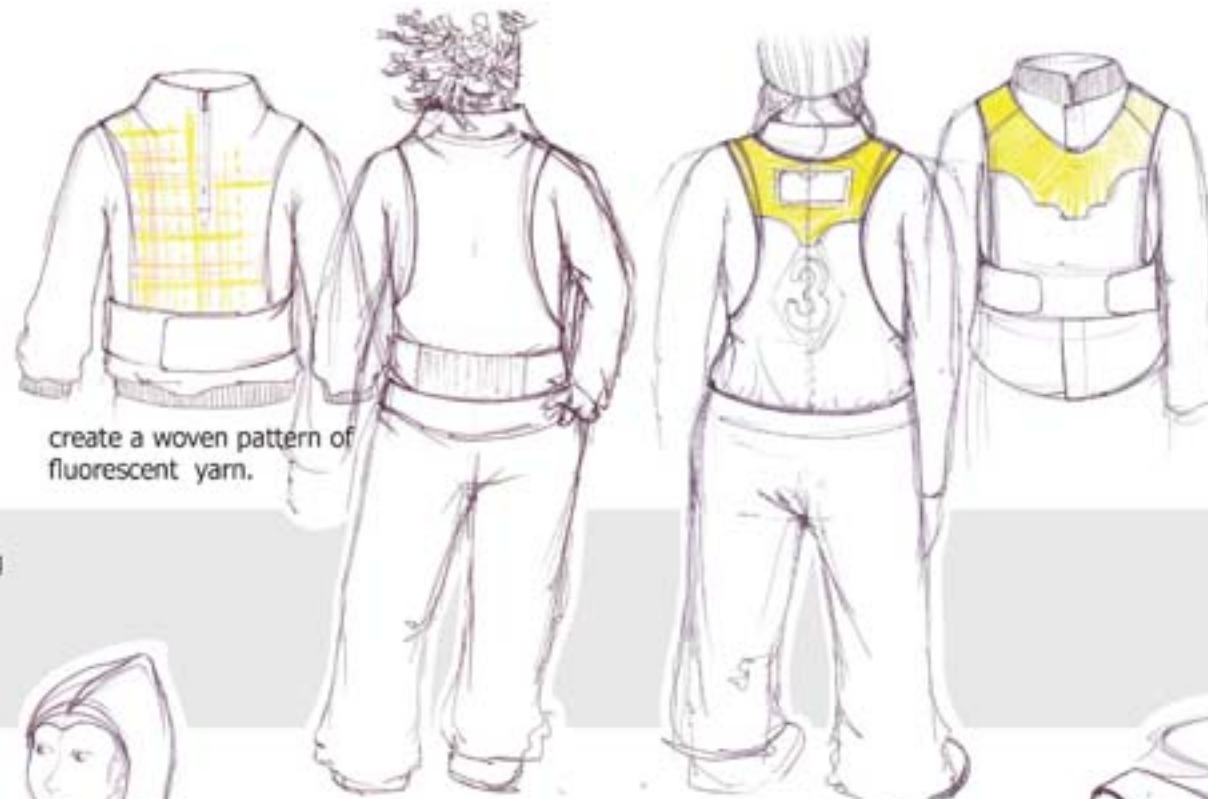
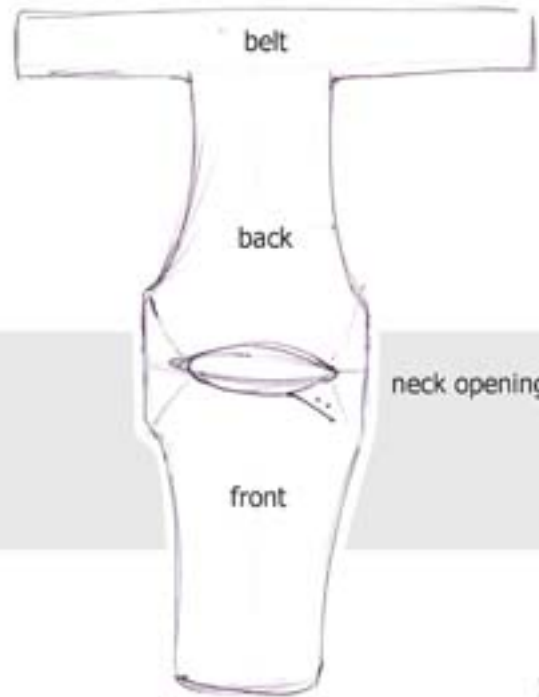
Symbol for buttoning on

Western inspired



Create a retroreflective decoration, maybe let the decoration spread over the garment.

An open piece to put on over the head without having to pull the arms through any armpits.



create a woven pattern of fluorescent yarn.

