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Furniture design for specified company

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with appendices

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V Brně dne:

.....

podpis

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Title of work: Furniture design for specified company

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ABSTRACT

This diploma thesis is dealing with the problematics of entrance halls and furniture, which is used in this space. The aim of the thesis is to develop a furniture design for the entrance hall and manufacture the product by a Czech company. It collaborates with the work which started during the exchange studies in Finland. The design of the product comes from the theoretical part and it also considers the possibilities of the company. There is a historical development of the entrance hall's furniture, its function, and a research, which contains ergonomic and safety standards. There are also described used materials for the final product. In the practical part, there are sketches, the development of the products in Finland by the author and the production of the product by the Czech company.

Key words: bench, collection, entrance hall, hanger, mirror, storage space, table

ABSTRAKT

Název práce: Návrh nábytku pro konkrétního výrobce

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Tato diplomová práce se zabývá problematikou interiéru předsíně a designem nábytku, který je v tomto prostoru používán. Cílem práce je navrhnout nábytek pro předsíně a vyrobit produkt českým výrobcem. Práce navazuje na návrh, který byl vytvořen během výměnného pobytu ve Finsku a dále rozvinut do finální podoby celku v České republice. Design produktu vychází z teoretické části a bere v potaz také výrobní možnosti firmy. Práce představuje historický vývoj předsíně, její funkci a také průzkum trhu, která obsahuje také ergonomické a bezpečnostní požadavky. Dále jsou zde popsány vybrané materiály pro finální produkt. Praktická část sestává ze skic návrhu, postupu výroby produktů ve Finsku a produkt, vyrobený českou firmou.

Klíčová slova: kolekce, lavička, předsíň, stůl, úložný prostor, věšák, zrcadlo

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Introduction

Every time we meet new people, we are making first opinion about them, according their clothes, shoes and their appearance. It is the same as the interior of the entrance hall, because it is the first place we see, when we enter a house and it gives us the first opinion about the inhabitants of the house as well. We can imagine how the rest of the house looks like from the furniture used and its interior design. It gives us an idea about how people live in the whole house, what kind of style they like and sometimes even what are their hobbies. That is why this place should not be the last one to think about, when planning the house. There should be placed furniture that is equally as good as in the rest of the house. Usually there are a lot of doors and it is quite difficult to make the room look nice, but it should have a representative character too.

The entrance hall is also a place, where people store their clothes. It is estimated, that most of the people wear only 20 % of their clothes. It means, that most of the storage space is overloaded with clothes, which we do not even wear. (Conran, 2006)

The entrance hall should be well designed, because it is a place where the family members cross many times during the day and they need to take off their jackets and shoes or put their keys away. In some countries, especially in the South of Europe, people are used to not taking off their shoes. It is probably because of the weather conditions. In the Czech Republic, and especially during the winter we must take off our wet shoes, winter jacket, scarf or a cap. This proves the importance of having a hanger, shelves, some storage space for shoes, which we usually wear and so on.

Furniture for the entrance hall is very important, but the people doesn't think about this so much. Usually there are used cabinets with a few hangers and a bench, with quite similar design. The author tried to design a new product for this area, which will change the traditional appearance of the entrance hall.

Goal

The goal of this work is to design furniture, which will continue with the work made during the Exchange studies in Finland and it will be manufactured by a Czech company as well. The author continues with the topic of the entrance halls and its furniture, because of the topic, which started during the exchange studies. The aim was to create a collection of furniture for the entrance halls. The author must also find a manufacturer for the production in the Czech Republic.

Methodology

Methodology of this work was affected by the exchange studies in Finland, the country with traditional and timeless furniture design.

The thesis is divided into two parts – theoretical and practical part. Before the theoretical part there is a process of choosing the manufacturer in the Czech Republic, their philosophy and work. In the theoretical part, there is information about the entrance hall itself, furniture which is usually used there, ergonomics, standard requirements of furniture and the function of the entrance hall. Information was taken from corresponding literature (university textbooks, books, magazines and online sources), which are written at the Literature and Resources list at the end of the thesis.

In the practical part, there is described the whole process of designing the product during the exchange studies, which were held in Finland at Kymenlaakso University of Applied Sciences in Kouvola during January and May 2016. There is written about the work at the University, which end up with two products, manufactured by the author. It led to the design of furniture collection, mainly intended for the entrance hall's interior. The practical part contains the sketching process and looking for the best solution of furniture for the entrance hall and the description of the machines used for the manufacturing process.

The work continues with design of another product manufactured by the Czech company Chatrný nábytek and it complements the furniture collection, created in Finland.

1. Manufacturer

The topic of this diploma thesis was written before the planned exchange study in Finland, which was carried out since January 2016 till May 2016 at Kymenlaakso University of Applied Sciences in Kouvola. The topic was written generally, because the author wanted to continue with the work, which will be done in Finland. It was predicted, that there will be created a prototype and the author wanted to continue with that work also in the Czech Republic.

Before the exchange studies, the author already had contacted a manufacturer called “Chatrný nábytek”, and asked if they would be interested in cooperating, because the author knew one of the owners of the company and she liked their philosophy of work. Also, the company was quite new and they liked to cooperate with young designers, so they agreed on the cooperation with each other.

During the exchange studies, the author contacted the craftsman several times, about the chosen topic of work and their possibilities of manufacturing the product in the Czech Republic.



CHATRNÝNÁBYTEK

Fig. 1: Logo of the company (www.chatrnynabytek.cz, 2017)

1.1 History and presence

The company was established in 1992 as the company called TOP Dřevointer. The company is in Nebovidy, which is a village near to Brno. Since the beginning, they were focused on the manufacture of non-typical furniture. The owner of the company is Mr. Ivo Chatrný and Mrs. Iva Šulcová. In 2014, a son of Mrs. Šulcová, Marek Šulc started with his own company, which is using the same workshop for his company called Chatrný nábytek. The name comes from the surname of the owner of the company Mr. Chatrný, who is a grandfather of Marek Šulc. Actually, “chatrný” means “crummy” or “fragile” in Czech. It can give an impression of non-quality furniture, but it is the opposite. Quality is their main demand, together with support for the young designers, because they can get known more thanks to them as well.

In Chatrný nábytek portfolio, they have different types of work, which are possible to choose from them. First, they are creating furniture design, because they cooperate with young designers. It is great experience for the both sides – the company can see new design ideas, and the young designers can have a traineeship along with practical work, since it is not that easy to find some work without practical experience. Second, they can make the whole process of designing a new object, which means, they can make the design and then manufacture it. Finally, it is also possible to show them your own idea and they will manufacture it. That was the option, which the author chose, because she needed to manufacture another product. The company decided to cooperate with the author after all.

1.2 Design and development of products

Development of the products starts with the first proposal, preview and consultation. After the final proposal is chosen, they can start with the manufacturing process. It ends with assembly at the customer's place.

First the customer must choose, which of the mentioned offers they want. If it is design with manufacture, designers, who are cooperating with them create design ideas. After that, simple technical drawings are made and the process of manufacture can begin. If the customer chooses the option to create a design by themselves and they need just a production, the company needs to be send the technical drawing with the most important dimensions. Eventually, they make their own technical drawing and send it back to the customer for approval. (www.chatrnynabytek.cz, 2017)

“We are creating furniture and thanks to that also space. We create modern furniture in a traditional way. We are trying to breathe soul into the furniture. We are cooperating with talented designers. We care about quality and 100% customer satisfaction.” (www.chatrnynabytek.cz, 2017)

Chatrný nábytek is using for its manufacture the same machines as the company TOP Dřevointer. They are using modern woodworking machines and some of them are PC – based controlled. At the figure below is their format saw.



Fig. 2: Format saw Shark (Marek Šulc, 2017)



Fig. 3: a-b: CNC Biesse ROVER A 1332 5-AXIS and Edge banding machine OTT (Marek Šulc, 2017)

One of the works, which was made in cooperation with the author and the company is a cabinet for a fridge, coffee machine and other things for easy prepared meal or beverages. This work was done before the diploma thesis and the author decided to cooperate with the company after all.



Fig. 4: Cabinet (author, 2017)

1.3 Range of goods

The company is focused on furniture for private houses, usually made from particle boards. They make furniture for kitchen, living room furniture, children rooms and so on. They are taking many chances though, and they are also not afraid to use other materials.



Fig. 5: Kitchen furniture ((www.chatrnynabytek.cz, 2017)

Sometimes they are working on other projects, for example, furniture for a bar. They were asked to produce furniture for the bar Hrušovany nad Jevišovkou, which can be seen in the following photos (Fig. 6: a-b). The company also did a reconstruction of the interior for the Opticians in Brno on Jánská street.



Fig. 6: a-b: Bar Hrušovany nad Jevišovkou (www.facebook.com/chatrnynabytek)



Fig. 7: Opticians, Jánská, Brno (www.chatrnynabytek.cz, 2017)

1.4 Target group

The target group for the company are mainly people, who like original pieces of furniture and who want to have harmony in their interiors. Also, it is mainly for the people who can appreciate new design ideas, fresh, young and funny design and work of the starting company, who likes to cooperate with young designers. They are also supplying their furniture to interior design studios and public spaces. The only problem of the company is, that they are not able to promote their brand very well. That is why they like to cooperate with young designers, who can promote them by the products manufactured by Chatrný nábytek

THEORETICAL PART

2. Entrance Hall

The entrance hall creates the first idea and opinion about the people who live in the house. Family members are walking through this area many times during the day. At the entrance hall, we are carrying out several actions in the same sequences. Firstly, we are taking off our shoes, coats and other accessories (scarf, gloves,). We are putting aside our keys, phone, purse or shopping bags. From those functions derives fitting things, such as hangers, shelves, bench or chair, shoe holder and mirror. (Černíková, 2010)

It has a function of semi – public space, because it is dividing privacy of the house from public spaces. Another function is communication, which means, that it is accessing other rooms in the house. Storage space and storing function is also very important, because usually, we store our clothes there. In the Czech Republic, there is a standard ČSN 73 4301 Residential Buildings, which is saying that there must be the entrance hall at family houses, which is capturing dirt from the outside and it is keeping the house from losing its warmth. (ČSN 73 4301, 2004). Because of moving of furniture, the size of the entrance hall should not be less than 1200x1200 mm. (Poštulková, 2008) Per ČSN 73 4301, disposition of the house must allow objects to be moved with dimensions 1800 x 600 x 1800 mm to all the rooms. The entrance door must have minimal width 900 mm. The space, where the room is connecting to other rooms, the width cannot be less than 800 mm. Entrance door should be opening to the inside of the house. The interior of the entrance hall should not be the last to think about. It has a function of communication, which means that we are entering other rooms in the house from there, then there is storing function, because we need to take off our jacket when we arrive to the house and take off our shoes. It can be different in other countries, because not every nationality and culture are used to taking off their shoes when they arrive home.

Before the entrance hall is even made, the proposal of the interior must be done. First, it is important to choose the right size of the space. It should not be too big and fancy, but also it should not be too straitened. The interior should be practical and it should correspond with the rest of the house interior.

2.1 Historical development

Humans had a need of keeping items since ages. That is why even during the old ancient times, they had the need of creating furniture, such as seating, storage space, bed or other products.

