DESIGN OF A SMOKE SOLUTION FOR PROFESSIONAL USE

GRADUATION PROJECT
By Bregje Nabuurs
Design of a Smoke Solution for Professional use
ID4195: Graduation Project

Graduating Student Bregje Nabuurs, 1171755
Industrial Design Engineering, Integrated Product Design
b.nabuurs@student.tudelft.nl

Neptunus Structures: Company Mentor Hans Eilers
Director Neptunus BV
h.eilers@neptunus.eu

TUDelft: Chair Prof. ir. Jan Jacobs
Industrial Design Engineering, Design Aesthetics
j.j.jacobs@tudelft.nl

TUDelft: Mentor Erik Jepma
Industrial Design Engineering, Design Aesthetics
e.j.jepma@TUDelft.nl
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**SUMMARY**

Since 1990 a smoke free working environment is compulsory at institutions, since 2004 on the work floor in general and since 2008 in the catering industry. This graduation project describes the development of a smoke solution to be used at companies, events and in the catering industry. The project is executed for Neptunus structures, a company that develops, manufactures and rents out temporary structures of superior quality for the event and business market. Neptunus is first in the development of new technologies, which makes them market leader in the top segment, where many competitors are active. In this market many trends can be noticed. A growing need for flexible housing, more restrictions for semi-permanent solutions, a stagnating event market and growing market for semi-permanent structures are most important for Neptunus. In the market of smoke solutions small tents and permanent smoke cabins are the biggest competition, but most of these solutions are not very comfortable.

Only few bars offer a smoke solution. Bar owners state that this solution increases their income. Often bars and restaurants without smoke solutions do not offer these solutions out of a lack of space, money and sometimes interests. Although customers say their choice of bar does not depend on an available smoke solution, they do tend to end up in a bar where a smoke solution is present or smoking is still allowed. For this situation a half open shelter or a closed smoke solution can be developed. People will walk in and out all night or permanently stay in the smoke solution during their visit. With alcohol consumption unintended usage will be an important problem, therefore some kind of openness has to make it easier for bar owners to keep an eye on the customers using the solution. Smoke solutions can be found at institutions and companies, but there are still many employees without that luxury. Reasons are similar to those in the catering industry, but sometimes it is a question of principle. At events an additional tent to function as smoke solution can be placed almost effortlessly. However, this is not seen very often. For companies and events the smoke solution will be mostly used for short periods in time and rush hours during breaks. At companies there will be more peer pressure, thus less unintended usage. Depending on what kind of event, a music festival or a polo game, the usage will be similar as in the catering industry and at companies. Managers are willing to pay approximately €1500,- for a possible smoke solution.

In the concept generation phase a brainstorm session has led to several product categories, for instance material, storage & assembly and existing shelters. These categories are used as guidelines to search images which serve as inspiration to start the idea sketching. Furthermore a process tree of the total life cycle, from production to dismissal of the smoke solution is drawn up. From this process tree a list of demands and wishes for the smoke solution in the catering industry and at companies and events has been concluded. The smoke solution has to fulfill all demands and as much wishes as possible for both the catering industry and companies and events since the final smoke solution has to be applicable in all environments. Design criteria are formulated to evaluate all concepts, for instance does it fit the Neptunus’ portfolio and is it better than current smoke solutions. Finally this analysis has led to 3 concepts of which one, The Smoke Dome, is chosen and elaborated in the detailing phase. This smoke solution is shown on the right.

*Picture: Smoke Dome*
1. INTRODUCTION

For over a decade now, the government is taking steps to implement a smoke free working environment. It originated in 1990 with a smoke prohibition in government institutions, care and educational institutions and sports accommodations. In 2004 the smoke restriction was elaborated to all companies. Since July 2008 the exception that was made for bars, restaurants, clubs and the arts and culture sector was cancelled and currently these sectors also have to provide a smoke free working space. In this context research about the different environments and the needs of smokers and managers will be done to develop a smoke solution.

Eventually one smoke solution will be elaborated that matches all environments mentioned above and meets the need of all stakeholders, smokers, managers and Neptunus.

1.1 Problem Definition

Since the smoke restriction smoking is only allowed in the open air and in isolated, ventilated smoking cabins. In companies and institutions those cabins, if present at all, often are very unpleasant and depressing to spend time in. This means that smokers frequently go outside into the cold and the rain to smoke their cigarette. Furthermore small bars are threatened to lose customers to big bars that do have the possibility to provide a smoke solution for their clients.

1.2 Assignment

The development of a smoke solution which provides clients of a bar, employees of an enterprise or visitors/employees of an event with a pleasant area to smoke their cigarettes sheltered off wind, rain and cold. The bar owner, the employee or the event supplier must be able to personally build up and break down the smoke solution.

1.3 Goal

Provide smokers with a pleasant environment to smoke their cigarette, during work and in their leisure time. It is important that the smoke solution is less expensive as current solutions on the market. It has to have the possibility to be build and dismantled by the owner itself, furthermore it needs to be easy to maintain and finally it should be a pleasure for the eye.
2. BUSINESS AND MARKET

In this chapter four leading issues are analyzed: an internal analysis of the company, an analysis of the market, competitors and stakeholders. An in depth analysis of the company with regard to aspects concerning the assignment will take place in the internal analysis. In the market analysis new trends are spotted to relate possible shifts in the society in several areas to the tent business. The position of Neptunus in relation to its competitors and a product comparison are evaluated in the competitors analysis. Furthermore a scheme with all different parties concerning the smoke tent is given in the stake holders analysis. This chapter will finally be summarized by a SWOT-analysis.

2.1 NEPTUNUS

2.1.1 Internal analysis

Introduction
Neptunus is an internationally operating specialist in the development and rental of tents and temporary structures for the top segment. Offices are located in Belgium, Germany, The UK, France, Austria and Poland, where their factory is based. Their head quarters is in Kessel, the Netherlands. The following chapters will handle a number of aspects concerning Neptunus; its history, mission, company structure, products and services, finance and image and identity.

History
Neptunus was founded in 1937 by Anton Eilers, who found a chest containing a tent during one of his walks on the beach. After throwing a party in the tent for all of his neighbours, there were a lot of candidates to use the tent for the same purpose. Anton Eilers decided to let the tent and Neptunus was born. The inspiration for the name came from the trident stamped on the lid of the chest: Neptunus.

Over the years the company has evolved from letting one tent to several complex tents and temporary structures for festivals and events all over the world. Design, production, logistics and maintenance are all executed in-house. Their current tent solutions are used as supermarkets, schools, to house life style, hospitality or sports events at a world-class level.