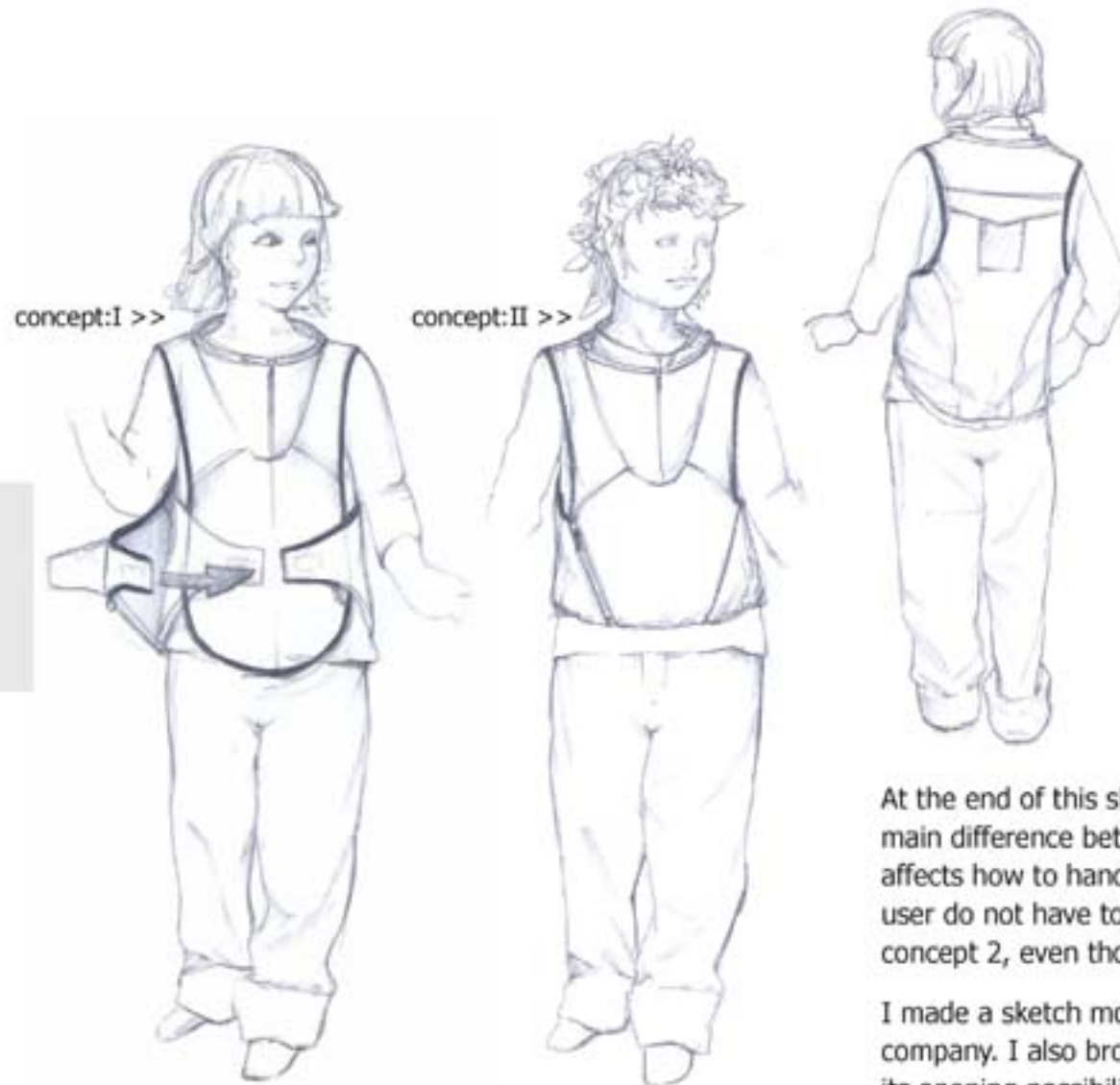


closes with a zipper in one side



DESIGN DEVELOPMENT // SYNTHESIS

two concepts

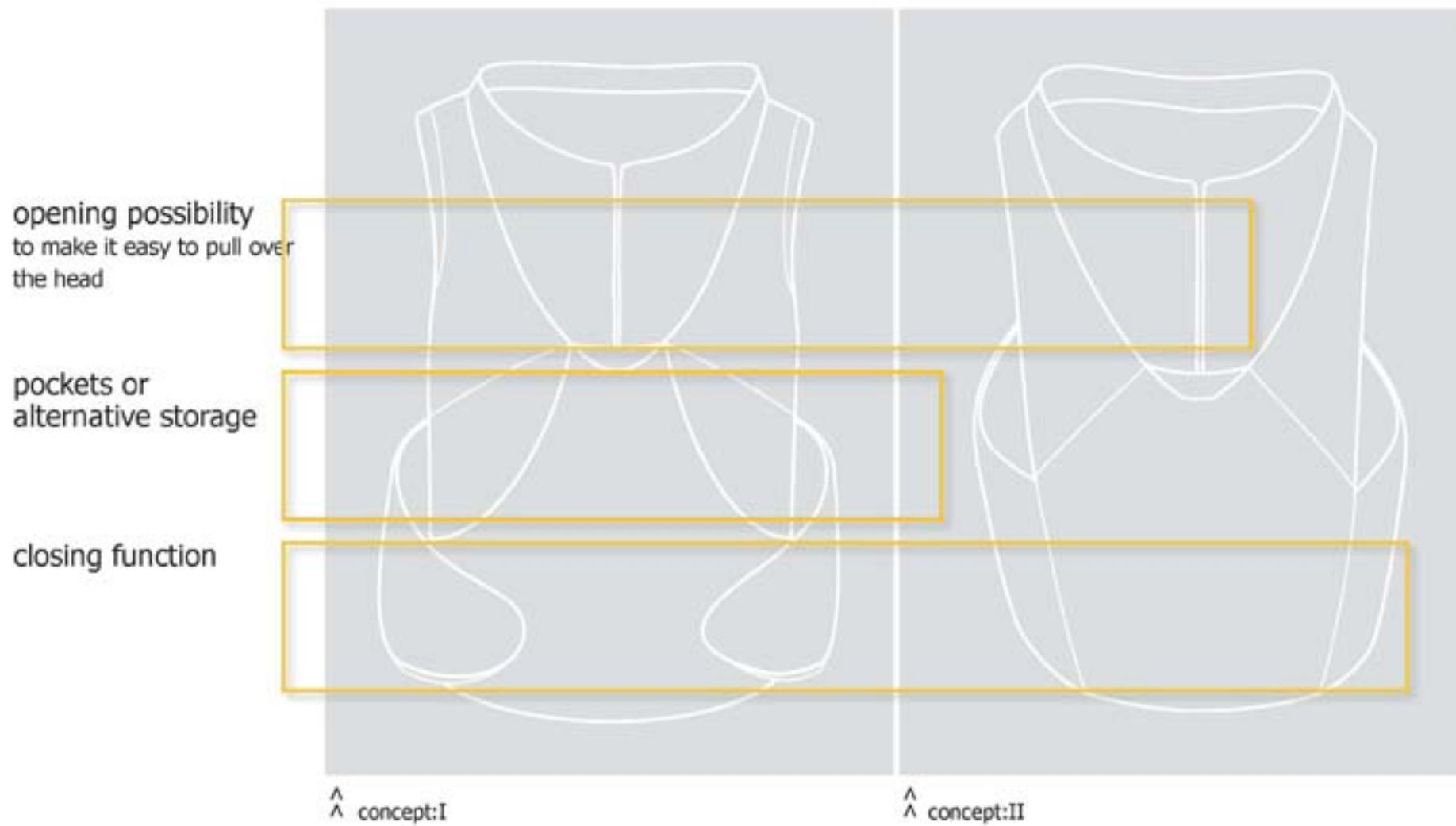


At the end of this sketch phase I had come up with two concepts. The main difference between these two concepts is how the overall design affects how to handle the vest when putting it on and off. In concept 1 the user do not have to put his arms through any armpits which is the case in concept 2, even though the generous armpits makes dressing easier.