2.1.1 Antiquity

During the antiquity, there was already an entrance hall in the house. There was oriental type of the houses in Mesopotamia, Egypt, Crete and Rome. In Egypt, the size of the house had representative character. Typical for Egyptian house is the tripartite layout, which divides the house into three main sections: a reception area, a columned central hall or living room, and private quarters. In Greece, there was a colonnade, which was a series of regularly spaced columns, epitomized the notion of space in the Greek interior. The Greek residence was made up of a distribution of rooms – living room, kitchen, bathroom, and dining room – around a central courtyard. (Slotkis, 2013) People in ancient Rome didn't fill the house with much furniture, because they usually used a lounger for sleeping and eating, one seating and a table. (Hradecká a kol., 2013)

2.1.2 Middle Ages

Middle ages buildings were protected with ramparts. At the country side, there were developed three – room's houses. The entrance was moved to the developed area and before there was another room. (Brunecký, 2009)

2.1.3 Modern Time

In renaissance times, there were mostly castles built, which had a representative function for the ruling class. Individual rooms, were accessible from arcades loggias. During renaissance, there was developed a plan for the houses, which basically stayed till these days. In Biedermeier style, there started to be new types of the houses – built – on galleries, where the entrance to the house was through the kitchen.

Houses with separated entrance halls started to be developed during the late 19th Century. The width of the entrance halls was usually between 1,5 – 2 meters. Bigger flats had entrance halls with the dimensions between 3 – 4 meters and in family houses, the entrance halls were also used as big halls with seating's and so on. During the 19th Century, there were

designed and manufactured first famous hangers from Michael Thonet, made from bended wood. (Brunecký, 2009)

2.1.4 20th Century

In the 20th Century, there was a shared passion from both men and women with an innovative spirit and their desire was to improve the society in which they lived by that time. There was research from which came new materials and production methods in the manufacturing of furniture and house hold articles. Even though the furniture had quality and well-designed furniture was available to most of the population and not only to the select minority. (Bueno, 2013)

In the middle of the thirties there came a new way, how to understand the creation of furniture, which was known as Scandinavian organic design. There was a big focus on the organic materials and organic shapes. From those times, there came two of the greatest designers – Finnish designer Alvar Aalto and the Danish architect and designer Arne Jacobsen. (Bueno, 2013)

During the 20th Century, there wasn't so much furniture and possibilities for the entrance halls in Czechoslovakia. Then started the use of new materials, such as High Pressure Laminate (HPL), which is typical for the prefabricated houses in Czechoslovakia. The entrance hall was usually small and dark corridor and there was this HPL core next to it. During the twenties and thirties, the houses were influenced by functionalism. Sadly, the houses weren't projected by architects. At the end of forties, there was made a collection of the measurements for family houses. (Konciar, 1996)

2.1.5 21st Century

As we are just in second decade of the 21st Century, we do not have the advantage of hindsight to reflect on changes that may eventually be described for the whole 100 – year span, but we can say, that the profession of designer is still changing and evolving. It increased creativity in all design areas – architecture, furniture design, graphic design and fashion. Interest in design is increasing and design of 21st Century looks different, then during 20th Century. Rational forms of 20th Century modernism are gone in benefit for experiments and sensuality. The entrance hall is multifunctional space and it can serve also as a meeting point and working space for clients. (Boháčková a kol. 2013)

2.2 Function of the Entrance Hall

The entrance hall has several functions. It is the first look of the house, but it can also say something about the people, who live in the house. It is also a filter between outside space and the living area in the house. The size of the entrance hall is proportional with the size of the whole house. It is not considered as a living room, so it does not have to have day light with windows and ventilation. (Hála, 2009)

At the entrance hall, we leave our clothes, such as coats, jackets, scarfs and other accessories. We also take off our shoes in this space and change outdoor shoes with the house “slippers”. It also serves as storage area in the house very often. That is why there are usually hangers, hanging wall, storage space for shoes, shelves for the keys or smartphones, which we have almost all the time in our hands these days. There also must be a mirror, to check our appearance. (Černíková, 2010)

From the practical view, it is suggested to have three cleaning zones. This is not usually possible at the family houses, so there should be quality mat for cleaning the shoes. The next important thing is the floor and walls. People should not save money on the quality of flooring they use, when there is an option for pavement or vinyl floor. Pavement flooring is the best especially in the case when there are animals living in the house, because it is easy to clean it. For the walls, it is good to use resistible and washable paint. (Černíková, 2010)

ČSN 73 4301 still requires entrance hall as separated space in the house, because other rooms cannot be directly entered from the house communication. There are also usually other separate rooms, such as cloak room, where can be the wardrobes with all the clothes. (Hála, 2009)

2.2.1 Semi – public space

The entrance hall is dividing other rooms of the flat from the outside communication. It is also serving as a place for taking off clothes and shoes of the house visitors. (Hála, 2009)

2.2.2 Communication space

It is a communication space in the house, from where we are entering other rooms. There are usually also stairs to the other floors. The entrance hall can divide the house into a public space (kitchen, living room) and a private space (bedroom, children room). (Hála, 2009)

2.2.3 Filter function

It has hygienic, noise and thermal-insulating function. That means, that it is protecting the rest of the house from the heat escape, and it prevents noise from the street coming in the house. Hygienic function means, that we can change our shoes here, before we enter the rest of the house. (Hála, 2009)

2.2.4 Storage function

Entrance hall is a place, where everybody stores their clothes, like coats, jackets, shoes and seasonal clothes. Usually, there are some big closets, hangers and shoe stands. Also, there must be a mirror and good lighting. (Hála, 2009)

2.2.5 Presentation and social function

It is the first place you see in the house. That is why the furniture should correspond with the rest of the house. All visitors of the house will come through there and they will need to take off their clothes and shoes too. (Hála, 2009)

3. Research

Within the start of the designing part, there was made a research about the current situation with furniture for the entrance halls. The research was focused on seating and hangers for the entrance hall, which are the most important for this space, because anyway, we need to sit somewhere, take off our shoes and hang our coat.

3.1 Overview of current market

The market is overloaded with several furniture pieces. There is a lot of cheap furniture, which at first maybe looks quite nice, but it is made from non-quality materials. People in the Czech Republic still need to change their thinking about design, because most of them think, that if it is „design furniture”, it is also expensive. But in this case, you pay also for the used materials, which are usually quality materials.



Fig. 8: Sconto nábytek, 12 000 CZK (www.sconto.cz, 2017)

In the Czech market, there are several very similar hall furniture pieces from Furniture stores, like Sconto, Asko or another brand. Usually it is a furniture wall, with closet, hangers and bench. It is usually made from particle board with various wooden decor.



Fig. 9: HM nábytek, Antwerpen, 19 565 CZK (www.hmnabytek.cz, 2017)

Furniture piece Antwerpen is also a furniture wall and it can be combined with the closet and a commode. There is also a bench for sitting. This kind of furniture is classical and we can see similar furniture at many entrance halls.



Fig. 10: Bjärnum, IKEA, 249 CZK/3 pieces

Bjärnum is idea of the entrance hall, created with hangers on the wall, which are making nice detail on the blue wall. There are also shoe holders. For sitting, there is a chair, which makes a nice contrast with the blue wall. Also, there cannot be a mirror missing. This idea is about open air storing of clothes, but most of all, just for visitors or the clothes we are currently wearing. There would have to be a storage room with closets for seasonal clothes. This idea is good for very narrow entrance halls.



Fig. 11: Platel Storage Unit, Note Design Studio (www.notedesignstudio.se, 2017)

Platel is a storage unit, which has original design and its aim is to maximize the space of the house. Many people leave their clothes and other stuff on the floor in the entrance hall or bedroom, which then looks messy. The idea of this product is to keep those items, which suddenly do not look so messy. Because of its design it creates order to those items in chaos. This kind of furniture piece can be used in the entrance hall, bedroom but even in a living room. There are two options for its colour – white or black, with different kind of wood as well.



Fig. 12: Camerino Valet Stand, Brose ~Fogale (brosefogale.co.uk, 2017)

Camerino Valet Stand is designed by designers Matteo Fogale and Joscha Brose and their studio, based in London. Together, they are working on interior design, products and bespoke furniture. This furniture piece was inspired by valet stands, which were used during 1920's very often, but unfortunately, they have been largely forgotten over the decades. This revitalized the archetype to fit into modern lifestyle. It gives a convenient place for hanging user's belongings, keeping their house tidy, but it also gives modern look to interior. There was also an idea for the people, who are moving very often, because it is very easy to disassemble this piece. It leans against any wall. Designers of this studio also wanted to shorten the distribution chain between the designer and the product user (Kickstarter, 2013).



Fig. 13: (a-b): MrO hanger, Neri & Hu (www.offecct.se, 2017) and MrO hanger at Salone del Mobile, Milano 2017 (author, 2017)

Chinese studio Neri & Hu designed this coat rack for Offecct and it combines metal, leather and concrete. It is made from tubular steel in rectangular shape with black, gold or copper finish. It rests on circular concrete base and there are leather straps for hanging.

3.2 Analysis of the object and specific needs for the object's solution

Research was made on the Czech market, but also in several foreign countries such as Finland, Spain and Portugal, which was conditional to the previous exchange studies abroad. The author focused on the classic furniture, which we can usually see at the entrance halls in several new Czech houses. After that, products were found from design studios, which have different ideas about interior and the use of furniture. There were found several products, which inspired the author for her work.

There were several requirements which needed to be settled, such as soft and smooth design, funny design, modern look but also timeless. The shape of product comes from the chair, with slightly different dimensions than usual, so one of the requirements was fulfilled. Also, the material used had to be birch wood, because it is one of the most used woods in Finland. It is because there is a lot of birch forests everywhere, so the material is quite cheap and it has good use. The author wanted to give the product modern look, with

using natural materials and show that furniture from solid wood does not have to be rustic, as we can usually see it in the Czech houses.

Furniture of the entrance hall is edited by ČSN 91 0000 NÁBYTEK-NÁZVOSLOVÍ in Czech Republic. There is a closet with shoe holders in use in most of the Czech houses.

Storing furniture:

According the size:

- Big storage space – wardrobe
- Small storage space – shelves, boxes, ...

According the stored objects:

- Closet, shoe holder, ... (Fišerová, 2006)

Shoe holder - Most often used piece of furniture. Not all the shoes of the whole family must be at one place. There can be some smaller shelf for worn shoes and then, another storage space for seasonal shoes. If it is a shoe holder or a shelf, which is closed, there must be some space, so it can breathe.

Seating - Older people, kids but probably almost anyone of us, prefer that there is some seating, which helps us to put on our shoes easily. There can be a smaller stool, poufs or a bench. The seating is very often wired with the shoe holder as well. It is possible to put on the top of the holder some upholstered mat, pillows or plaid as a decoration and make the seating more comfortable.

Closable storage space - Because entrance halls are usually quite small, it is better if all the jackets and shoes are not on a visible hanger. That is why it is better to have a closet, which is possible to close. For a jacket, which we are wearing right now it is enough to have some hangers, but it is always good to have an option of hiding everything in the closet, if someone is coming to visit our house for example.

Small storage space – Another need is to put somewhere our keys, mobile phone or post. It can be a small shelf, drawer or a console table.

Mirror – A mirror is very important item for every interior in the entrance halls. There should be a big mirror, where we can see our whole body and check our appearance, before we leave the house. Another good property is, that it is making the room look bigger. The mirror

should not be right in front of the door, because it does not look very pleasant. It is better to place it next to the door either on the left or right side, depending on which side the door is opening. Also, it is important to have enough distance from the mirror, relative to the lighting in the entrance hall.

Also, there can be separate changing rooms, which serves also for storing seasonal things, like sleeping bags, in-line skates, ice skates, snowboarding shoes, skiing shoes and so on. It is also good to have stand for wet umbrellas. (Hála, 2009)

Furniture must be made per ergonomic measurements. The next part includes ergonomic suggestions and measurements.