The strength of Neptunus
Becoming the specialist in supplying temporary structures of superior quality doesn’t happen overnight. Employees personify the true Neptunus spirit, no matter what position they hold within the company. This spirit and enthusiasm translates into an insatiable desire to arrange even the tiniest details of a project. Customer and service orientation are guiding principles that come naturally to Neptunus’ employees. One of their priorities is the investment in personal relationships through a customer driven approach in order to seek the best possible customized solution on the market.
Devising bright, new ideas means ‘out of the box’, or in this case ‘out of the tent’ thinking. The Neptunus’ way of creativity, an openness to do different things and/or see challenges instead of obstacles, very often results in original and innovative solutions. The versatility of Neptunus’ structures is virtually unlimited. The tents and temporary solutions are used as supermarkets, schools, to house life style, hospitality or sports events at the highest level. But, Neptunus’ flexibility doesn’t stop here. The finishing details and completing turn-key projects are also aspects that Neptunus excels in. Electricity, lighting, air conditioning system or a loading dock can also be provided by Neptunus.

Neptunus likes to keep things straightforward. Design, production, logistics and maintenance all operate under the Neptunus seal of approval. Neptunus’ advantage is that they can implement their own rules and thus maintain total control. Advantages for the clients are short lines of communication, clarity and just one contact point.

**Products and Services**

Neptunus has a large portfolio of products and services. They develop and let semi-permanent structures which can be used as long-term modular accommodation such as temporary office space, warehousing, portable building or emergency commercial unit and many other applications. Although there is a shift from the event business to semi-permanent structures; rental tents for events remains their biggest range of products. These tents are often used for events like conferences, festivals and very chic happenings (e.g. horse polo). All tents and structures can be air conditioned or provided with a heating system. They can be fitted with features like roller shutters depending on each client’s specific wishes. The interior, like tables and chairs, is usually done by the client, unless there is a specific demand.

The products of Neptunus are shown in the following chapter.

**Tents in their environment**

Neptunus possesses a very big range of different products. Event solutions go from three story, windowed tents for very big and luxurious events; to little tents with peaks than can be used in smaller events. Business solutions starts at big halls used as sports accommodation and go as far as semi-permanent plastic buildings used for warehousing.

In appendix 1 all products of Neptunus are displayed larger.
Material
Since there are many different kinds of tents, with very diverse structures, different materials are being applied to fulfill the right function. The tents and semi-permanent structures are constructed with aluminum and steel profiles. The sides are fabricated from PVC canvas, sandwich steel filled with PUR and thermoformed synthetic PVC. Opaque, 80% translucent and transparent single layered and inflated double membrane PVC are used for the roof. Aluminum castings are used for roof construction and stabilization. All materials applied by Neptunus for building tents and structures are summarized in appendix 2.
TNO is currently researching the use of magnesium as a structure material for Neptunus. Since magnesium is lighter and stronger than aluminum, bigger structures with the same weight or the same structures with a lower weight can be build. Light materials are very important, since all parts need to be transported, replaced and carried around.

All materials used, extinguish by themselves when burning. The canvas roles are impregnated during production, but need to be impregnated again after 5 times of usage. All materials used by Neptunus are of very high quality. Therefore these materials are also used by other tent builders, e.g. De Boer, to create semi permanent and temporary structures for the high segment.

Company culture
Neptunus currently has 192 permanent employees and a number of temporary employees depending on the assignments. About 7 people are engaged in the product development, building and testing of prototypes. In their workshop new technologies are developed and existing products are adjusted and improved. In this small team of product developers the communication lines are short and information can be transferred easily. A disadvantage of this small team is that daily activities are time consuming and less time remains for the development of new products.
Notwithstanding this company culture all new technologies in the field of event and business solution are developed at Neptunus. This makes Neptunus the most innovative player on the market and thus market determining with their products. They continue to grow annually.
Although Neptunus already is the most innovative player, they could even improve. Currently all innovations comes from years of experience and knowledge about construction. By including a professional designer in the product development the appearance of their products could be optimized and Neptunus would be able to strengthen their position even more.

![Organizational Chart](image-url)
**Logistics (bigger view appendix 3)**

Neptunus Structures head quarters, containing departments for logistics, PR, rental and sales, product development, storage and maintenance all are based in Kessel. Other offices in Europe are only active in the rental business.

All tents are stored in Kessel. When a tent is needed for an event all parts and building materials are loaded onto a truck. Accompanied by a tool bus (with tools and builders) the truck will drive to the event site, where the tent is build and later broken down. Neptunus has 5 trucks and 15 tool busses. More trucks are rented when needed. Every day these trucks and busses leave to an event.

**Picture 2.1.4: Top view Neptunus Kessel**

**Life span of tent**

A tent is constructed mainly with standardized parts, which means that most parts are interchangeable. Tents are not stored entirely, but parts are stored per type. When a certain tent is ordered, specific parts are collected. This means a tent is never build up with exactly the same parts. Therefore it is hard to say when a tent is worn out, because the one part can be much older than the other.

The depreciation system is the economical life span. Therefore an average lifespan off 7 years is calculated. The canvas survives for about 5 years. The roof is the most vulnerable. Since the PVC turns yellow because off the weather, the roof has to be replaced the most often. In the case of event business the PVC side panels last 5 to 6 years, because they have to be transported, built and dismantled. Then they go to the Eastern Block to be used as isolation material or a pigsty. When the panels are used in a semi-permanent hall, the parts will last for 10 to 15 years. The aluminum structures last very long.

The most important reason to discard a tent is that it is outdated because of modernization and the development of new materials.

**Maintenance**

When a tent is dismantled the headman on the site has the responsibility to indicate shortcomings on all parts. Parts that are tagged with a blue label immediately go back into storage. Parts with a red label need to be maintained or depreciated.

Dirty canvas will be washed in the laundry room of Neptunus. The self-developed wash and dry tower also checks for holes in the canvas. Little holes will be repaired in the canvas repair room with the use of a high frequency welder. Dirty PVC panels can also be washed, dried and stacked.

The wooden floor boards can be damaged. When reconstruction is not possible, new wooden boards are placed in the aluminum profiles. From time to time door panels get a new paint job.

The canvas needs to be impregnated again after using it 5 times. After a few years of use, aluminum profiles can be anodized again to get rid of little flaws and damages.
Processing
Currently there is a very efficient material cycle at Neptunus. Damaged aluminum profiles that cannot be repaired anymore return to the aluminum supplier. There the profiles are melted and the aluminum can be used again. The PVC panels are processed into other products (picture 2.1.5). This recycling has decreased the environmental surcharge Neptunus has to pay when disposing materials and diminishes their environmental footprint.

Internal Technology
Before 1999 all tents and semi-permanent structures were produced in Kessel. In 1999 the production factory was moved to Poland, since all people with the necessary skills and knowledge were situated in Poland and production is less expensive over there. In the following scheme an overview of the production possibilities in Poland and in Kessel is given.

In the factory in Poland all mass production takes place, 90% of the products is standardized. All aluminum profiles are processed in Poland. Large heavy profiles are supplied by Sapa and Nedal in Utrecht, all profiles smaller than 20 cm are supplied by 10 different companies, which makes Neptunus less dependent on one supplier. The manufacturing of the aluminum castings and PVC side panels is outsourced. Parts are sent to Poland for further processing. The canvas, which is supplied on big roles by Verseidag, is cut and welded into the desired models. The PVC panels are supplied by Hilpack and Veka.