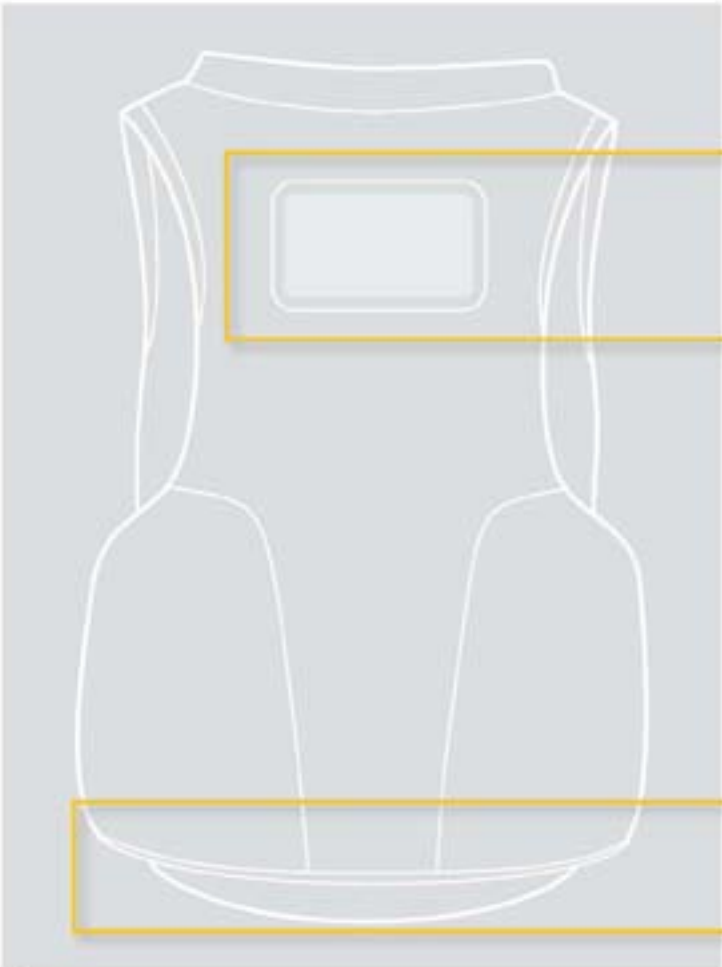
I made a sketch model of each concept and presented them to the company. I also brought sketches of detail solutions as pockets, collar and its opening possibilities and an identification pocket for the garment, to that meeting with the company. These sketches follows in the next pages.

DESIGN DEVELOPMENT // SYNTHESIS

two concepts - front



DESIGN DEVELOPMENT // SYNTHESIS
two concepts - back



Identification pocket
A pocket where the owner of the garment can put his or her personal identification to show who the vest belongs to.