3.3 Ergonomics

Ergonomics comes from Greek language – ergon, which means work and nomos, which means rule or law. Basically, there are general principles of safe and comfortable movement and work. (www.n-i-s.cz, 2017)

Before the start of planning the entrance hall, it is necessary to consider several important measures, which relate to the human body. This is to prevent a person from inability of taking off their coat or shoes. Minimal width of the entrance hall without furniture is 1,1 m.

The measurements of entrance hall's furniture are derived from sizes of clothes, shoes and other objects, which we are keeping there.

For the shoe holder, the depth should be at least 370 mm, if there is an option of ejecting the shoes. For very narrow entrance halls it is suitable to have the depth of the shoe holder just 150 mm. (www.n-i-s.cz, 2017)

The height of the seat should be between 320 – 470 mm. The depth is supposed to be between 400 – 500 mm for the chair. All the dimensions depend on the height of the person and the best would be, if all furniture would be according those measurements. (www.n-i-s.cz, 2017) Those dimensions can be seen below (Table 1), where are measurements for different height of the person. The average is size M.

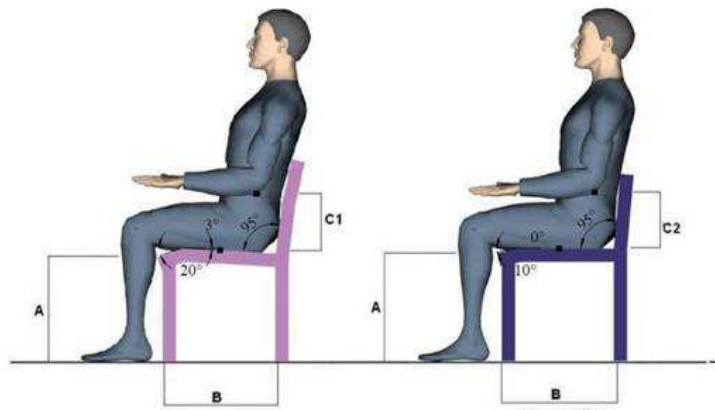


Fig. 14: Dimensional requirements (www.n-i-s.cz, 2017)

Table 1: Dimensions of domestic chair (www.n-i-s.cz, 2017)

DOMESTIC CHAIR

SIZE (CM)	(XS)	S	M	L	(XL)
HEIGHT OF THE PERSON +/- 5 CM	155 cm	165 cm	175 cm	185 cm	195 cm
A	32,0	40,0	42,0	45,0	47,0
B	40,0	40,0	45,0	45,0	50,0
C1	19,0	20,0	21,0	22,0	23,0
C2	18,0	19,0	20,0	21,0	22,0
WIDTH OF THE SEATING	35,0	40,0	40,0	45,0	45,0
DISTANCE BETWEEN REST	55,0	60,0	60,0	65,0	70,0
ANGLE OF THE SEAT	0° – 3°				
ANGLE OF THE BACK REST	95°				
ANGLE OF THE FRON EDGE OF THE SEAT	10° - 20°				

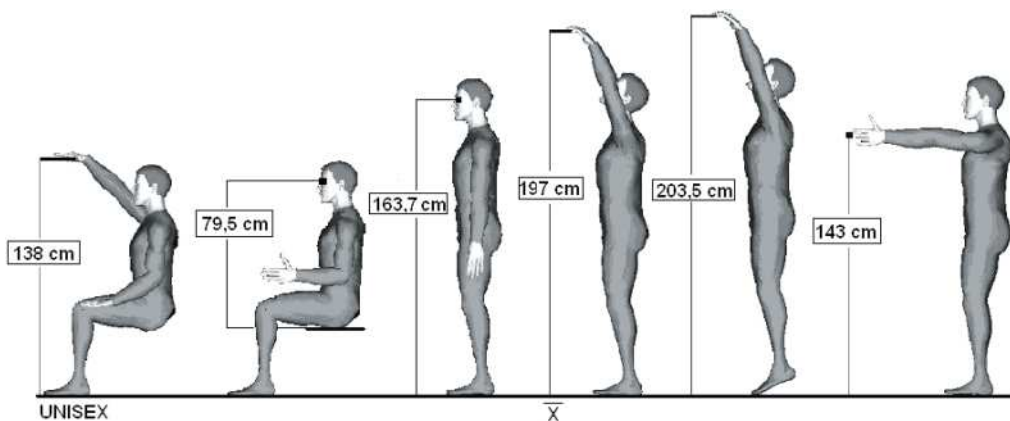


Fig. 15: Dimensions Requirements for the height (www.n-i-s.cz, 2017)

On the Fig. 16, there are heights, where the person can easily achieve. We need to know those heights for storing our jackets or the seasonal stuff to the high placed shelves.

Another important thing is some place with hangers for coats, in case they get wet thanks to a rainy weather. Only hangers are good just for visits for a while, but not for a long time. For that, there should be place with hangers for which is need 550 mm depth. In case there is withdrawable stick, there can be 300 mm only. (Boháčková a kol., 2013)

The height, where the person can reach while standing is around 1400 mm. This height is good for silent servants or shelves. Height is derived from the height of the person. Dimensions can be seen at the table below (Table 2). (www.n-i-s.cz, 2017)

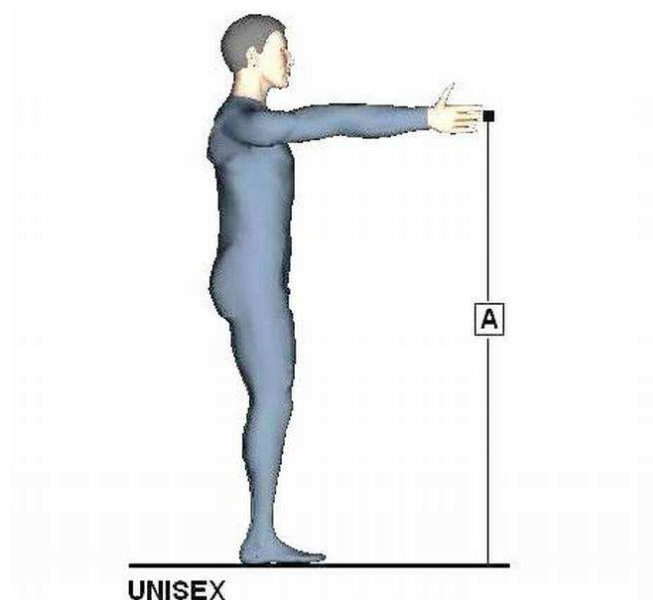


Fig. 16: Height range of arms (www.n-i-s.cz, 2017)

Table 2: Height of the arm's reach (www.n-i-s.cz, 2017)

	HEIGHT OF THE ARM'S REACH				
SIZE	(XS)	S	M	L	(XL)
HEIGHT OF PERSON +/- 5 CM	(155 cm)	165 cm	175 cm	185 cm	(195 cm)
A	127,0 cm	135,5 cm	143,5 cm	152,0 cm	160,0 cm

3.4 Standard requirements

The space of the entrance hall and furniture used must fulfil some technical standards. It must comply with safety standards as well. The main regulations are Czech Technical standards. They are taken from the EU – ČSN EN (they can be in the original language or translation). Terms and definitions come from the standard ČSN 91 0000 Nábytek. Názvosloví (Furniture). Requirements for technical properties derives from ČSN 91 0100. Nábytek. Bezpečnostní požadavky. Requirements for the technical properties of wood derives from the standard ČSN 91 0001.

Related standards in the European Union for furniture

Technical standards are requiring features of the product. The standards in the Czech Republic are a recommendation only and it is not obligatory to use them.

Selected standards:

Standard for furniture and safety requirements - ČSN 91 0100. Nábytek – Požadavky na bezpečnost.

Domestic furniture - seating furniture and testing of furniture - ČSN EN 1728 (91 0235) Nábytek bytový – sedací nábytek – Zkušební metody pro stanovení pevnosti a trvanlivosti.

Furniture – Strength, durability and safety - Requirements for domestic seating - ČSN EN 12520 Nábytek – Pevnost, trvanlivost a bezpečnost – Požadavky pro domácí sedací nábytek

3.5 Lighting

Lighting is an important part of interior also at the entrance halls, because it is the first place we see when we enter the house. Sources of lighting are categorized as being either natural, such as daylight and flame or artificial, which are mainly electric in origin. (Slotkis, 2013)

Natural light

At the entrance hall, there is not a daylight very often and sometimes it is present from the entrance doors or other rooms. Usually, light is coming through the glass windows or doors. That is why there must be some artificial light. (Vinárčiková, 2001)

Artificial light

There can be placed bigger central lighting with smaller point lights. Instead of the central

lighting there should be also additional light, usually used with mirrors. The light must emit to standing person in front of it, but it cannot be glaring at the person. (Vinárčiková, 2001)

LED technology (Light – Emitting Diode)

LED light are used very often these days. It is thanks to its low use of electric energy and their long life. They are very small and they can be used as a belt with small bulbs. There are several colouring options and they are not hot. (Slotkis, 2013)



Fig. 17: Led stripe (www.t-led.cz, 2017)

3.6 Colours

Entrance hall shows us the first idea about the rest of the house with its colours. It should represent the rest of the house. Colours in this area should help to orientation in the house. For smaller rooms, it is better to use colours in the same tone, and conversely in the bigger area also a contrast colour.

3.7 Composition of the stored items at the entrance hall

Composition of the stored stuff in this area depends on the size of the entrance hall itself. The practical thing is to have a dressing room next to the hallway. It also depends on the people who live in the house. Single people does not need so much space as a family with two kids, but it also depends on the lifestyle of its inhabitants. (Fišerová, 2006)

Most often stored stuff at the entrance hall are:

- Shoes
- Clothes
- Seasonal stuff, such as winter/spring jacket, sleeping bags, tent, luggage's, backpacks, ...
- Sport stuff, like, in-line skates, ice skates, snowboard, skis, ski or snowboard shoes, bike, ...
- Detergents for cleaning, vacuum cleaner, broom, clothes dryer, ...
- Shoe care products

Table 3: Orientational composition of chosen stored clothes, shoes and accessories (Fišerová, 2006)

MEN		WOMEN	
Shoes	6 pairs	Shoes	10 pairs
Winter jacket	2 pieces	Winter jacket	2 pieces
Sport jacket	1 piece	Sport jacket	1 piece
Summer jacket	2 pieces	Summer jacket	2 pieces
Rainy coat	1 piece	Rainy coat	1 piece
Hat	2 pieces	Hat	2 pieces
Gloves	3 pairs	Gloves	5 pairs
Belts	4 pieces	Handbags night/day	3 pieces/2 pieces
Working bag	2 pieces	Working bag	1 piece

4. Materials and Technologies

Unstoppable research is giving us a lot of new materials, with great aesthetical and physical properties every year. Even though, there are still materials, which are used for ages. It is wood and metal. Both are very resistible and they have long life term too. Because of the possibility of working in a metal workshop and wood workshop during the exchange studies, those two materials were chosen for the final product. At this part, there are described materials, which were chosen for the final product. There is basic information about their properties and the technology of working with them.