In the former factory in Kessel prototypes are built and tested, which leads to the development of new technologies. Unique, client specific tents are also produced in Kessel, since Poland only produces mass products. Since all tents are stored in Kessel, the washing and repairing of parts takes place over there. Pictures of the factory in Poland and the machine park in Kessel are shown in appendix 4.
Finances
Neptunus had a turnover of € 35 million in 2008. This means an increase of 15% in comparison to 2007. The turnover in rental activities increased with 10 %, while the sales activities increased with 40%, mostly because of the sales of several Evolutions (semi-permanent structures).

The market share of Neptunus is growing every year. In the event sector they strive to a turnover growth of 10% by consolidating or increasing their market share on the current markets. Possibilities of growth exist particularly in Germany, Austria, Switzerland, Belgium, France and the UK. On long term perspective, Neptunus wants to expand to the former Eastern Bloc, Russia and the Balkans. This activity will be an outlet to increase the life span of current products. In the business sector Neptunus strives to increase the rental of semi-permanent structures to 40% of the total rental turnover within 5 years. In this market a strong growth and increasing need of flexible solutions for existing housing is visible. For this business the world is the market with UK as a leading potential. In the current economical climate the demand for new rental tents is stagnating. This results in less machine occupancy in the factory in Poland. Therefore there is space to try something new.

Image and identity

Neptunus sees itself as the most innovative market leader in the field of high segment event tents and semi-permanent structures. All new developments in the tent business have their origin at Neptunus. Other tent rental companies copy the new technologies from Neptunus. Neptunus mostly operates in the highest segment for event and business solutions, therefore only the best quality and highest standards are good enough for their clients. Since Neptunus has its own factory in Poland, they are in total control of the production of high quality materials. In terms of appearance Neptunus also provides the best quality. Their identity is shown in the following collages.

Since the rental business is their core business Neptunus can fully control the appearance of tents on event sites. Whenever a tent is dirty or damaged when dismantling; the headman has to indicate this to make sure that the next time a part of the tent is reused it is clean and intact. In that way the tents will always be in perfect condition and the good image of Neptunus will be retained.
In the field of semi-permanent structures the rental period is much longer, therefore the responsibility lies with the client. Assuming the client wants a sublime appearance to attract customers, the structures will also be in perfect condition.

Neptunus VCA certified
Neptunus has proven to own an adequate safety assurance system, which can achieve safety management conform VCA directives. Evaluation of the VCA-system took place according to the procedures for the VCA-system certification of TÜV Nederland application range. Neptunus demonstrates with the updated VCA certificate that through specialized training, company instructions and regular information; all its employees are able to work in a safe, healthy and (environmentally) responsible manner. They work using tools and machines approved for safety and can protect themselves correctly using personal protection equipment. Neptunus also employs a systematic approach of risk assessment and inventory and the company Health & Safety Service safeguards the health and safety of its employees.

VCA stands for Safety, health and environmental checklist for contractors. The VCA certificate shows that the service provider has a safety system and that safety measures are controlled.

2.2 MARKET

In this chapter an analysis has taken place to find general trends and issues concerning the market in general, concerning Neptunus and smoking. Furthermore the smoke restriction has been looked at in detail to gain a better insight in this issue.
2.2.1 General trends

Trends are searched at different levels. Different categories have been looked at on Destrp Level: Social, Ecological, Political, demographical, technological and economical. The most important findings are summarized in the following table. An elaborate analysis can be found in appendix 5.

**Picture 2.2.1: Trends in the market**

2.2.2 Smoke restriction

**History in the Netherlands**

Since 1990 it is prohibited to smoke in government institutions, care institutions, education institutions, institutions of social services and indoor sports accommodations. Since January 1st 2004 the smoke prohibition also includes all other companies with employees. Every employee has the right to work in a smoke free area. This smoke prohibition also an injunction for the public transport. Separate, ventilated smoking rooms are still allowed and smoking in the open air is also permitted on the work floor. Since July 2008 smoking in bars and in restaurants is forbidden in the Netherlands. In other European countries like France and England smoking has been forbidden for a while already. Smoking in a bar can be done in a recognizable, separate, closed room where it is not allowed to serve drinks. Outside the smoking room customers cannot be bothered by smoke and the toilets need to be accessible without passing through the smoking area.

There are no restrictions for furniture in a smokers room. This means that one can play cards, play pool, etc. The smoke room can be as luxurious as desired. In Great Brittan, where smoking is already banned from the pubs since July 2007, this has led to the success of beer gardens. A place, mostly at the back of the pub, which is covered or not where people can drink and smoke.
When the smoke restriction is violated by employers, bar owners or even by clients the first fine will be € 300,- up to € 2400,- for recidivism.

Smoke restriction world wide
Sweden, Ireland, Malta, Italy, France, Holland, Scotland, Spain and England all have a smoke prohibition in the catering industry. Smoking is only allowed in the foreseen en ventilated areas. In the USA the rules differ in every state, however smoking is banned almost everywhere.
In Austria, Luxembourg and Switzerland smoking is allowed in the catering industry. Catering businesses with a surface bigger than 100 m² have to have a separate smoke free room. In the train smoke compartments are provided. In Belgium smoking is prohibited on the work floor and in restaurants. In bars smoking is allowed. In Germany smoking in the catering industry was not allowed anymore since January 2008, but after a couple of trials so many exceptions were made that smoking can be done everywhere. In Greece smoking is prohibited in governmental institutions, hospitals and in the subway, but Greeks are very good at ignoring this. This is also the case in Latin-America. More details can be found in appendix 6.

Where is smoking allowed
- In closeable smoking rooms. It has to be indicated that smoking is allowed inside that room.
- In open air, smoking is also allowed at covered terraces, as long as these are not fully closed (top and sides). Nuisance inside of smoking outside is not allowed.
- In private rooms, e.g. in people’s homes; but also in living rooms for example in nursing homes, as long as rooms are not shared with other residents.

Media: Smoke restriction in bars
The discussion about the smoke restriction in bars continues. The turnover in bars has decreased with 7% in 2008 because of the smoke restriction, according to the bar managers.

Small bars without space for a smoking room, loose customers and see their turnover decrease. But still there is no governmental exception for little bars. The government is currently discussing the possibility to give bars the freedom to choose for a ventilation system that provides employees with a smoke free environment when inside smoking is allowed. Such a system does not exist yet and could turn out to be too pricy for bar managers if it would be realized.
In Germany smoking rooms without door are allowed. As long as other parts of the bar are not bothered by the smoke. In the Netherlands a door still is required.

Another discussion is going on about clemency for little bars with no employees and no space for a smoking room. This would only consider bars where the owner taps the beers, since a smoke free working environment for staff still is priority.

Facts
27% of all adults (15 year and older) in The Netherlands are smoking.
The amount of smokers is decreasing (1958: 60%, 2009:27%)
In 1958 90% of men and 29% of the women smoked, now this is 30% vs. 24%.