Drawstring

^
^ concept:I and concept:II



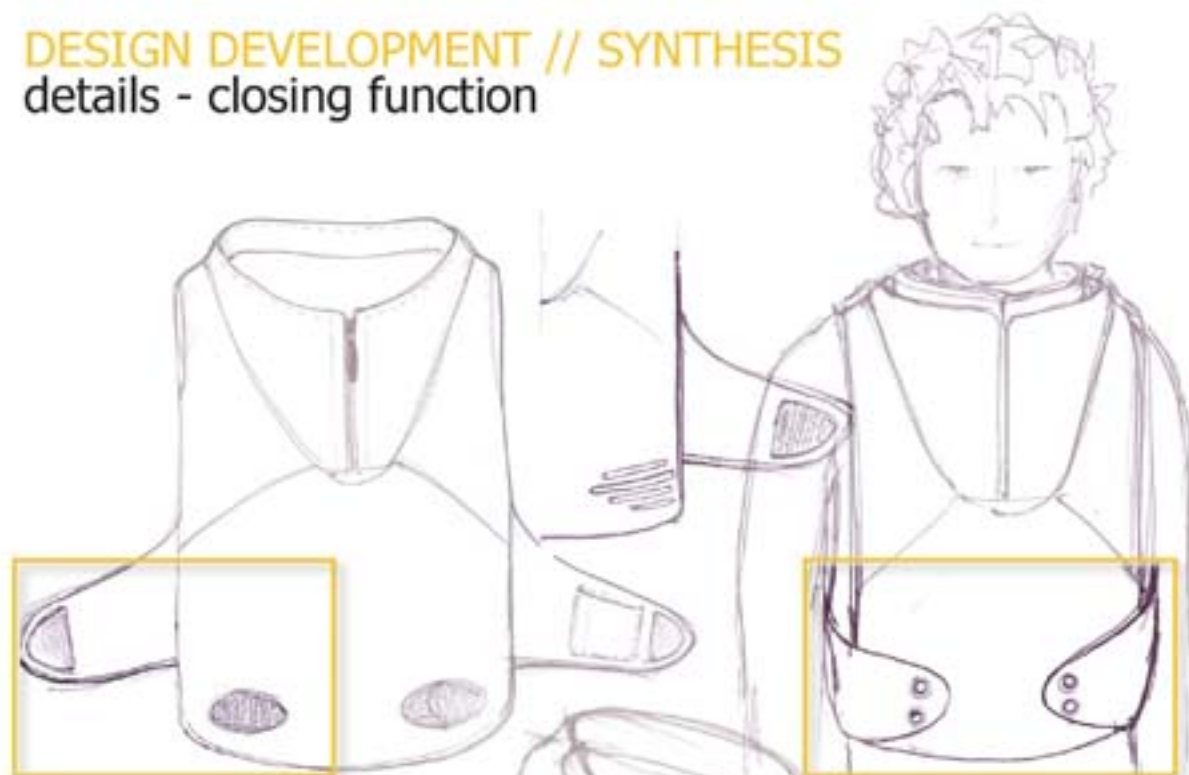
^
^ Sketch model of concept:I



^
^ Sketch model of concept:II

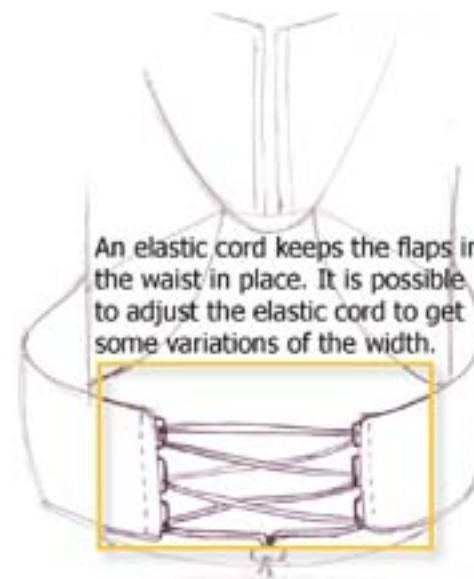
DESIGN DEVELOPMENT // SYNTHESIS

details - closing function

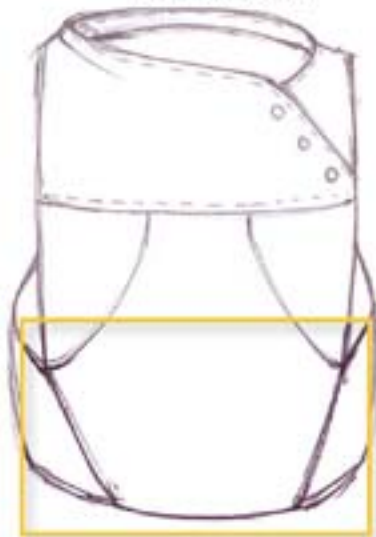


Velcro solution

Closing with poppers.

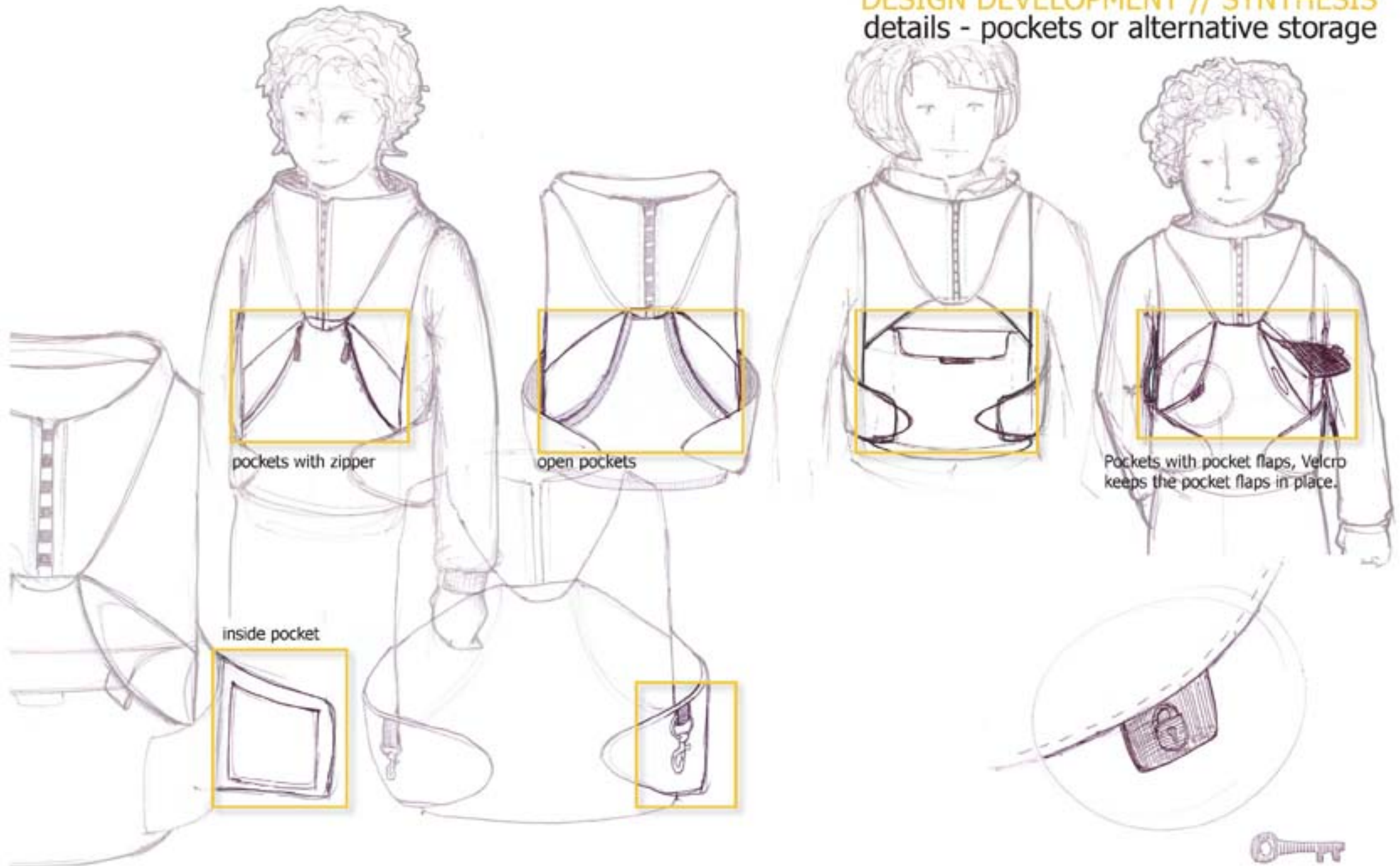


An elastic cord keeps the flaps in the waist in place. It is possible to adjust the elastic cord to get some variations of the width.