4.1 Wood

The most used material in the entrance halls is wood or its other forms. Wood is still one of the most used materials in interiors, because it is a natural material and it has a lot of good properties. It is also ecological, because it is still growing, hygienic and it is not dust binding so it is suitable for the people with allergies. Wood also has long life term, and it is a soft and warm material. For the author's design a birch wood was used, because it is the most popular wood in Finland. It is probably thanks to the biggest amount of the birch forests in Finland. That is why the author decided to use birch also for her product. There are many species of the birch. The yellow birch is the most commercially important. European birch is fine grained, rare and expensive. (Hradecká, 2004)

Birch is a bowery wood and it belongs to scattered porous deciduous hardwood. The colour of the wood is mostly white or yellow. It is not good to use this wood at exteriors, because it can be affected by wood-decaying mushrooms and so on. For the interiors, it is best suited. It has very good mechanical properties and it also used to grow a lot in the Czech Republic. These days, the birch is mostly used in Northern European countries, such as Sweden, Denmark, Norway, Russia and especially Finland. In Finland, there is highly developed plywood industry and Finnish plywood is even exported to the Czech Republic. The most famous Finnish company, who manufacture plywood machines is Raute. Another reason for considerable use of birch wood is the company IKEA, which started using this material during the eighties.

It is quite a cheap wood with interesting patterns. It is used for floors, doors of kitchen furniture, table boards and slatted bases for beds. It is easy to sand, shape and polish. The

hardness of the birch wood is 26 MPa, so it is quite soft wood in comparison with oak, which has around 40 MPa or very hard wood Ipe, which growth in tropical areas, has 65 MPa. (Hradecká, 2004)

4.2 Metals

Metals are elements with the biggest amount in the periodic table. The most used metals in product design are alloy metals. The most common type of metal is steel, which is iron with carbon and other alloying elements to make them harder, tougher and more resistant to the corrosion. Steel is used in 90 % of all cases in the world, after that there is aluminium, followed by copper, nickel, zinc, titanium, magnesium and tungsten. (Ashby, 2009)

In comparison with other materials, metals are stiff, strong and tough. The disadvantage of them is, that they are heavy. They have relatively high melting points, which allows some metal alloys to be used at temperatures as high as 2200 °C. All metals are vulnerable to corrosion, because of the reactions with oxygen. (Ashby, 2009)

Metal is used as a building materials but we can find it in the interior very often as well. Every house contains something from metal, such as taps, lockers or handles. Metal is a mineral material and we can find it in several variants in the nature. It is very solid material, which can be shaped when it is hot. It is not emitting any warmth though and it is cold when we touch it. (Ashby, 2009)

Low Carbon Steel

This type of steel is the most common used type and it is strong, tough, easily formed and cheap. It is an alloy of iron with carbon and with a little of manganese, silicon or nickel. This kind of steel has less than 0,25 % of carbon. It is relatively soft and easily rolled into plate. (Ashby, 2009)

4.2.1 Technology

Bending of metals

Bending is a way of forming the materials without any joints, which is progressing in cold form. It is elegant and economical solution for working with metals. Usually, there are used two ways of bending – simple bending or by using a hammer. (Kula&Ternaux, 2012)

For the product manufactured by the author, there was used a bending machine for bending tubular steel. It is possible to set up the needed angle and the machine will turn the steel automatically.

Welding

Welding is the most common type of joining the metals. There are several types of welding. There had to be settled thermodynamical conditions, when the new bonds arise. (Číhal, 1999)

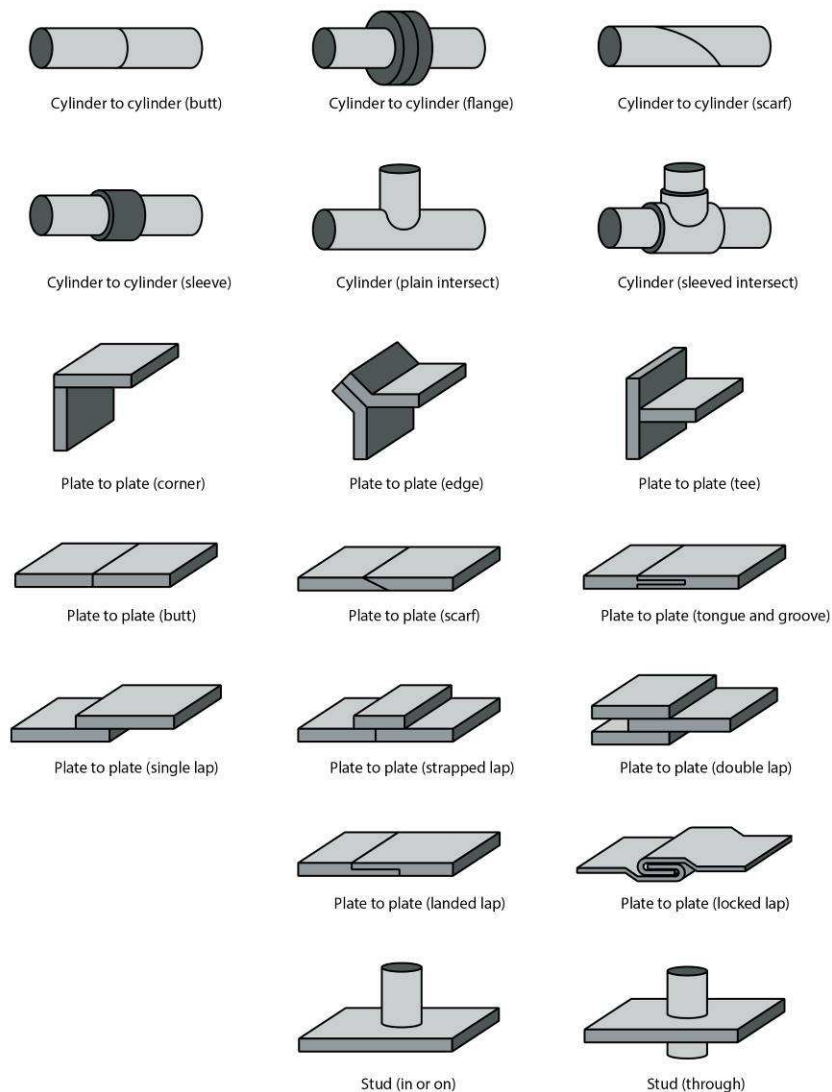


Fig. 18: Joining types (Ashby&Johnson, 2002)

Welding types

Torch Welding (MMA or SMA)

Torch welding, also known as manual or shielded metal arc welding, is one of the most important welding types, using low-cost equipment. An electric arc is established between a flux coated consumable rod (an electrode) and the component. It can be used for all joint types (Fig. 18). This type of welding is very easy to use, but it has a disadvantage – that it cannot be automated. Because of that, it is not good for mass production. Metals, which can be welded by this type are carbon, low alloys, stainless steel, cast irons and certain nickel alloys. Weld lines should be straight or have simple contours. (Ashby&Johnson, 2002)

Gas Metal Arc Welding (GMAW/MIG)

More commonly known type of welding as MIG welding. This type of welding uses a bare wire with no flux, which is replaced by a stream of inert gas. This method requires a constant voltage and direct-current power source and it uses shielding gas, which is usually argon, helium, carbon dioxide or a mixture of these. It can be used for mild steel, stainless-steel, aluminum, magnesium and titanium. Joint type, which can be used is *butt* and *lap*. (Fig. 18) Weld lines should be straight or have simple contours. (Ashby&Johnson, 2002)

Gas Tungsten Arc Gas Welding (GTAW/TIG)

It is also an arc-welding process that uses a tungsten electrode to produce the weld and the piece is shielded by inert gas too. In this case, the tungsten electrode is not consumed, because it has extremely high melting temperature. Filler materials must be supplied as a wire or rod. This process is much more time consuming than the other three, but it is also the cleanest and the most precise, although the most expensive type of welding. It can be used for aluminum, magnesium, titanium, stainless steel, cast iron, mild steel, and for a nickel. There can be used all the joint types (Figure 18). (Ashby&Johnson, 2002)

PRACTICAL PART

5. Working process

At this part of the thesis, there will be described the process of work during the exchange studies and it will continue with the manufacturing process with the Czech company. When the topic of this diploma thesis was chosen, the author did not know, where exactly the thesis will lead. The author only knew the possibilities of the company, so she tried to use materials and technologies, which they will be able to process. The diploma thesis has got its aim after the exchange studies, where the topic of the entrance halls came up together with Furniture design project. The author communicates with the company after that, so she knew their possibilities according her design idea.

The author wanted to create a product, which will bring a hint of design to the entrance hall, because most of the times, there are several “boxes” for storing clothes, but nothing very special, which would give you a good expression about the rest of the house. She also wanted to create a product, which will be useful for singles in a small flat or for a couple, who has a starting habitation. That is why the product should have a “friendly design” for the most of the customers and it should not look too expensive.

In the following chapters, there is described the design process of the laptop table, which inspired the author for the other piece – Bow bench, which was created for the entrance hall. From this derives also the last product – Bow mirror, which is also designed for the entrance hall, but it can be used anywhere in the interior as well. It is divided into three separate chapters about its own product, according the timeline, how the products where created.

6. Bow baby

Before the product, which was supposed to be for the entrance hall, there was a design of a table for laptop, which can be used in a bed. This product was designed also during the exchange studies in Finland at the Wood Workshop course. The metal part was made in the Metal Workshop. It gave the idea for the product which could be used in the entrance hall with the used materials and technology. The author decided to create a collection of furniture pieces, which can be used anywhere in the house, even though, it was supposed to be used in the entrance hall first.

In this part of the thesis, the manufacturing process of the table will be described, but all the machines will be described at manufacturing process for the bench, because it had a similar process of work.

6.1 Development of design

People are using laptop in their beds very often these days, even though it is not good for our back and health. Unfortunately, it is a part of today's lifestyle. The table can serve as a table for breakfast in bed and it is nice supplement to the interior too.

6.2 Sketches

First, there had to be made sketches, which were consulted with the supervisor. There was an idea of table with moving legs, which would be hidden in the board eventually. After consideration of the manufacturing process, the decision was to create a table, which is easy to disassemble.

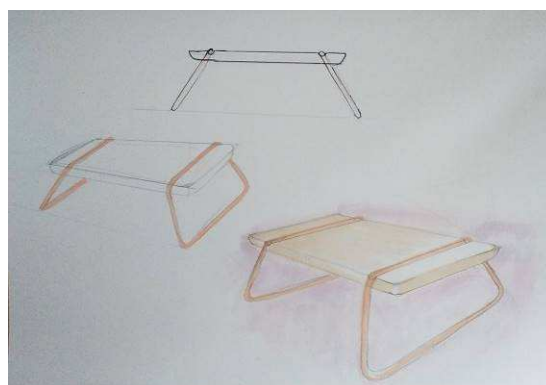


Fig. 19: Sketch of the table (author, 2016)

6.3 Manufacturing process

The product was created at Kymenlaakso University of Applied Sciences building called “Paja” in Finnish, which means workshop in English. There is wood, metal and plastic workshop and they are in the first year of the Finnish student’s studies. For the Erasmus+ students it is kind of a quick practice, made during one week. Students can use all the machines by themselves after that, but there must be a teacher in the workshop. It is possible to use the machines since 8am till 4pm every day Monday to Friday, but it was also possible to ask the teacher, if he can come during the weekend.

First, a battenboard had to be manufactured for the desk. Pieces of the birch wood were cut with a vertical belt saw. The pieces of wood had to be levelled to the same width with a planer and the same thickness with thicknesser after that. When this was done, the author could glue all the pieces together. After hardening of the PVAc glue, the board was cut into correct dimensions, which are 400mm x 320mm. The thickness of the board is 28mm. The edges were sanded with a belt sanding machine and flat parts were also sanded with hand eccentric sanding machine Festool. Finally, there were trenched slots for tubular steel legs.