2.3 COMPETITORS

In the following chapter the competitors of Neptunus are reviewed. This competition occurs at different levels: competition in event and business solutions and competition of the smoke solution, which are small tents and smoke cabins. The position of Neptunus in the market is shown by schemes and a product comparison.
2.3.1 Event & Business Solutions

There are many companies specialized in the development and rental of event tents. In the field of business solutions, with products like semi-permanent structures, less competitors are active. A list of the most important competitors of Neptunus and their products is given in appendix 7. To gain insight into the business of tent rental an overview is given about the position of Neptunus in relation to its competitors in terms of size and turnover (figure 2.3.1 and 2.3.2).

![Diagram showing the relation between Neptunus and competitors in terms of turnover](image)

Figure 2.3.1: Relation between Neptunus and Competitors in terms of turnover

As can be seen in the figure above Neptunus, General Location (French company) and De Boer have a very large overlap in their event solution product assortment. With a turnover of 90 million for De Boer and 60 million for GL, they are much larger, but only in the event sector. The other competitors are a lot smaller and compete with Neptunus only with a few products. Apart from De Boer and GL none of the other competitors are active in both event and business solutions.

Although De Boer and GL are bigger, they are far less innovative than Neptunus. In fact all new technologies are developed at Neptunus and copied by the other competitors. This is shown in the following figure.
2.3.2 Product comparison

To get an overview of the products and companies Neptunus has to compete with, the following figures show the competitors with their products in relation to Neptunus in the field of event solutions and business solutions. The tents are arranged according to their positions in the segment from high end to low end.

Figure 2.3.2: relation between Neptunus and competitors in terms of innovation and size

Picture 2.3.3: Overview of event solutions
Conclusion
Neptunus is the 3rd biggest player in the field of event solutions and the market leader in the field of business solutions in terms of turnover. Since the market of event solutions is seasonal sensitive and thus fluctuating, Neptunus wants to shift more and more to business solutions. De Boer and GL (and GL Owen-Brown, its daughter company in England) are the biggest competitors of Neptunus. They are both very active in the event solutions, but not in the field of business solutions, where they mostly provide semi-permanent structures with a canvas roof for storage. De Boer and GL focus mainly on big projects on the foreign market, e.g. the Olympic games, which provides an enormous turnover. Therefore Neptunus is the biggest player on the Dutch market as well as in France. Neptunus, De Boer and GL all provide products with a very high quality and therefore they have to compete in price. Although De Boer and GL are bigger, their product assortment is much smaller and Neptunus still is the most innovative and market determining in both event and business solutions.

Most of the smaller competitive companies overlap with Neptunus in the segment of smaller tents. However the product range and diversity Neptunus can offer is much bigger. Those smaller companies compete with Neptunus mainly on price. Their products are much cheaper, but of lesser quality. For instance they use a canvas roof for about 15 years.

2.3.3 Smoke possibilities
Small tents and smoke cabins are considered in this chapter, since they are direct competitors of the smoke solution.

Small tents
There are many companies in the field of small tents, companies that let big tents or structures for events, but also companies that have an other core business or only specialize in party tents.
In the previous scheme some small tents which can function as a smokers tent have been compared.

**Conclusion**

There are several companies selling or renting out small tents, but the diversity is relatively small. It starts with the party tent in the lower segment, which is offered by many different companies. These party tents only differ a little bit from each other. Going up in the segment, the tents become a little bigger, but still look like a very basic white tent with a peak and round windows. With the round tent (picture on the left) the German company called Röder is the only one who really made an innovative small tent. Although they also sell round and square tents with a peak they seem to be the first one totally stepping away from that model.

**Smoke cabins**

Smoke cabins and rooms are used by companies to provide their employees with an area where smoking is permitted. Restriction for such areas are that they need to be ventilated very well and indoor people have to be able to pass the whole company or bar without needing to go through the smoking zone. In a company it can be a zone, in a bar it has to be a fully closed space where no drinks are served and no cigarette smoke can bother other customers. Companies also provide smoke cabins outside to protect smokers against the cold and rain.

**Conclusion**

There are many providers of smoke cabins. These structures are fixed to the ground and can be used in- and outdoor. Prices vary between € 2500,- and € 4000,-. All indoor cabins are provided with
ventilation mechanisms, for instance an electric fan, to conduct the smoke and refresh the air. Some can be fully closed, but most of them are half open. Therefore they provide a good smoke zone indoors, but only protects against rain and not against the cold outdoors.

2.4 STAKE HOLDERS

There are many different parties concerning the smoke tent, one plays a bigger role than the other. Not only the user and Neptunus have an influence on the smoke solution, but also the government with its regulations. In the schema bellow an overview of all stake holders is given.

Scheme 2.4.1: Overview Stake Holders
With the smoke solution Neptunus is located in a B2B market where the buyer is not the direct user. The smoke solution can be purchased by a bar or enterprise manager to be used by their customers and employees. This means the purchaser of the solution differs from the smoker in it. Both parties can have different interests. For instance the enterprise manager wants an economic solution while the employee wants a pleasant comfortable place to smoke its cigarette, price does not matter to the employee. This also occurs with an event manager and its employees and event visitors. The government made up a set of rules concerning smoke rooms on the work floor and in bars. They are concerned about the health of the employee, while a bar manager cares mostly about keeping his smoking clientele.

### 2.5 SWOT

The most important points from the previous analysis are summarized in a SWOT analysis. The strengths of Neptunus and the possible opportunities give input for the product development.

<table>
<thead>
<tr>
<th>Strengths</th>
<th>Weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Neptunus</strong></td>
<td><strong>Neptunus</strong></td>
</tr>
<tr>
<td>Neptunus is VCA certified</td>
<td>Neptunus makes effort and investments to develop new technologies and systems that can be copied by competitors</td>
</tr>
<tr>
<td>Offices abroad, therefore close to the market</td>
<td>Too little perception in profit on Product Market Combination</td>
</tr>
<tr>
<td>Experienced employees, great involvement and excellent working environment</td>
<td>Costs development of transport is hard to control</td>
</tr>
<tr>
<td>Informal working environment, short communication lines and quick decision making</td>
<td></td>
</tr>
<tr>
<td>Supply reliability, flexibility, customer directed and a good image</td>
<td></td>
</tr>
<tr>
<td>Quality control material: laundry, storage, packaging material, training of employees</td>
<td></td>
</tr>
<tr>
<td>The rich history has led to many products and a lot of knowledge and skills</td>
<td></td>
</tr>
<tr>
<td>Good problem solvers</td>
<td></td>
</tr>
<tr>
<td>Very high quality products</td>
<td></td>
</tr>
<tr>
<td>Customer-orientated flexibility</td>
<td></td>
</tr>
<tr>
<td>Driven market determining ambitions</td>
<td></td>
</tr>
<tr>
<td>Flexible in adjusting to new markets</td>
<td></td>
</tr>
<tr>
<td>Good in development of new technologies</td>
<td></td>
</tr>
<tr>
<td>Interest in new materials</td>
<td></td>
</tr>
<tr>
<td>Progressive on recycling issue</td>
<td></td>
</tr>
<tr>
<td>Very good in large spaces</td>
<td></td>
</tr>
<tr>
<td><strong>Business</strong></td>
<td></td>
</tr>
<tr>
<td>One of the only players in this market segment</td>
<td></td>
</tr>
<tr>
<td>Not seasonal sensitive</td>
<td></td>
</tr>
<tr>
<td>A lot of experience, thus no more flaws</td>
<td></td>
</tr>
<tr>
<td><strong>Event solutions</strong></td>
<td></td>
</tr>
<tr>
<td>High end and therefore less conjuncture sensitive</td>
<td>Seasonal sensitive</td>
</tr>
<tr>
<td>Only a few competitors</td>
<td></td>
</tr>
<tr>
<td>Good brand awareness</td>
<td></td>
</tr>
<tr>
<td>Market leader concerning big (sports) events</td>
<td></td>
</tr>
</tbody>
</table>