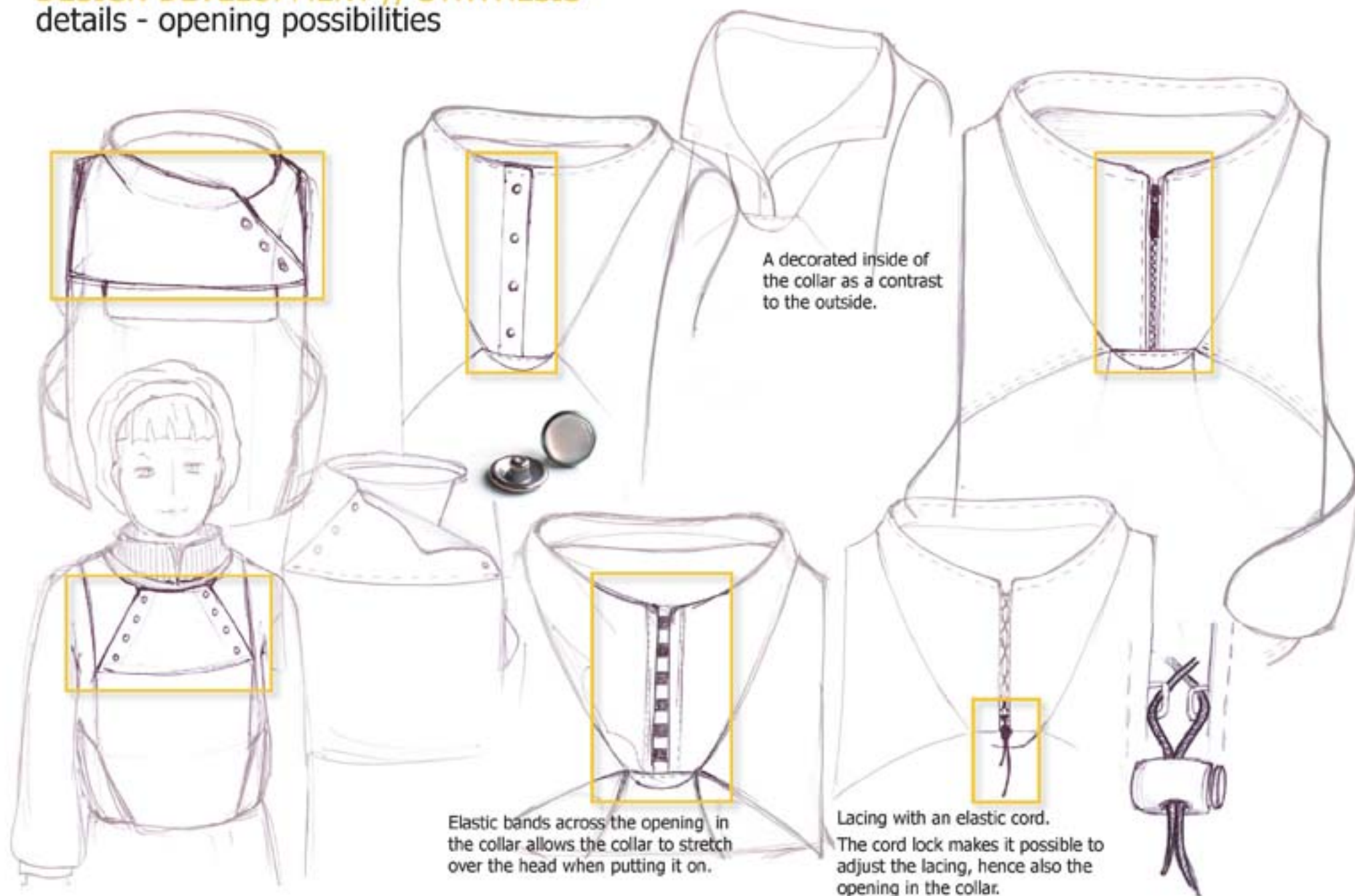
Elastic part to facilitate dressing and to get a nice profile when wearing the garment.