Fig. 20: (a-b): Glued board and trenched slots for tubes (author, 2016)

When the wooden part was done, the author started with the process of manufacturing the legs. They are made from tubular steel with 16 mm diameter. Tubes were bent on an automatic bending machine, where it is possible to set the angle. Tubes were bent into trapezoid shape and they had to be welded at one point. The weld was grinded after that. Finally, there were holes drilled for screws, which can only be seen from the bottom. The same had to be done with the wooden board. Metal tubes were painted with acrylic paint in salmon orange colour and the table was assembled after the colour dried. Finally, the legs

were screwed to the wooden board from the bottom.



Fig. 21: Start of bending the tubes (author, 2016)



Fig. 22: Bended tubes without welded joint (author, 2016)



Fig. 23: Bow baby table before paint



Fig. 24: Laptop table Bow baby (author, 2016)

7. Bow bench

7.1 Development of design

Bow bench was designed at Furniture Design Project, which was a final project of studies in Finland. This course was for the last year students, unlike of the Wood Workshop or the Metal Workshop, which are courses for the first-year students. Supervisor of the work, was designer Saara Renvall. It continued with the same design as the laptop table has. The topic was ETEINEN, which means entrance hall in Finnish. The students had to create furniture design of the product, which will serve in the entrance hall. At the end, there supposed to be a real prototype, manufactured by the students at the university. Finally, the product was presented to the company Hakola, which is manufacturing furniture. They were supposed to choose some of the students work and manufacture them in the future and send the best product to Habitare furniture fair in Helsinki.

The first idea of the author was to create an object, which will have an aesthetical function, but it will also serve and be functional. First, some sketches were drawn.

7.2 Sketches

The first sketches were usually of a bench or a hanger. Bench, because usually people sit, when they are putting on the shoes and a hanger, because people needs to hang their coats. The author was trying to find the best shape of those things. Finally, the author decided to connect those two things together.



Fig. 25: a-b: Looking for the right shape (author, 2016)

The supervisor liked the idea, which can be seen in the following figure. It is a bench, with a bow for hanging clothes, bags or anything else, which people are leaving in their entrance hall. After the sketches, the 3d visualizations were made with other variants as well.



Fig. 26: Final idea (author, 2016)

7.2.1 Looking for the best solution

The author derived those visualizations from the last sketch, but she tried to use a metal bow as one piece also for the legs at one side. It was reminding kind of a disproportional chair. Here is seen an idea of milled “bowl” for holding the user’s keys and mobile phone already.

The author also tried to use square metal profiles, which would also be a support for the board. In this case, square profiles will not be so friendly for the hanged clothes and it did not look so funny anymore either, because of the square profiles. This idea was not developed more after this.



Fig. 27: Wooden board with metal part for hanging and variant 2, square profiles (author, 2016)

7.2.2 Visualisation of the final design

For the final design was chosen the first idea, but with the metal legs at both sides. The board is from birch wood. The design of this piece was about taking inspiration in simplicity of a finish design, which has a long tradition in design history. Also, used material comes from Finnish tradition. At the *Fig. 28* are shown colour options for the bench.

Final design is simple and clean, a bench with a hanging bow for clothes and a “bowl” for user’s keys, smartphone and so on. It enables the user to have their favourites garments on hand always. The user can just leave their keys and phone in the prepared bowl, hang their jacket and take off their shoes, while sitting on the bench.

The author decided for the same manufacturing process as it was used for the laptop table before. It was just in bigger size this time, so the table was a good practice for this final project.



Fig. 28: Final design and colour options (author, 2016)

7.3 Manufacturing and technological process

The manufacturing process was very alike as the process of manufacture of the laptop table, as it was written before. In this part of the work, it will be described more, because this bench was the final and biggest project, made during the studies in Finland. Here will be written about the chosen materials, technological process of manufacturing the wooden and the metal parts.

7.3.1 Wooden part

First, the author started with the wooden board. As it was done with the table, there was created a battenboard from the birch wood. The taken birch plank had to be cut to a smaller piece with a pneumatic cut-off saw. It was measured to the length 750mm and it was cut

after that.

Then the board had to be cleaned from the sides, which were not straight. There were made marks, according which the plank was cut with a vertical saw (Fig. 30: a). When this was done, the board was levelled at the planer. (Fig. 30: b).



Fig. 29: Pneumatic cut-off saw STROMAB TR 500 (author, 2016)



Fig. 30: a-b: Vertical Saw Penope and Surface planer Hofmann AHW 512 (author, 2016)

The work continued with the vertical saw, where the plank was cut into smaller pieces, with the 40mm width. It was made from the cut planks of wood. They were made to a 730mm length and after that, they were all united in the same thickness. For that, the surface planer was used again, and after that a thickness planer (*Fig. 31*), where it is possible to set up the needed thickness.



Fig. 31: Thickness Planer Panhans 436 (author, 2016)

When all of this was done, all the planks were glued together with PVAc glues again. The board then had to be cleaned of the excess glue from the joining process. In the following picture (*Fig. 32*) is the glued board with the excess glue showing. It is necessary to clean this glue before it hardens, because it is very difficult to remove the rests of glue from wood after hardening.

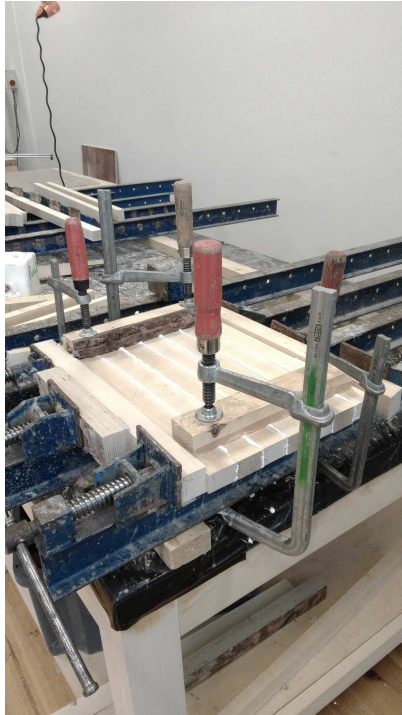


Fig. 32: Glued battenboard (author, 2016)

When the glue hardened, the vertical saw was used again for cutting the board to the needed dimensions. The final dimension of the board is 418 mm and 735 mm. The thickness of the board is 28 mm. After that, the edges of the board were sanded with the sanding machine, which can be seen at *Fig. 33*. The flat areas were sanded by the hand eccentric sander (*Fig. 34*), with the use of sanding papers granularity 60, 80, 100, 120, 150, 240, 320 gold paper. This is to make the surface of the board as smooth as possible.



Fig. 33: Sanding machine LVO120, Volpato (author, 2016)



Fig. 34: Eccentric sander ETS 150/5, Festool (www.festool.com., 2016)

At this point of manufacturing process, the author drew marks for trenching the “bowl” for storing keys and other items. The plunge router from Festool was used for trenching with the guidelines for the cut.

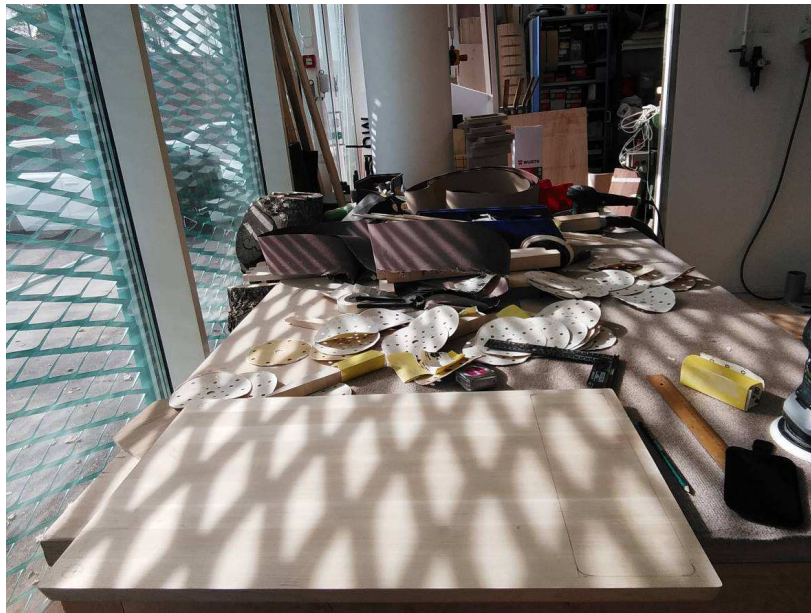


Fig. 35: Sanded board (author, 2016)



Fig. 36: OF 2200 W Plunge Router, Festool and trenched cut into the board (www.festool.com, author, 2017)

Final work with the wooden part was to drill the holes for the metal legs. The diameter of the metal tubes is 22 mm, so the hole had to be a little bit bigger. A drill with the diameter of 24 mm was chosen. The holes were drilled from one side through the whole board and in 5mm depth on the other side. This was because of its design, where there is a hanging bow coming through the whole board and the tubular steel legs, which are ending under the bowl. In the *Fig. 37*, you can see the drilled holes at one side and preparation of the metal legs on the other side. At this point, the wooden part was over and the author approached to the metal part.



Fig. 37: a-b: Drilling machine OPTIMUM and drilled holes (author, 2016)

7.3.2 Metal part

For the construction tubular steel was used with the diameter 22 mm. At first, the tubes were cut on the vertical saw for metals. The length was approximately three meters for the whole product. After that, all the parts were cut for the actual length. The bow should have a length 1.3 meters, the legs 420 mm.



Fig. 38: Vertical saw (www.pily-obchod.com, 2016)

Then, the hanging part was bent at the bending machine. There the degree of the bent was set. Then both sides were bent in the 90 degrees' angle required. The machine, which was used for bending is seen at the *Fig. 39*.



Fig. 39: a-b: Bending machine for steel tubes and bench before the paint (author, 2016)

After that the tubes were cut for the legs to a length 420mm, which were eventually welded together with the supportive construction under the board (*Fig. 40: a-b*). For welding, the most common type of welding – Gas Metal Arc Welding was used. At first, the legs with the supportive tube had a shape of a U, so the board did not have support under the whole length. The weld had to be grinded after that. Although, when the bench was constructed, there was a problem, because the bench was moving from side to side. The author had to dismantle the whole bench and add extra tubes for the longer sides as this was to brace the structure and give more rigidity. After the tubes were welded and the bench was constructed again, the bench did not have any other movement and finally, it was stable.



Fig. 40: a-b: First supportive construction (author, 2016)

For the hanging bow, 200 mm long aluminum tubes were glued into the legs. They serve as a support for the legs, which you can see at the figure below (*Fig. 41: a-c*).



Fig. 41: a-c: Supportive aluminium tubes (author, 2017)

Finally, the whole metal part was painted with acrylic paint for interior furniture in salmon orange colour. The author wanted to use spray paint, but it was not possible to buy the wanted colour in spray. That is why the author used acrylic paint and paint the tubes with a brush. The final prototype of the Bow bench was joined with screws and the hanging bow was settled on the aluminum tubes.



Fig. 42: a-b: Painted tubes Bow bench and Bow baby (author, 2016)



Fig. 43: Bow bench at Paja, Kouvola, Finland (author, 2016)

8. Bow mirror

8.1 Development of design

First, Chatrný nábytek was supposed to manufacture another BOW bench in the Czech Republic, because the author thought, she will not have the prototype. Finally, she received it from Finland, but she still wanted to manufacture it again. First, because she wanted to improve the construction of the bench and second, because she had a customer, who wanted to buy it. After everything was settled, the customer changed his mind, because of the financial problem, so the author decided to design another additional piece for the Bow bench. The author wanted to create a collection, which was an idea in Finland already, so she decided to design another additional product for the collection.

The author was considering all the furniture pieces and accessories, mentioned in the theoretical part. Finally, she decided to design a mirror, which would improve the function of the bench. Finally, the bench can serve as a valet stand for jackets, keys, smartphone and the user can check their appearance now as well.