| Market | | |
|---------|| |
Since all products are build and dismantled by Neptunus, they are in total control of product usage. The rental market is capital intensive, hard for competitors to enter the market and products will not be easily copied.

Since more and more restrictions are formulated, it is harder and harder for new players to enter the market and almost nobody (except for Neptunus) complies with the rules.

<table>
<thead>
<tr>
<th>Opportunities</th>
<th>Threats</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neptunus</td>
<td>Neptunus</td>
</tr>
<tr>
<td>Large and long-term knowledge can be used to develop new products Neptunus develops all new technologies in-house and can be always the most innovative player on the market Development of solutions for small semi-permanent spaces</td>
<td>Chance of failure of new products is high</td>
</tr>
<tr>
<td>Market</td>
<td>Market</td>
</tr>
<tr>
<td>There is a growing need for flexible solutions to solve the housing problems Bars are hungry for a smoke solution Neptunus has a very good reputation in the event and business field, this gives an opportunity to enter other markets Crises gives opportunities (companies that have no possibilities to invest in buildings) Growing interest in semi-permanent structures</td>
<td>A lot of competitors Increasing governmental requirements on semi/permanent structures Increasing quality requirements</td>
</tr>
</tbody>
</table>
3. ENVIRONMENT

The smoke tent can be applied in different environments: outside a bar, a restaurant or club, outside a company or institution or at an event site. Every different environment has different needs and different inherent regulations. These are handled in the following chapter.

3.1 Bars, Restaurants, Clubs, Community Halls

3.1.1 Environment

Bars have had 5 years to prepare for this moment. The attendance in bars is a little lower in general than in previous years, but it is not clear whether this is because off the smoke restriction or the economical recession. Most bars and restaurants in e.g. Delft do not have a separate smoke room, but the terraces are heated and sheltered. Some bars provide blankets. People just go outside to smoke their cigarettes and take their non-smoking friends with them. They still consume their dessert and coffee in the restaurant and do not go home for this. Most bars have terraces in front of their bar. Regulations for furnishing are very strict and permission for a tent has to be demanded. Some bars with a terrace at the back (mostly found in villages) provide space for smokers. The dilemma presents itself with the possibility of placing a tent on that terrace with the consequence of losing tables. Obviously this is less of a problem in the winter. Since most night bars still allow smoking inside, people just go there and it does not matter whether other bars provide a solution or not. In appendix 8.1 interviews with employees of bars and restaurants in Delft can be found.

There are several bars that do provide a smoke room. This can be a closed part of the bar or a separate cabin placed in the bar as seen in the following pictures.
Clubs are often much bigger than restaurants or bars. Thus they do have the space to provide a smoke room. This is seen very often and widely spread.

### 3.1.2 Regulations

The right for a smoke free working environment for bars, restaurants and clubs has been implemented since July 1st 2008. Originally the smoke restriction did not only apply for bars with employees, but also for one-man-businesses. This way no dichotomy would occur between entrepreneurs with and without employees. Since the court of justice in Den Bosch and Leeuwarden have stated that a smoke restriction for one-man-businesses clash with the law, the situation for bar owners has become unclear. To eliminate ambiguity the regulations about a smoke-free working environment have to be modified. This will be discussed in the cabinet at the end of October 2009. The principle remains; an equal treatment for all bars.

An indicated closed smoking room is allowed, as long as smoke does not bother the environment. Every room has to be reachable without going through the smoke room. And employees cannot serve customers in this room. A covered outside terrace is authorized, as long as one side is fully opened, ergo not shielded by any obstacles. A fully closed tent can function as a smoke room as well, but is prohibited legislation to be cleaned before closing time. Important is that people inside the bar cannot be bothered by the smoke from outside.

Regulations for the furnishing of terraces are different in every city, but when a terrace is placed in front of a bar, 1.5 m pedestrian space has to be kept free. In old city centers rules are often very strict, since the appearance of the city needs to stay intact. In ‘s Hertogenbosch no objects are allowed that block the view of the facade and in Groningen and Arnhem a tent on a terrace is never allowed, in Groningen not even when the terrace is located at the back of the bar. In Maasbree a tent can be placed on the terrace after a permission and in Utrecht a tent with one open site is allowed in front of the bar. Whenever a tent is placed, a license is needed and a fee needs to be paid. Tents are mostly only allowed during the opening hours of a bar.

A building and fire safety license are needed when a tent is placed permanent. Depending on the city a wealth license is also required. The rules for publicity are also very strict and only one brand can be highlighted. The terrace has to match the looks of the bar and the city and furniture has to be in natural colors. For a couple of cities the rules can be found more elaborated in appendix 8.2.

### 3.2 Enterprises, Institutions and public buildings

#### 3.2.1 Environment

There are many places where a smoke room or cabin is offered, there are places that provide a shelter outside and there are companies where smokers have to smoke their cigarette outside. In the last case smokers often are standing close to the door and sometimes bother non-smokers with their smoke (see pictures 3.2.1-2). They often intend to throw their stubs on the floor which is also unpleasant for others and the ecological environment. A smoke solution can also help to concentrate the smokers in one spot.
The reason not to provide a smoke solution is often money. Current smoke solutions are very expensive and not that good-looking. Thus when a good solution is offered many companies will be interested, since most companies have enough space outside to place a smoke solution.

In appendix 9 a list and a collage about companies and institutions and their smoke solutions is given.

![Smokers in front of building](image)

**Picture 3.2.1-2: Smokers in front of building**

![Smokers during break](image)

**Picture 3.2.3: Smokers during break**

### 3.2.2 Regulations

Since 1st January 2004 every employee has the right to work in a smoke free workplace. Employers are obliged to ensure that employees can work without interference or burden from tobacco smoke. This counts for governmental institutions since 1990. The employer can provide one or more smoke rooms or open ventilated cabins as long as they do not cause any nuisance in surrounding rooms. Exceptions can be made for private rooms, closable smoking rooms and open air.