DESIGN DEVELOPMENT // SYNTHESIS details - pockets or alternative storage

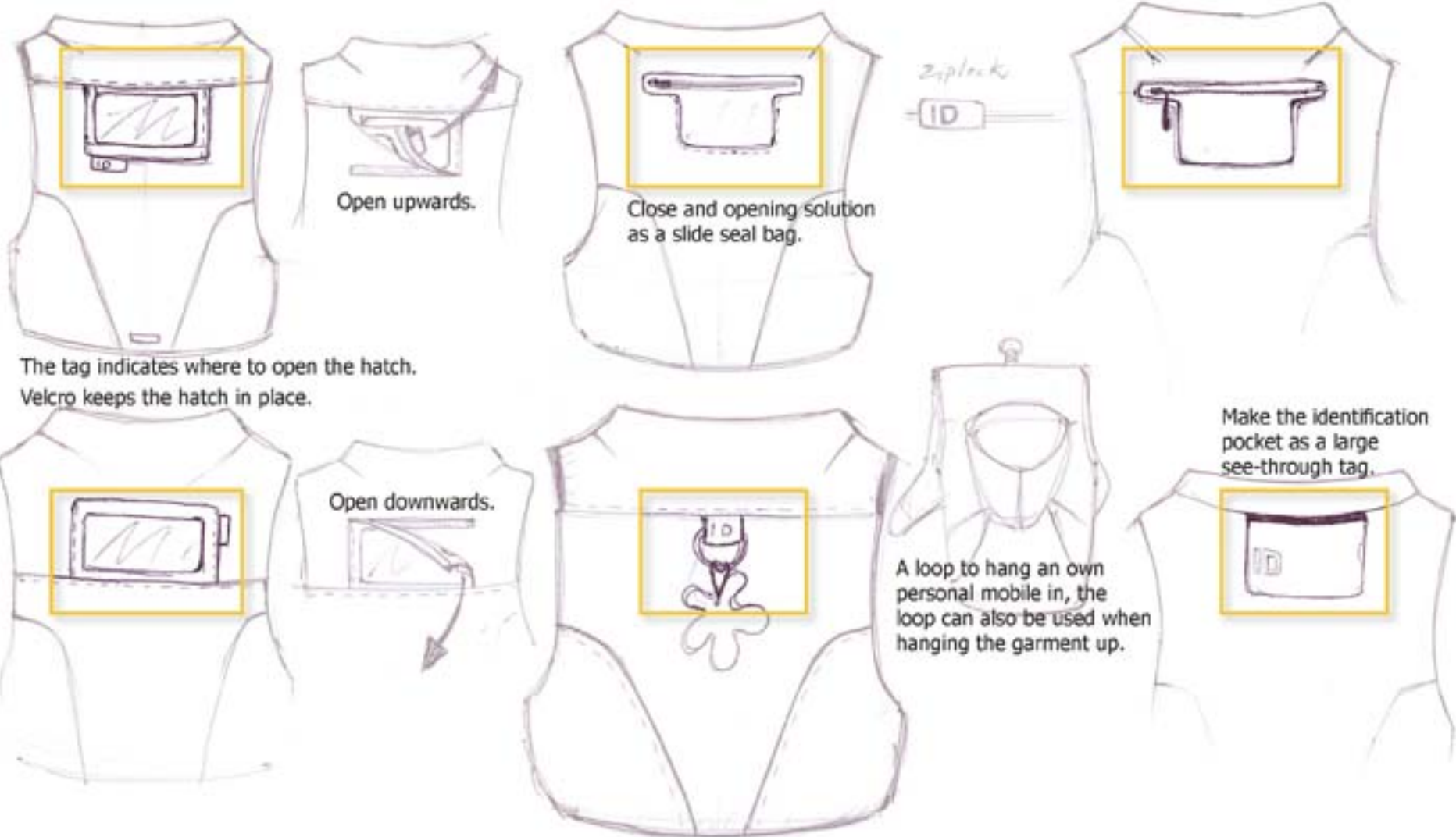


DESIGN DEVELOPMENT // SYNTHESIS

details - opening possibilities



DESIGN DEVELOPMENT // SYNTHESIS
details - identification pocket



The tag indicates where to open the hatch.
Velcro keeps the hatch in place.

Open upwards.

Close and opening solution
as a slide seal bag.

Ziplocks

ID

Open downwards.

Make the identification
pocket as a large
see-through tag.

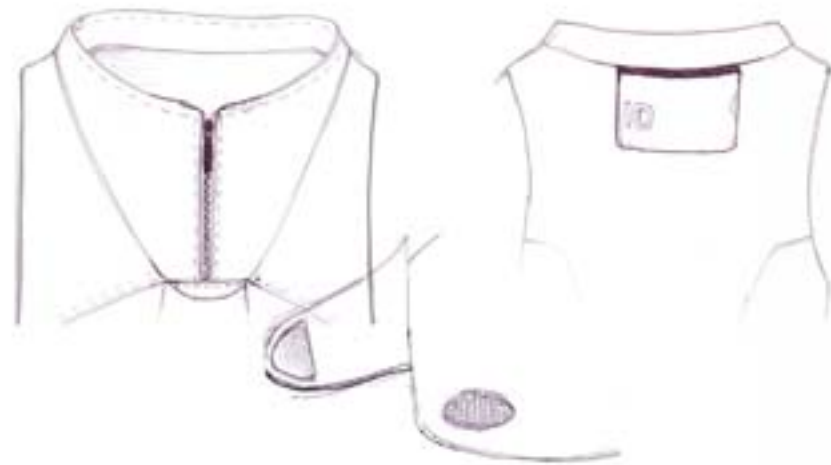
A loop to hang an own
personal mobile in, the
loop can also be used when
hanging the garment up.

ID

DESIGN DEVELOPMENT // SELECTED MODEL

After consultation with the company we agreed on further work on concept 1. The reason to this was that this concept had most potential to fulfil the design demands. We also judged the two concepts with respect to the key words; being adjustable, time effective and flexible. Also from this point of view the company and I experienced that the concept 1 was the right way to go from here.

Furthermore we discussed the different detail solutions of the vest. Together we came to the conclusion that the design of the vest should include Velcro as a closing function of the vest, a zipper as an opening possibility on the collar and a see-through pocket on the back piece. Because there is less fabrics on the front piece and because of the design of the closing mechanism, we came to the conclusion not to have any pockets in the final design.



A photograph of a workspace. In the foreground, several rolls of brown paper are scattered on a surface covered with fashion sketches. The sketches include a bodice pattern with a bust dart and a skirt pattern with a waistband. The rolls of paper are some standing upright and some lying flat. In the background, a white wall features a yellow electrical outlet with a white cord plugged into it. The word "REFINEMENT" is overlaid in yellow capital letters on the right side of the image.

REFINEMENT

REFINEMENT // FINAL DESIGN
optimize





REFINEMENT // FINAL DESIGN the pattern



When I had the final pattern of my design I contacted the company Stenwall & Ljungkvist to digitize my pattern and grade it according to the height measurements in the European standard, EN-1150.



1. Wide collar with a zipper

The wide collar makes the vest spacious over the chest and neck which both facilitates dressing and wearing outdoor garment underneath. The opening possibility make it easier to pull the garment over the head.

2. Generous armpits

The generous armpits is to make it easier to move with garment underneath.

3. Closing function

The vest closes with Velcro which is easy to use and provides you a possibility to adjust the width around the waist.

4. Alternative storage

The loops makes it possible to attach for example gloves or a whistle by using a carbine hook.

5. Identification pocket

The user can put his or her personal identification.

6. Elastic piping

The elastic part over the shoulders makes the vest follow the body.