8.2 Sketches and visualisations

The first idea was to create a mirror, which will be possible to hang on the hanging bow. The aim was to use a leather eyelet, which will be connected to the wooden frame of the mirror, and it will correspond with the design of the bench.

After finding the right shape, the author made simple drawing with the measurements for the company, who started with the manufacture accordingly. Marek Šulc oversaw the manufacturing process and he was still in contact with the author.



Fig. 44: Looking for the shape of the frame and the stand (author, 2017)



Fig. 45: Visualisation of the hanged mirror (author, 2017)



Fig. 46: Bow mirror visualisation (author, 2017)

8.3 Manufacturing process

The manufacturer ordered wood for the manufacturing of the battenboard. The chosen type of wood was birch, because it was used also for the bench and the table. The mirror was ordered from VV SKLO s.r.o., with diameter 200 mm.

First step was to create a battenboard. The process of the work was quite similar as the author did in Finland. The only difference was, that the craftsman of Chatrný nábytek made a finger joint between the battens, which can be seen in the *Fig. 47: a-c* below. This joint is better, because the joint between the planks is stronger than the butt joint, which was used in case of the Bow bench and Bow baby. The board had to be glued after that with PVAc glue again and rest for at least eight hours. In this case, the work continued the next day.



Fig. 47: a-c: Finger joint, battenboard, milling machine Holzkraft (author, 2017)

When the glue was hardened, the manufacturer could start with cutting the shape of the mirror frame. The diameter of the wooden frame is 240 mm and the diameter of the mirror is 200 mm. Those dimensions were chosen, because of the pitch between the hanging bow of the bench, which is 330 mm. In the figures below (Fig. 48: a-c), it shows how the work continued. There had to be a hole milled for the mirror, which was 10 mm deep. It is because the mirror itself is 4mm thick, there is a reversible tape and the author wanted to have the mirror embedded into the frame, which is 5 mm.

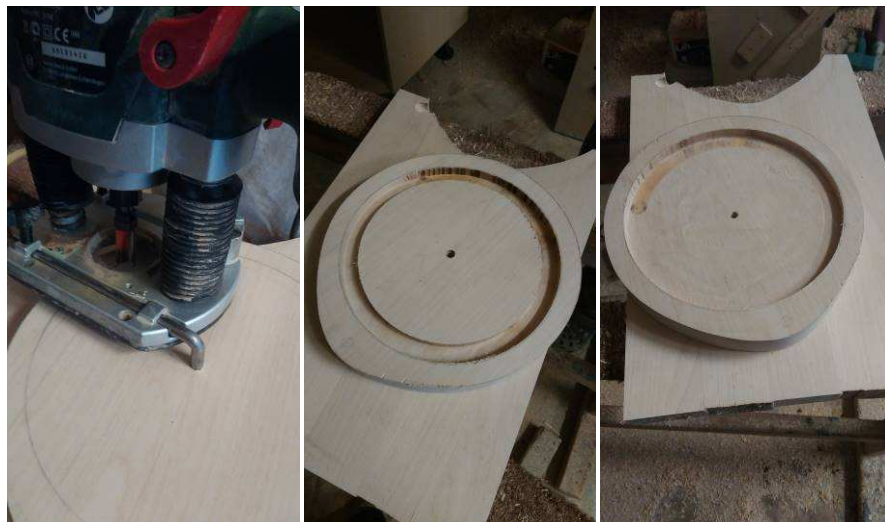


Fig. 48: a-c: - Plunge Router Makita (author, 2017)

At this point, the wooden frame was sanded with the sandpaper granularity 60, 100, 150 and 240. After that, there had to be drilled a slot for the leather eyelet. There had to be also a

hole drilled for the screw, which will hold the eyelet.

The final step was to sand the wooden frame as smooth as possible. As it was said before, first, it was sanded with the granularity 60 of the sandpaper and it was changed throughout the sanding process. It finished with granularity 320 to give a smooth texture.

The next step was to create the stand for the mirror with a bowl for jewellery. The stand has a rectangular shape, which comes from the shape of the bench. The dimensions of the stand are 170 x 400 mm with the 40-mm thick board. After the real size of the board was cut at the format table saw, there had to be created the slot for the mirror by using milling machine and later it had to be a hand work with a chisel, because of its shape (Fig. 50: a). Finally, there was trenched the bowl, with 85mm width for jewellery (Fig. 50: c).



Fig. 49: Milling machine Holzskraft TF 200 SE (author, 2017)



Fig. 50: a-c: Slot for the mirror and jewellery bowl (author, 2017)

After all of this was done, the craftsman had to sand the stand as well with the same sandpapers. The final step was to use transparent wax for wood, to prevent the wood from pollution. Finally, the mirror could be fastened into the wooden frame with reversible tape.



Fig. 51: a-c: The Bow mirror usage, leather eyelet (author, 2017)



Fig. 52: The Bow mirror (Barbora Floriánová, 2017)

9. The Bow collection summary

This chapter is a summary of the whole collection. The three products are described here with its main dimensions. Other measures are described more in the appendices at technical drawings.

Bow baby

Length: 480 mm

Width: 310 mm

Height: 227 mm

Weight: 3 kg



Fig. 53: The Bow baby table (author, 2016)

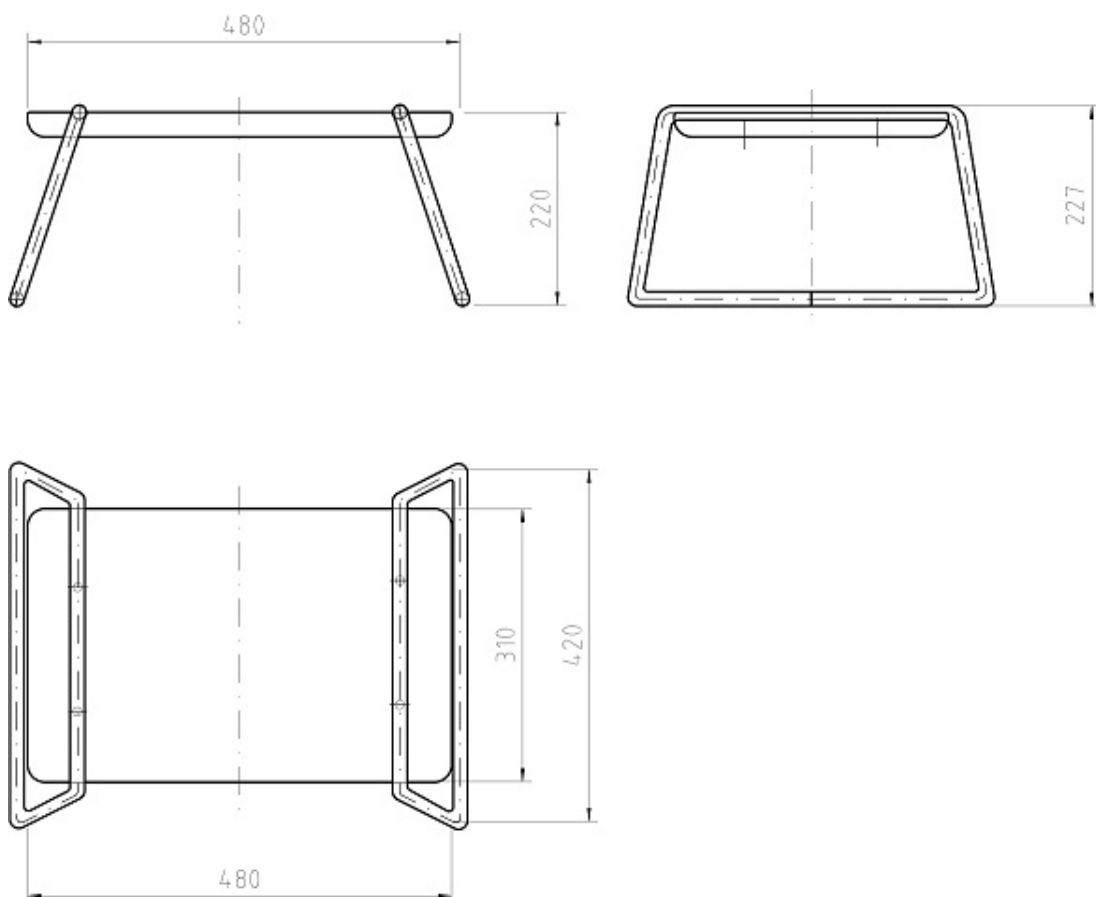


Fig. 54: The dimensions of the Bow baby (author, 2017)

Bow bench

Length: 735 mm

Width: 420 mm

Height: 1320 mm

Weight: 13 kg



Fig. 55: The Bow bench (author, 2016)

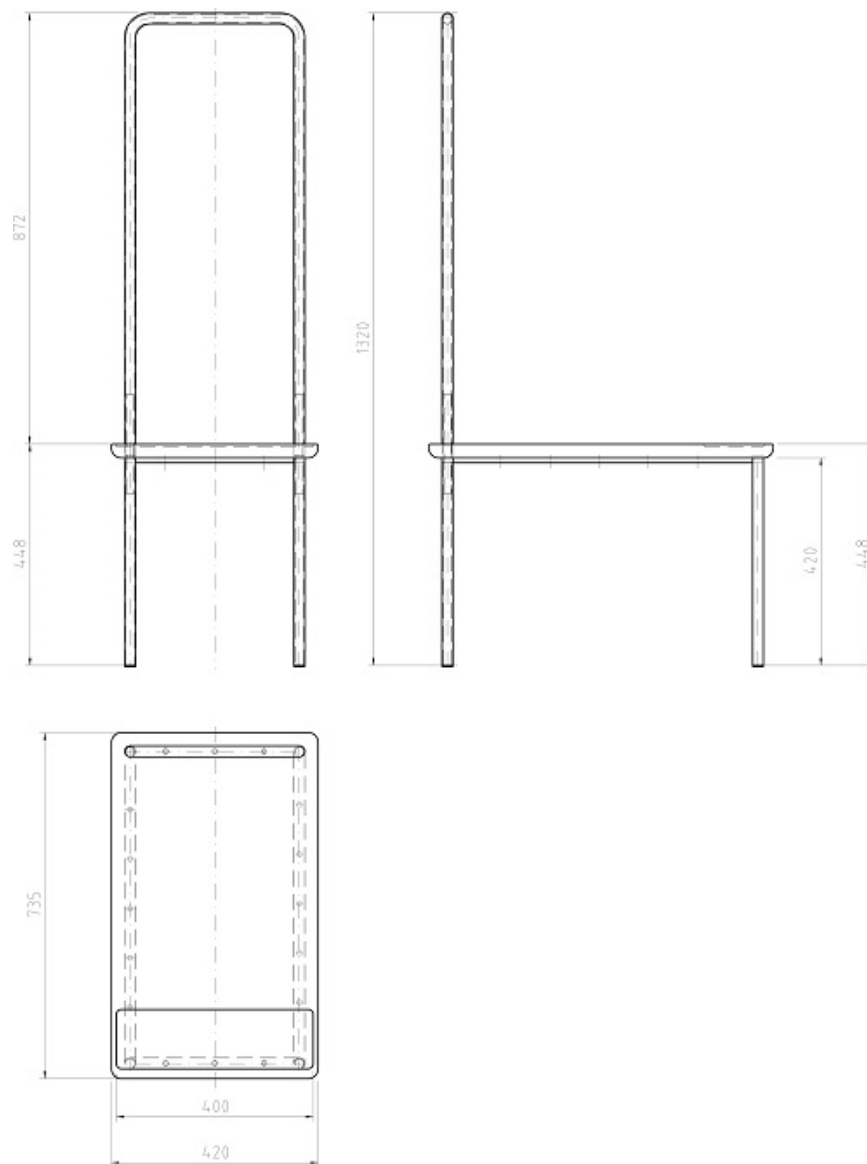


Fig. 56: The dimensions of Bow bench (author, 2016)