Since 1990 certain other institutions are submitted to the same rules as government institutions. These institutions operate in the following sectors: health care, social services or support, well being, art and culture, sports, social cultural work and education. This means smoking is not allowed anymore on places that function in common use, e.g. waiting room, foyer, corridors, canteens, meeting rooms and class rooms. People must be able to use and work in the facilities mentioned above without being bothered by smoke. One or more smoke rooms can be provided. These rooms need to be pointed out as smoke rooms and outside this room people may not be hindered by the smoke. Institutions for mental health care, elderly care, care for the disabled and social care are allowed to make an exception for their waiting rooms, canteens or recreation rooms as long as there is more than one of those rooms available. When there is more than one canteen in the building, smoking can be allowed in maximal half of the number of canteens. In smoking rooms no services or facilities can be offered that are not available in the smoke free zones.

Employers in the catering sector and arts and culture were excluded for realizing a smoke free working situation. In July 2008 this exception was cancelled. Furthermore furnishing a smoking room was allowed.

Since July 2008 smoking is also not allowed anymore in shopping malls, event halls, conference center and airports. A smoking room is also permitted here.
3.3 Events

3.3.1 Environment

At events it is prohibited to smoke in rooms where employees are active as well. This means to
smoke a cigarette people have to go outside or to a smoke room if present. For an event like a music
festival people will not be bothered when they have to go outside to smoke a cigarette (or they just
smoke it inside), but at a high class event (the sector where Neptunus is very active) people cannot
be obliged to go stand outside in the rain and wind in their gala gown when smoking a cigarette.
Since the accommodation for an event is all rented, it is not difficult to add a smoke tent to the
order.

3.3.2 Regulations

At any location where employees are working, smoking is prohibited. Therefore event halls too have
to be free of smoke. The regulations for a smoke room are similar to company regulations. A smoke
room is allowed as long as this is indicated and surrounding rooms are not bothers by the smoke.

3.4 Conclusion

The smoke tent can be used in different situations wherever smoking inside is not allowed. In every
situation the tent will be used by different people with different intention. The three most commonly
occurring situations will be handled in the following scheme.

- The tent is a very important part of the infrastructure
- Walking in and out all evening
- Drink a beer and chat
- Stay there all evening with friends and drinks
- Limited space to place the tent
- Legal restriction about placement
- Bar owner has to purchase the tent
- The bar owner has to build the tent himself

- The tent is only a small part of the infrastructure and is less important
- Smoke tent is used during 15 minute break and lunch break
- A lot of people at the same time and an empty tent in between breaks
- A quick cigarette and a social chat
- Relaxing in tent
- Plenty of space to place the tent
- Company has to buy the tent
- Employee must build tent
The tent is only a small part of the infrastructure and not very important in the whole event.

- Walking in and out all day
- Rush hour during breaks
- No permanent place to stay all day or evening
- Plenty of space to place the tent
- Smoke tent can be rented together with other tents
- Tent will be build by professional tent builders

The tent is bought by a pub holder, a manager or rented by an event organizer, but will be used by visitors, clients or employees. This means that the one to purchase the tent will not be the one to use it. The tent will be built by the pub holder, an employee of the enterprise or a tent builder of Neptunus.
4. PEOPLE & SOCIETY

In this chapter the opinion of managers, who are responsible to purchase a smoke solution, and smokers, who are going to use the smoke solution, is verified. This is done by means of interviews.

4.1 Emotional Aspects and Mentality

The taken interviews can be read in appendix 9. The opinions in these interviews are taken into consideration when a smoke solution is developed.

4.1.1 Interview with bar/enterprise/event manager

The diversity of opinions in bars and restaurants is very big. On the one hand smoking along is bad for your health, thus a restriction is good. But on the other hand it keeps customers to go somewhere else, which is bad for the turnover. Some managers provide a smoke solution, others do not.

There are bars that have the space to provide an in- or outdoor smoke solution, but do not consider this necessary. They say their loss of clients is small and it is not clear whether it is because the economical recession or the smoke restriction. There are bars that have a heated terrace with ashtrays and blankets and find this enough effort for their smoking clients. Other bars that do provide a smoke solution (e.g. a room or a tent) state that they do have more clients because of this solution. These bar managers are all pretty satisfied with the situation.

The biggest problem can be found at small bars with a steady older public, which is not very flexible anymore. This public just wants to drink a beer and smoke a cigarette at the bar or the same table they always do. Those bars do not have the possibility to provide a suitable solution, therefore smoking is still allowed in many of these bars.

In enterprises opinions are also very divers. Some managers provide a nice smoke solution, a ventilated room in the building or an old characteristic shed in the garden, others put wigwams at the back and some just provide a shelter. Many of these solutions are merely improvised and could be replaced by a better one. Managers which do not provide a solutions have different motives. Some say it is too expensive and others say you just should not smoke. Having smokers hanging around the entrance is only the smokers own problem since they make a fool of themselves.

When a better and cheaper solution is offered, many managers are interested for most companies have the space to place such a solution.

4.1.2 Interview with customers/employees

“Smokers are not very happy about the smoke restriction, but they do understand it.”

Current smoking rooms or cabins are often very depressing rooms, which are filled with smoke and are very unpleasant to stay in. That is why smokers still go outside instead of making use of the room. They would use a smoke room if it would be cozy, well ventilated and a pleasant temperature. Also because, in case of going out, it creates an extra space to the pub where it is less crowded and noisy.

Most smokers say they do not take a smoke solution into consideration for the choice of a bar, but rather go where friends are. But they do go to ‘night’ bars where smoking still is allowed.
When a bar is accommodated with a smoke the tent or other solution, this probably will not be an extension of the bar, but depending on the division non-smokers/ smokers, people would stay only for a cigarette or for a longer time in the tent. If most of the people in a group smoke, groups (non-smokers and smokers) will probably stay in the tent longer. But, as the smokers proclaim today, eventually they would only go to the tent to smoke one cigarette.

On the work floor people are very enthusiastic about a smokers tent. There are many companies without any concessions for smokers. This is because a smoke cabin is pretty expensive. If a cheaper solution is offered companies would be interested.

Elaborated interviews can be found in appendix 10.

4.2 Financial Aspects

There are many competitive solutions for a smoke tent; a smoke room, a smoke cabin in- or outdoors, a shelter or no smoke solution at all. And the idea of a tent as a permanent structure is still not fully accepted. Therefore the smoke tent has very strict requirements concerning quality, price and looks. Current smoke cabins for outdoors are the biggest competitors of the smoke solution at companies, since they are also placed when no space inside is available and employers do want to provide a smoke environment for their employees. These smoke cabins are very expensive to purchase and to install and mostly do not provide a pleasant environment. When bars do not offer a smoke cabin inside clients are obliged to smoke their cigarette outside, in most cases under a shelter or an umbrella with heating. In the catering business the smoke tent has to compete with this solution. In the event business no direct solution is offered. When tents for an event are rented it is very easy to just add a smoke tent. The smoke tent has to compete with a cabin and a heated shelter in terms of money and appearance.