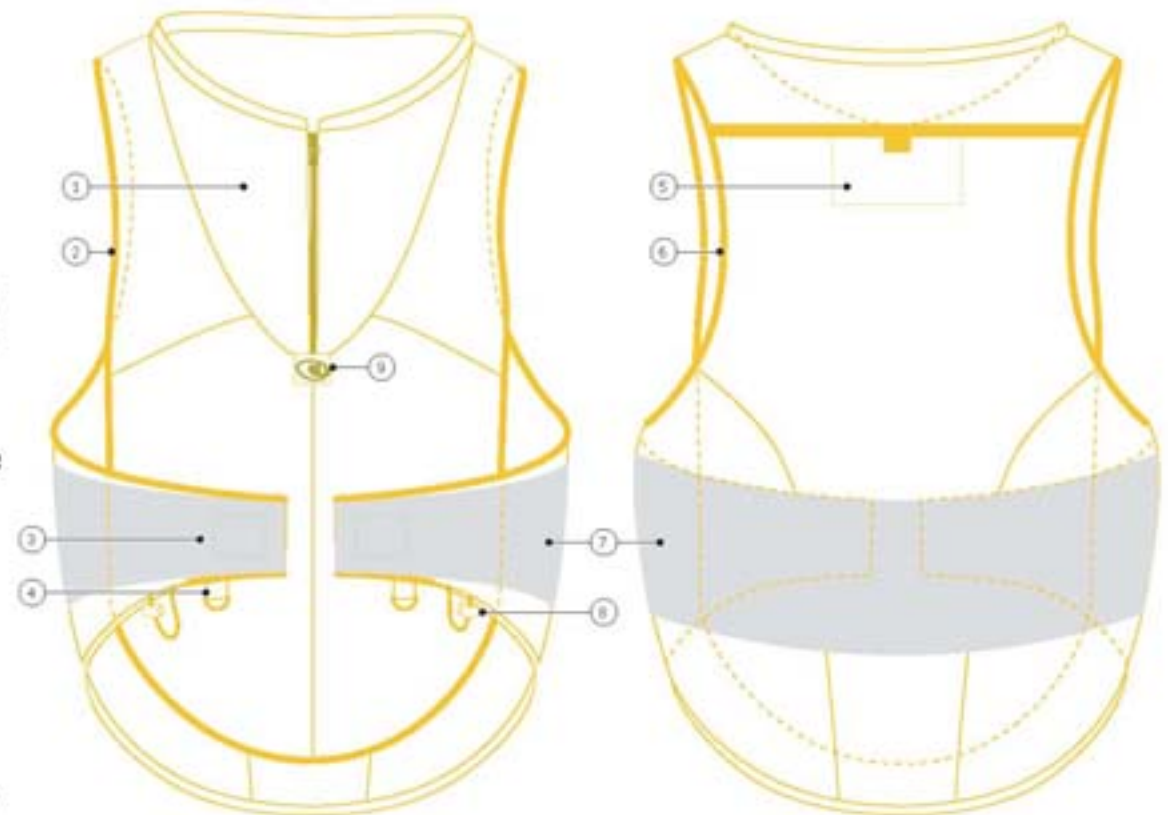
7. Retroreflective area

the retroreflective area extends around the waist.

8. Cord lock adjustment

The canal with a thin rubber band gives a possibility to adjust the lower width according to the amount of clothes worn under.

9. Trade mark



REFINEMENT // FINAL DESIGN

function

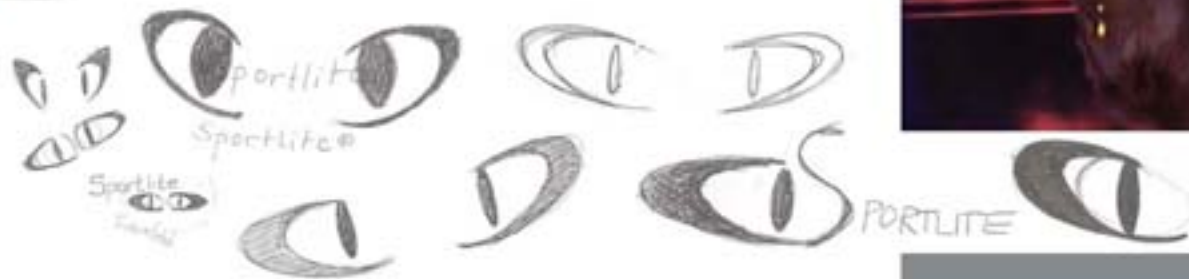


Since the vest is designed as an open piece it is just to pull the head through the generous neck opening. The vest is then fastened by Velcro over the stomach. This is easy to handle also for a child.



REFINEMENT // FINAL DESIGN identity

I made a suggestion of a trademark to give my vest its own identity. The arc in Reflectil's logotype was developed into a trade mark, also inspired by the cat species eye. I got inspired by the cat species eye because of a cat's excellent night vision and also that their eyes reflect light, just as retroreflective material does.



REFINEMENT // FINAL DESIGN decoration

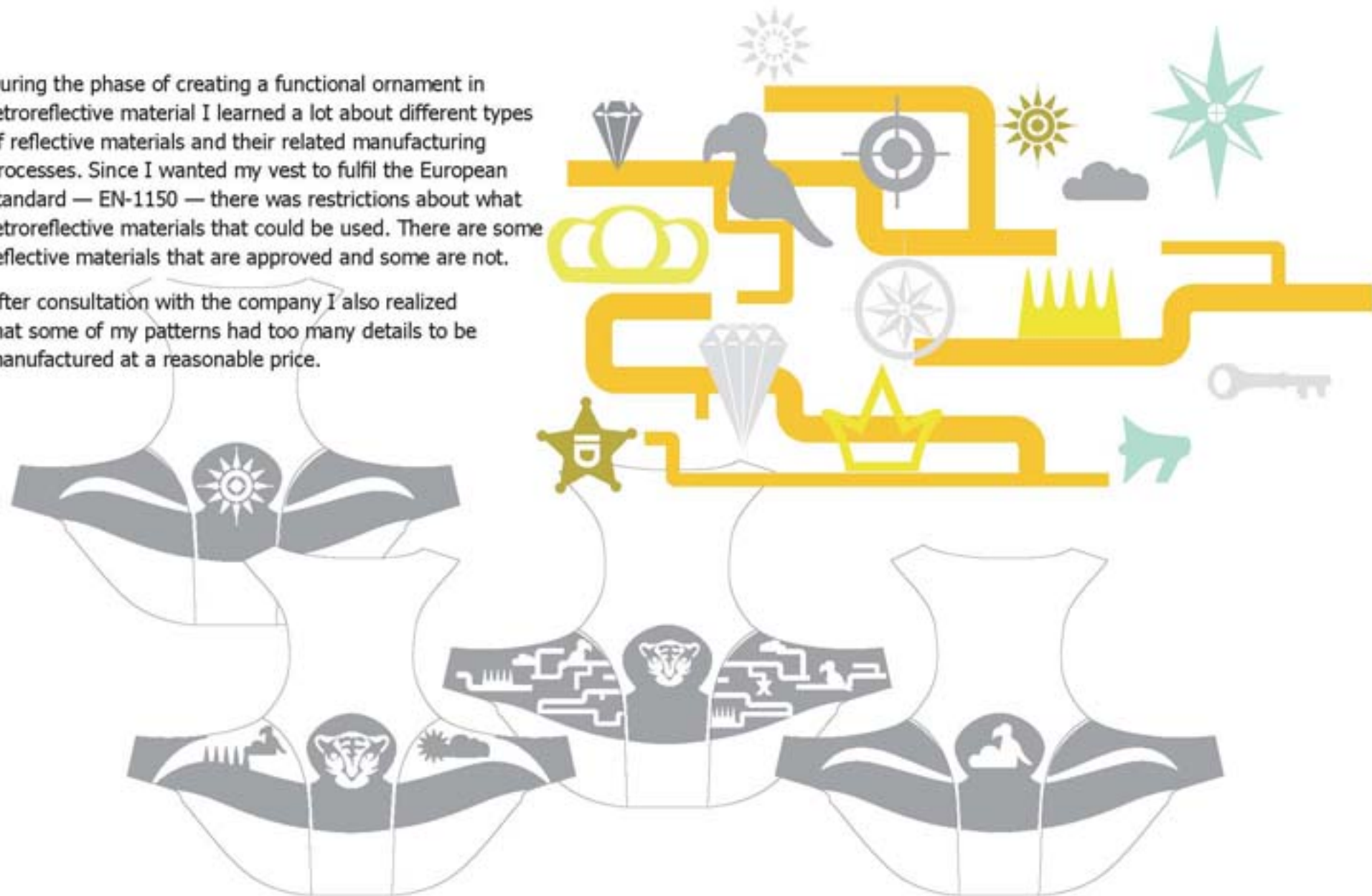
I wanted to develop the retroreflective area around the waist from the two plain strips that extends around the waist of today's vests to something more interesting and decorative. My intention was to create an expression of adventure and playfulness.