Bow mirror

Frame

Diameter: 240 mm

Mirror: 200 mm

Stand

Length: 400 mm

Width: 170 mm

Height: 250 mm

Weight: 4 kg



Fig. 57: The Bow mirror (author, 2017)

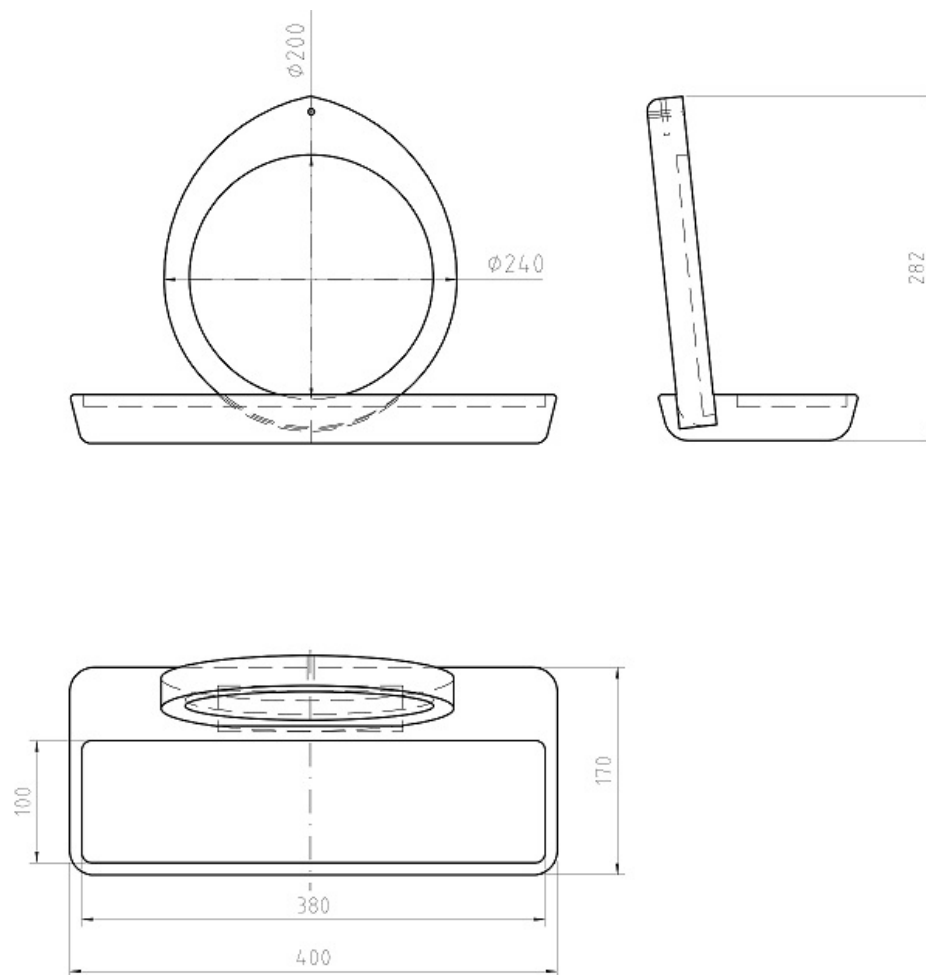


Fig. 58: The dimensions of the Bow mirror (author, 2017)

10. Calculation of the Bow collection

In this chapter the estimated prices of the products and the whole collection will be described. The two of them were manufactured by the author herself and the last one was manufactured by the company Chatrný nábytek.

First made was the Bow baby laptop table, which took about two weeks of work. After that, the Bow bench was designed and the whole product was made during one month. The author wanted to manufacture another bench in cooperation with Chatrný nábytek, which would have bigger rigidity and better properties overall. The author had to communicate with the company about the chosen materials, process of work and the price as well. Finally, the company wanted 6930 CZK for the manufacture of the product, with both the wooden and metal parts. From this price was determined also the price of the final product for the sale. In the table below, there is a calculation of the production of the bench.

Table 4: Calculation of the Bow's price manufactured by Chatrný nábytek

Item	Price (CZK)
Battenboard	890
Metal tubes – bending, welding	2350
Paint (acrylic)	490
Manufacturer	3200
Total	6930

The price comes from the several steps during the manufacture, such as cutting the wood, milling, sanding and the manufacture of the metal part, which was cut, bended and welded. The author was communicated with the customer, who changed his mind, because he thought it is too expensive. The customer was willing to pay 1500 CZK for the product.

The price of the bench would be less, if more pieces would be produced. In the case of the metal tubes, the calculation was offered by the company, which is seen in the table below (*Table 5*).

Table 5: Price of the manufacturing the metal part

ITEM	PIECES	PRICE (CZK/PC)
METAL LEGS	0-5	2000
	5 – 20	1650
	20 and more	1400
HANGING BOW	0-5	350
	5 – 20	180
	20 and more	150

After the customer decided not to buy the Bow bench, the author had to come up with another idea for the product, manufactured by the company, so it would fulfil the topic of the work, but it would not be too expensive for the author. After the design process, there was designed a mirror as a supplement for the whole collection. The mirror was made in cooperation with Chatrný nábytek, as it was planned before, but only with a smaller product. It is possible to hang the mirror on the bench or it can just stand anywhere in the room in the stand, where is also possible to store jewelleryes. The final price of the mirror is 1585 CZK, which can be seen in the table below. In this price, there is the price of the materials, such as the birch wood, mirror and leather eyelet. The manufacturer wanted 1000 CZK for its manufacture.

Table 6: Price of the Bow mirror

Item	Price (CZK)
Battenboard	300
Mirror	230
Leather eyelet	55
Manufacturer	1000
Total	1585

Table 7: The estimated price of the Bow baby

Item	Price (CZK)
Battenboard	300
Metal tubes – bending, welding	950
Paint	290
Manufacturer	700
Total	2240

Table 8: The price of the manufacture of the Bow collection (only one product of each)

Item	Price (CZK)
Bow bench	6930
Bow baby	2240
Bow mirror	1585
Total	10755

If the Bow baby would be manufactured also by Chatrný nábytek, the estimated price is 2240 CZK. The price of the manufacture for the whole collection is 10 755 CZK in case of the manufacture of one piece of each product, which means the bench, table and the mirror. According this calculation, the author made the estimation of the price for the whole Bow collection with the profit for the designer as well. The estimated price of the whole collection would be 15 755 CZK. The profit for the designer would be 5000 CZK.

In case of the manufacture more pieces at one time, the price would be lower. The whole Bow collection can be seen in the appendices of this work.

11. The discussion.

The goal of this thesis was to continue with the work, which started during the exchange studies in Finland, and it was supposed to end with the manufacture of the same product in the Czech Republic. During the decision of the thesis topic, the author was planning an exchange study in Finland already. The author was assuming, that there will be created a prototype of furniture, which would eventually be made also in the Czech Republic, because probably, the author would not be able to bring the product with her from Finland. By that time, the first communication with Marek Šulc had already started, even though it was not sure, what kind of furniture will be designed. That is why the author had chosen very general topic, so she could continue with the work also back in the Czech Republic. The topic of the entrance halls came up with the task, which was to design furniture for the entrance hall. The design of the product was inspired by the first product created by the author in Finland - the laptop table. The author created the laptop table during the Wood Workshop and the Metal Workshop in Finland.

The other product had to be designed at Furniture design project course. It started with creation of the battenboard from the birch wood. When the battenboard was ready, the author created construction from tubular steel. During the manufacturing process, there were several problems, which had to be solved. First, there was made the frame from just two rectangular profiles on the shorter side. Unfortunately, this frame was not strong enough and the whole product was moving from side to side. That is why the author decided to weld another two rectangular profiles to the longer sides as well. When this was done, the product had finally a good stability and it is possible to sit down normally without any movement of the prototype.

As it was planned, there was supposed to be manufactured another Bow bench by the Czech manufacturer Chatrný nábytek with some changes in the construction. The whole frame under the board, would be crafted into the board, so it would become even more stable. The legs would have better endings with plastic covers and on the hanging part, there would be a little metal sphere on both sides of the hanging bow, so the user could put there a hanger and the clothes would be prevented from falling. Finally, came up a problem with the customer, who changed his mind about buying the product. It was purely just because of the price, which was finally 6930 CZK. This price comes from the several steps during the

manufacture. The problem is, that the customer was willing to pay only 1500 CZK for this kind of furniture. This is the problem of the design thinking in the Czech Republic. Most of the people want to have nice things, but pay as little as possible for it. They are affected by the chain of stores, such as IKEA, Jysk, Asko, Kika and so on. They do not appreciate the original design of this kind of furniture, made according their preferences.

The author had to come up with another idea of the manufacture, which she will be able to pay by herself, but still fulfil the topic of the thesis. Finally, she designed the Bow mirror, which is the additional product for the Bow bench and it is a part of the Bow collection together with the Bow table. It can be hanged at the bench or it can stand separately anywhere in the room. It is also possible to store jewellerys in the stand for the mirror. The frame is made from the birch battenboard as well with a mirror and leather eyelet for hanging, which makes nice detail to the product. The Bow mirror makes the whole collection even more useful, because the user has all the things on a hand. He can just take the jacket from the hanger, put on his shoes and check his appearance in the mirror. Thanks to the manufacture by the Czech company Chatrný nábytek, the author knows how the working process of a product looks like in practice.

The estimation of the final price for the whole collection is 15 755 CZK. This price is including the manufacture of the bench, the table and the mirror, the work of the manufacturer and a profit for the designer. This price is only estimation and it could change according the customer and his needs. Those prices are calculated for the three products only, which means the bench, the table and the mirror. In case, that there will be more pieces manufactured, the price would be lower.

In the pipeline, there is still production of another Bow bench, but with looking for another customer, who will be willing to pay that amount of money for an original piece of furniture. The author wants to exhibit the product in the fair-trade shows, to put the Bow into the public eye in the Czech market and abroad. She had already started with this thanks to the studies in Finland. The first opportunity for the exhibition of her product was at the University of Applied Sciences in Kouvola. The exhibition was called "Eteinen" which means entrance hall in Finnish and the author created also a poster for this exhibition. The manager from the company Hakola came to the university to see all the products and presentations of students work. Also, there were other teachers from the university to see

the exhibition. The teachers liked about the author's product, that it is a bit different than the other products, made by Finnish students. It has something funny, and you can see the funny Czech humour in it.

Even though the students did not have any similar suggestions with materials or colours, finally all the products made quite nice collection of the entrance hall's furniture. The company Hakola liked together with the teachers all the products and that is why they decided to send all the products to the furniture fair Habitare, which was held in September 2016 in Helsinki since 7th of September till 11th of September. The students of KYAMK created the whole exposition of the products. It was exhibited in the area for student's work together with informative "postcards" for each product. When the fair was over, the author was asked by a writer for the online magazine Wallpaper about Bow bench information and some photos. Eventually, on the 20th of September 2016, there was posted an article in the online magazine Wallpaper about Habitare fair and the work of the author with it.