From the interviews can be stated that managers are willing to pay €1500,- for the smoke solution. This means when the solution is produced in series of 100/500 the production price can be about €1150,-.
5. FINAL CONCLUSION

In this chapter all findings and conclusions from the previous analyses are joined together to end up with final directions to continue the development of a smoke solution.

5.1 General findings

In the following scheme all findings, which are related to the subject, from the analysis phase are listed. These have led to a number of general conclusions out of which two different directions have originated.

![Diagram showing findings and conclusions related to smoke solution]

- Neptunus is not the biggest, but the most innovative player on the market
- Very high quality products
- All development departments are in-house, therefore total control
- Managers are interested in good looks and low price
- Many competitors in terms of small tents and in- and outdoor smoke cabins
- Search for a solution for the smoke issue in the catering industry
- Inside the bar a smoke cabin must be closed
- Regulations for furnishing a terrace are different in every city
- Environment around the smoke solution cannot be bothered by the smoke
- People would use a smoke room/tent if it would be pleasant to stay in, not smokey inside and dry and warm
- Most people say they do not choose a place for its smoke solution, but finally they do
- BARS - RESTAURANTS - CLUBS
  - EXTENSION TO THE BAR
    - place to spend some time in
    - just smoke one cigarette
  - SHELTER TO PROTECT AGAINST RAIN, WIND AND COLD
    - just smoke one cigarette
- COMPANIES - EVENTS
  - A SHELTER
  - A TOTALLY CLOSED TENT TO STAND IN
  - A FULLY CLOSED TENT WITH ROOM FOR TABLES AND CHAIRS
- BEST COMPANY TO GRADUATE AT
- A FANCY, GOOD LOOKING, NOT EXPENSIVE SMOKE SOLUTION
- TENT FOR OUTDOORS AND AT BACK OF BAR
- TENT MUST NOT FEEL LIKE A TENT AND BE PLEASANT TO STAY IN
5.2 Different Solution Levels

In the following chapters different smoke solutions for different environments are explained. The final solution has to operate in all environments, only the usage, the purchasing and the build - dismantle characteristics differ. The specifications of the different environments are translated in boundary conditions and specific problems which function as a starting point for the concept generation. It is indispensable that all solutions should offer a pleasant smoke experience for the user.

5.2.1 Smoke solution for bars, restaurants, clubs and community halls

When the smoke solution is placed at a bar, a restaurant or a club there are several possibilities. Since the space available in this environment often is limited, the solution will be limited in size.

- A half open shelter: This shelter will protect against wind and rain. An optional separate heater could provide heat. The shelter can be used to smoke a cigarette in between e.g. courses. The shelter can be placed permanently, since it will not take too much space on the terrace and no tables will be lost. When the tent is placed on the terrace in front of the bar the shelter is possibly only allowed during opening hours. This means it should be easy to build and dismantle.
- A closed space: This closed tent will be an extension of the bar. It is possible to place tables and chairs in this optionally heated environment. That way it will provide all the comfort which is also present in the bar. People can come in just to smoke one cigarette or they can spend their whole evening in the tent. This solution is season-sensitive, it will be placed in fall and winter to protect against chilly and rainy weather. In spring and summer the tent can be dismantled, if the space is needed, since there are many sunny moments on which people want to make use of the terrace instead of sitting in a tent.

Boundary conditions
- The smoke solution will be an important part of the infrastructure, so looks are very important
- The tent will be used constantly
- Managed and maintained by bar owner
- Limited space to place the solution
- More or less a public area
- Strict regulations concerning placing of the solution
- With nice weather the smoke solution needs to be stored

Specific problems
- When out of sight people can behave differently (not well-behaved)
- When drunk people can get violent
- Smoking causes polluted air
- Smoking causes stubs/garbage
- Smokers can cause nuisance at entrances
- Smokers which are standing outside can cause noise pollution
- Smokers can cause inconvenience on the sidewalks or streets
- A smoke solutions can take a lot of space on the terrace
In both cases the smoke solution has to be purchased, build and dismantled by the bar, restaurant or club manager himself.

5.2.2 Smoke solution for companies and events

At companies and events there usually is a lot of space available to place a smoke solution. Employees will only use it before and after working hours and during breaks. This means employees will only spend short periods of time in the smoke solution to smoke one or two cigarettes. Event visitors can use the solution all day long and will probably use the solution for longer periods.

- A small optional heated closed tent, that protects against rain and wind. Sitting possibilities can be placed in the tent if wanted. The smoker can smoke his cigarettes standing or sitting. It is important that the smoker feels comfortable during his stay in the smoke solution.
- A bigger comfortable tent which can function as an extension of the cafeteria or event hall in which furniture can be placed. It is important that it is a pleasant and comfortable place to spend time in.
- A shelter to smoke one cigarette in, which protects against wind and rain. It is not intended to stay in the shelter very long.

**Boundary conditions for events**

- Just a small part of all tents that are rented, which means a big budget is available
- Standing between other tents, looks are less important
- Constant crowd in the smoke solution and peak times
- Managed by event manager (responsible) and maintained by Neptunus
- Plenty of space to put the smoke solution
- No public area
- Not many regulations concerning placing of a smoke tent

**Specific problems for events**

- When out of sight people can behave differently (not well-behaved)
- When drunk people can get violent
- Smoking causes polluted air
- Smoking causes stubs/garbage
- Smokers can cause nuisance at entrances
- Events can be very crowded

**Boundary conditions for companies**

Company has to purchase the smoke solution, which will only be a small part of the infrastructure, middle large budget available

- Looks can add something to the building, thus they are very important
- The tent will be mostly used in peak times
- Managed and maintained by the company
- Plenty of space to place the smoke solution
- No public area
- Not many regulations concerning placing of a smoke tent

**Specific problems for companies**

- Smoking causes polluted air
- Smoking causes stubs/garbage
Smokers can cause nuisance at entrances
Smokers can cause inconvenience on the sidewalks or streets

Companies have to purchase, build and dismantle the solution itself. The solutions above are meant to function as a solution for rainy and cold weather. This means they can be temporarily, but since even during summer days it can rain cats and dogs it is not an unnecessary luxury to place the solutions permanently. When semi-permanent structures are rented as a temporary housing for a company, Neptunus can also supply a smoke room.

For events the smoke solutions can be rented together with the other equipment rented for the event. The solutions stand as long as the event takes. This can be a couple of days or weeks, which means that the tent will only have to stand for a little while. The tent is build and dismantled by professional tent builders.

5.3 Brainstorm session

A brainstorm session was organized to receive input from others. Questions about several subjects concerning the smoke solution were answered. The best ideas that are related to the project are summed up in the following table. In appendix 11 all outcome can be read.