As with the trademark I was still inspired of the cat species when I continued my work of developing the retroreflective area. The eye in the trademark turned in to a cat. I also experimented with other symbols inspired by a treasure map. To me wild animals and treasure hunts can represent child adventures.

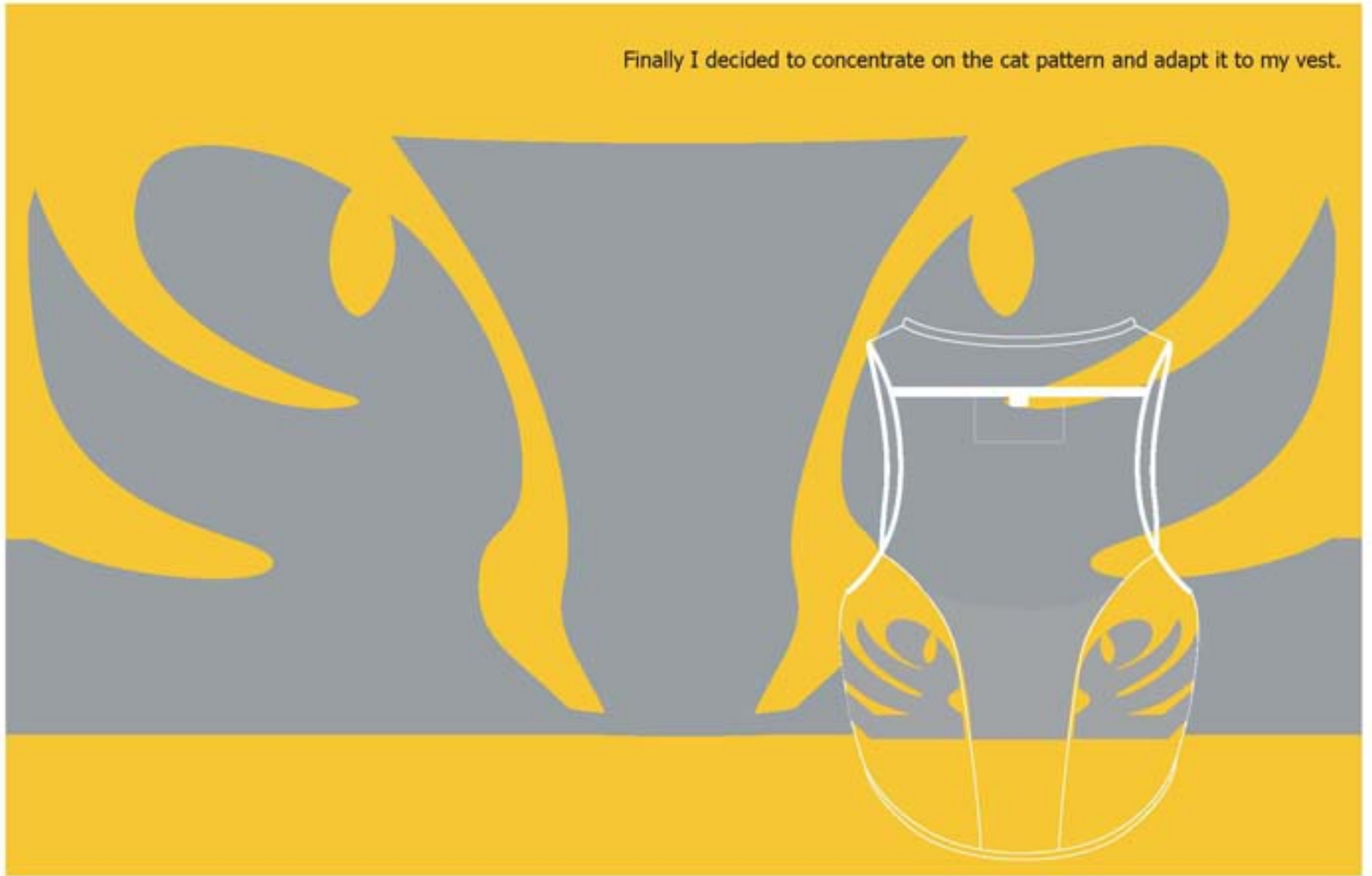


During the phase of creating a functional ornament in retroreflective material I learned a lot about different types of reflective materials and their related manufacturing processes. Since I wanted my vest to fulfil the European standard — EN-1150 — there was restrictions about what retroreflective materials that could be used. There are some reflective materials that are approved and some are not.

After consultation with the company I also realized that some of my patterns had too many details to be manufactured at a reasonable price.



Finally I decided to concentrate on the cat pattern and adapt it to my vest.





[Autumn 2007]

When I had presented the vest as my degree work Reflectil and I continued to cooperate. I made some refinements of the vest to optimize the design for production and to make the vest more cost efficient. At that time Reflectil's intention was to launch the vest to the Swedish market in the autumn 2008. Today we are working on another design of a high visibility vest which is going to be produced in China this autumn 2007.