Fig. 59: Habitare furniture fair, Helsinki (Riku Laine, 2017)

Thanks to this possibility of having the bench exhibited at furniture fair Habitare, the teacher from the University of Applied Sciences in Kouvola decided to send the prototype to the author to the Czech Republic. That is why the author decided to exhibit this furniture piece also in her birth country. The author wanted to know, if the product will have success

also in the Czech Republic, so she decided to attend in the competition „The price of professor Jindřich Halabala”, which was held since 9th of November till 27th of November 2016 in Brno. Bow accomplished to get to the exhibition at Místodržitelství palác Moravské galerie with the best products chosen. Even though, the author didn't win any price, it was a success already. The author signed up Bow also to the Grand Prix Mobitex 2017, which was held during Mobitex furniture fair in Brno, from the 26th till 29th of April 2017. In this exhibition, there was exhibited the whole collection already, also with the Bow mirror, which was manufactured by Chatrný nábytek.

The Bow collection enables the user to have their favourites garments on hand always. Bow is a bench with bow for hanging clothes, bags or whatever else we are using in the moment. The concept of the products was to create a new kind of furniture for people who like to hang their garments and accessories open in a room, in plain sight, rather than concealed in a closet or wardrobe. It is a sign of respect for the garments, but also motivated by hygienic reasons — to air the garments out after wearing them the whole day, for example, a hotel room. It is a multifunctional seating for the entrance hall, which is suitable also for small halls, for single living or a starting house for young couples. Even though it was designed for the entrance hall, it can also serve as a valet stand in a bedroom. It is connecting the function for the hanging jackets, bags and other items, sitting while taking off shoes and as a storage space for keys or smartphone, before we leave the house. Those are the three things we usually do before we leave the house or when we arrive home. The good thing is, that it connects all of this in one piece, so we do not have to go from one place to another. If the piece is used in the bedroom, it can serve as the valet stand for the clothes we are wearing right now, hanging bags, but also as a table or a stool, when we need to reach some high to reach shelves. The Bow table and the mirror are giving to the Bow bench another option of usage – to check our appearance before we leave the house or use the Bow table as a stool for our legs too.

Conclusion

The entrance hall is the first place, which we can see in the house and it gives us an idea about the rest of the house, but also about its inhabitants. The interior of this room should not be forgotten. While choosing the topic of this diploma thesis, the author was planning exchange studies in Finland. It was obvious, that she will be working on some prototype, she chose a general topic, with which she could continue in the Czech Republic in cooperation with Chatrný nábytek.

During the exchange studies in Finland, the author was working on several projects – design of laptop table and the hanger bench. Design of the laptop table was designed at first, and it brought the idea of the hanger bench as well. The table is made from birch battenboard with a supportive construction from tubular steel. It was painted in salmon orange colour, but the author was counting with several colouring options, according the user's preferences. The table was created in the Wood Workshop.

In the course Furniture Design Project, there was a task to design furniture for the entrance hall with Saara Renvall as a supervisor. Design should start with sketching, 3d visualizations and technical drawings and it should have finished with a prototype along with a presentation to the company Hakola, who were supposed to choose products that they will like and send the best to Habitare furniture fair. The author designed a multifunctional seating for the entrance hall, which is suitable also for small halls, for single living or a starting house for young couples.

The author was supposed to produce another piece of Bow, because she had a customer, so the bench's construction would be further developed. There would be milled a hole for the steel profiles in the board, which would give bigger stability to the whole product.

Unfortunately, the customer changed his mind at the end. That is why the author decided to create another supplement for the bench – the Bow mirror. The mirror was produced in cooperation with the Czech company “Chatrný nábytek”. It can be hanged on the bench, but it can also stand anywhere in the house in the stand. The mirror is a supplement for the bench with hanger and it is bringing another function for the product itself.

Finally, there was created the Bow collection, which is giving a fresh look to the interior and it brings hint of design to any room. It becomes almost like a sculpture in the room —

adding another value but also fulfilling a clear function in the entrance hall, bedroom or other rooms in the house, because it has various options of usage. First, the user can sit down and put on his shoes, take his jacket from the hanging bow and check his appearance in the mirror after that. The other option for the use of the products is in the bedroom, where it can serve as a valet stand for clothes and the table can be used in the bed for a laptop. It depends on the user, how he will choose to use all the products.

Shrnutí

Touto diplomovou prací bylo dosaženo navrhnutí a výroby kolekce nábytku, který je vhodné využít v předsíni, ale i kdekoliv jinde v bytě. Při výběru tématu diplomové práce plánovala autorka výměnný studijní pobyt ve Finsku. Jelikož bylo zřejmé, že zde bude pracovat na prototypu nábytku, zvolila obecné téma, na které by tato práce mohla dále navázat. O výrobci bylo uvažováno už před samotným odjezdem a už v té době došlo k první komunikaci s Markem Šulcem, vedoucím firmy Chatrný nábytek. Bylo ujednáno, že autorka po příjezdu do České republiky bude požadovat výrobu produktu, který bude navrhnout a vyroben ve Finsku. Předpokládalo se, že autorka nebude mít možnost produkt dopravit s sebou, a tak by došlo k výrobě stejného produktu v Česku.

Během studia ve Finsku, pracovala autorka práce hned na několika návrzích, z čehož vznikly dva prototypy – stolek na laptop a odkládací lavička s věšákem do před síně. Nejprve vznikl návrh stolku, který byl také inspirací a podnětem pro návrh dalšího produktu v jiném předmětu, lavičku s věšákem do před síně. Stolek je vyroben z březové spárovky, jelikož právě březové dřevo je ve Finsku hojně užívané. To je dané především tím, že se tento druh dřeva ve Finsku vyskytuje nejvíce. Pro podnož byly použity ohýbané ocelové trubky, které byly následně natřeny na lososovou barvu, avšak byl zde předpoklad různých barevných variant, dle preferencí uživatele. Stolek byl navrhnout a vyroben v rámci předmětu Wood Workshop.

Ve druhé polovině studijního období absolvovala autorka předmět Furniture design project, kde dostali studenti za úkol navrhnout nábytek do před síně pod vedením designérky Saara Renvall. Návrh měl být vytvořen nejprve formou skic, následných vizualizací produktů s vytvořením technického výkresu a práce měla být zakončena prototypem. Autorka navrhla multifunkční sezení do před síně, které je vhodné do menších bytů, především pro singles, ale může být využita také ve startovním bydlení mladého páru. Výsledný prototyp Bow je lavička, která má velmi variabilní možnosti využití. Přestože byla nejprve určena do před síně, může fungovat taktéž v ložnici. Spojuje funkci pro odložení kabátů či tašek, zároveň však funguje jako lavička, na které je možné pohodlně přezout obuv. V před síni tak funguje jako lavička s věšákem a odkládacím prostorem pro klíče, smartphone a další drobnosti. Splňuje tak více funkcí, které vyžadujeme od před síňového nábytku, ale zároveň máme vše pohromadě. Při umístění jinde v interiéru, nejčastěji v ložnici, slouží velice dobře

jako němý sluha a může sloužit také jako odkládací stůl. Zároveň je však možné využít Bow jako schůdek pro dosažení do vyšších prostor skříní.

To vše bylo na konci semestru ve Finsku prezentováno představiteli finské firmy Hakola, která si měla ze studentských prací vybrat tu, která je zaujala nejvíce a následně ji vyrábět. Jelikož se výsledné návrhy líbily jak představiteli firmy, tak i učitelům na škole, rozhodli se vystavit všechny produkty na chystaném nábytkovém veletrhu Habitare v Helsinkách, který se uskutečnil od 7. do 11. září 2016. Poté měl být Bow zaslán autorce do České republiky, ale i přesto chtěla autorka vyrábět druhý produkt, který by měl zlepšené konstrukční vlastnosti. Po návratu do České republiky autorka dále komunikovala s Markem Šulcem, ohledně výroby daného produktu. Autorka našla zájemce pro koupi Bow, který by byl vyroben z materiálu dle preferencí zájemce. Ten si přál, aby bylo pro sedák použito tmavší dřevo než původní bříza. Zájemce s designérkou se tak shodli na dubovém dřevě v kombinaci s šedou barvou ocelových trubek. Dále měl být vyřešen nedostatek konstrukce, což byla její pevnost. Pro druhý produkt už autorka měla ověřeno, že je nutné, aby kovová konstrukce pod deskou měla obdélníkový tvar, díky prvnímu prototypu, kde nejprve byly podpůrné ocelové profily pouze na kratší straně sedáku. Ke zpevnění konstrukce by bylo dosaženo tím, že by se do březové spárovky vyfrézovaly otvory pro ocelové profily, které by tak byly zapuštěny a došlo by k celkovému zpevnění.

Po vyčíslení ceny výroby jednoho kusu byla ustanovena cena pro zákazníka, která však ani zdaleka neodpovídala ceně výroby produktu. Samotná výroba produktu stála 6930 Kč, a to bez zisku pro autorku. Zákazník byl však ochoten zaplatit za produkt 1500 Kč, což nebylo za tuto cenu možné.

Autorka musela řešit danou situaci navrhnutím a výrobou jiného produktu ve spolupráci s firmou. Následně byla dohodnuta výroba přídatného produktu pro Bow lavičku. Jedná se o menší produkt, u kterého nebyla jeho výroba finančně náročná a autorka byla schopná tento produkt sama uhradit. Nad rámec diplomové práce, byl tedy vytvořen prototyp zrcadla ve spolupráci s firmou Chatrný nábytek. Jedná se o zrcadlo, které je možné zavěsit na lavičku, ale může fungovat i jinde v interiéru, při postavení do podstavce, který funguje také jako úložný prostor pro šperky. Zrcadlo tak doplňuje samotnou lavičku s věšákem o další funkci, která je v předsíni nezbytná. Tento produkt má usnadnit odchod a příchod z domu a zároveň mít vše pohromadě. Pro finální kolekci nábytku byla odhadnuta cena – v případě výroby

jednoho kusu od každého produktu byla cena vyčíslena na 15 755 Kč. V této ceně je zahrnuta cena za výrobu lavičky, stolku a zrcadla, výtěžek pro výrobce i pro designéra. Pokud by však došlo k výrobě více kusů, cena by byla samozřejmě nižší. Předpokládá se však, že se jedná o originální produkt, který není určen pro sériovou výrobu.

Autorka by však stále ráda vyrobila i novou Bow lavičku, dle domluvené spolupráce u firmy Chatrný nábytek, a proto se snaží produkt propagovat. Úspěšná propagace začala již díky zmíněnému veletrhu Habitare v Helsinkách, který se uskutečnil v září 2016. Jelikož byla autorka následně oslovena redaktorkou z lifestyleového magazínu Wallpaper o více informací o jejím produktu. Ten byl dne 20. září 2016 zveřejněn v daném magazínu. Autorka se také aktivně účastnila soutěží jako je Cena profesora Halabaly 2016, Best in Design 2017 či Grand Prix Mobitex 2017, kde již byla vystavena celá kolekce nábytku se jménem Bow. Dále k propagaci slouží autorky osobní webové stránky a také facebooková stránka.

V této diplomové práci autorka vytvořila kolekci nábytku do předsíně, která však může být využita i jinde v bytě, jelikož se jedná o velmi variabilní produkty, které je možné užívat samostatně. Nejlepší funkci však plní všechny pohromadě. Produkty jsou nyní využívány samotnou autorkou v ložnici, kde Bow funguje jako němý sluha a odkládací stolek vedle postele. Bow baby stolek pro laptop je umístěn pod Bow a je často využíván při práci na počítači. Taktéž zrcadlo je aktivně využíváno, a to jako šperkovnice, která je umístěna obvykle na komodě, ale při potřebě úklidu je zavěšeno na věšáku. Produkty se vyznačují mladistvým designem, vhodným především pro startovní bydlení singles či páru.

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