<table>
<thead>
<tr>
<th>QUESTIONS</th>
<th>OUTCOME</th>
</tr>
</thead>
<tbody>
<tr>
<td>How can you add value</td>
<td>Color full</td>
</tr>
<tr>
<td>How can you fit tent to architecture</td>
<td>Neutral</td>
</tr>
<tr>
<td>How can you store</td>
<td>Transparent tent</td>
</tr>
<tr>
<td>How can you fix to the ground</td>
<td>Different designs</td>
</tr>
<tr>
<td>How can you give comfort</td>
<td>Integration of shape</td>
</tr>
<tr>
<td>How can you shelter</td>
<td>Brick design</td>
</tr>
<tr>
<td>How can you enter</td>
<td>Contrasting design</td>
</tr>
<tr>
<td></td>
<td>Name of company or brand on the tent</td>
</tr>
<tr>
<td></td>
<td>Very open, building is very good visible</td>
</tr>
<tr>
<td></td>
<td>Modular system</td>
</tr>
<tr>
<td></td>
<td>Hinging</td>
</tr>
<tr>
<td></td>
<td>Harmonica</td>
</tr>
<tr>
<td></td>
<td>Slide into each other</td>
</tr>
<tr>
<td></td>
<td>latten</td>
</tr>
<tr>
<td></td>
<td>Shove inn</td>
</tr>
<tr>
<td></td>
<td>Recycle</td>
</tr>
<tr>
<td></td>
<td>Decomposable</td>
</tr>
<tr>
<td></td>
<td>Dismantle modules and use as terrace</td>
</tr>
<tr>
<td></td>
<td>Flatten</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Dance/smoke pole</td>
<td></td>
</tr>
<tr>
<td>Feeling of lying in the grass</td>
<td></td>
</tr>
<tr>
<td>Print on inside</td>
<td></td>
</tr>
<tr>
<td>Nature feeling</td>
<td></td>
</tr>
<tr>
<td>Panoramic view</td>
<td></td>
</tr>
<tr>
<td>Ashtray</td>
<td></td>
</tr>
<tr>
<td>Art gallery</td>
<td></td>
</tr>
<tr>
<td>VIP lounge look</td>
<td></td>
</tr>
<tr>
<td>Make aware of comfort inside and unpleasantness outside</td>
<td></td>
</tr>
<tr>
<td>Stained glass</td>
<td></td>
</tr>
<tr>
<td>Screws/bolts</td>
<td></td>
</tr>
<tr>
<td>Vacuum rubber</td>
<td></td>
</tr>
<tr>
<td>Make heavy with bricks</td>
<td></td>
</tr>
<tr>
<td>Hooking</td>
<td></td>
</tr>
<tr>
<td>Support</td>
<td></td>
</tr>
<tr>
<td>Stand with water</td>
<td></td>
</tr>
<tr>
<td>Clicking</td>
<td></td>
</tr>
<tr>
<td>Partly underground</td>
<td></td>
</tr>
<tr>
<td>Seating</td>
<td></td>
</tr>
<tr>
<td>Heat</td>
<td></td>
</tr>
<tr>
<td>Fresh air</td>
<td></td>
</tr>
<tr>
<td>Pillows</td>
<td></td>
</tr>
<tr>
<td>Hang tables</td>
<td></td>
</tr>
<tr>
<td>Enough space</td>
<td></td>
</tr>
<tr>
<td>Water proof</td>
<td></td>
</tr>
<tr>
<td>Big empty ashtrays</td>
<td></td>
</tr>
<tr>
<td>Umbrella</td>
<td></td>
</tr>
<tr>
<td>Straw</td>
<td></td>
</tr>
<tr>
<td>Head</td>
<td></td>
</tr>
<tr>
<td>Something transparent</td>
<td></td>
</tr>
<tr>
<td>Veranda</td>
<td></td>
</tr>
<tr>
<td>Plants</td>
<td></td>
</tr>
<tr>
<td>Harmonica</td>
<td></td>
</tr>
<tr>
<td>Plaited leaves</td>
<td></td>
</tr>
</tbody>
</table>
The brainstorm session has led to different categories in which research can be done to give inspiration for the generation of ideas. Appendix 12 shows the different product categories and inspirational images which are used for the development of ideas.
6. CONCEPT GENERATION

To outline the concept generation a process tree, that shows all steps the smoke solution goes through from bulk material trough usage up to disposal, is drawn up. This scheme will lead to a program of demands and wishes the smoke solution has to respect.

6.1 process tree
6.2 Demands and wishes

In the following chapters demands and wishes are summed up for the smoke solution at companies and events and in the catering industry. The smoke solution has to meet all requirements.

6.2.1 companies and events

Demands

Production and assembly
1. Price +/- €1500,-
2. The frame mainly exists of aluminum profiles
3. Life span of connections and part has to be at least 10 years (not the canvas)
4. Processing of parts has to be possible in the factory in Poland

Looks
5. Fit with architecture
6. The smoke solutions must distinguish itself from existing smoke cabins and small tents
7. The smoke solution must be saleable/vendible
8. Free-standing or connected to architecture

Transport & Placing
9. Max weight per package 23 kg
10. Building the tent can take an amateur half a day and professional builder 1 hour
11. Package needs to be stackable
12. Efficient in transport
13. Portable manually

Usage & Maintenance
14. The smoke solution must be fire resistant
15. Provide accommodation for at least 15 people
16. Semi-permanent, so a solid construction
17. Stand all weather conditions, a wind force 0,35 kN
18. Waterproof for 7 years
19. Pleasant environment
20. Concentrate smokers
21. Easy to maintain
22. Ventilated
23. Mountable together
24. Tolerable fresh air but protect against wind and rain
25. Walk in and out easily (no poles on the floor)

Dismissal
26. Frames can be reused
27. PVC can be recycled

Wishes
28. adjustable to the climate
29. Openness but privacy
30. Relaxing environment
6.2.2 Catering industry

Demands
Production and assembly
1. As cheap as possible ( +/- €1000,-)
2. the frame mainly exists of aluminum profiles
3. life span of connections and part has to be at least 10 years (not the canvas)
4. processing of parts has to be possible in the factory in Poland

Looks
5. Fit with architecture
6. The smoke solutions must distinguish itself from existing smoke cabins and small tents
7. The smoke solution must be saleable/vendible

Transport & Placing
8. Max weight per package 23 kg
9. Building the tent can take an amateur half a day and professional builder 1 hour
10. Package needs to be stackable
11. Efficient in transport
12. Portable manually

Usage & Maintenance
13. Free-standing or connected to architecture
14. The smoke solution must be fire resistant
15. Provide accommodation for at least 5 people
16. Stand all weather conditions, a wind force 0,35 kN
17. Easy to break down
18. Easy to store
19. Pleasant environment for possible longer stay
20. Waterproof for 7 years
21. To use in backyard of in front of bar if possible
22. Limited size
23. Pleasant environment
24. Concentrate smokers
25. Easy to maintain
26. Ventilated
27. Mountable together
28. Tolerable fresh air
29. protect against wind and rain
30. To stand rough usage, 2 men pushing against the smoke solution with 50 kg
31. Walk in and out easily (no poles on the floor)

Dismissal
32. Frames can be reused
33. PVC can be recycled

Wishes
34. Adjustable in size
35. Awareness of comfort inside and unpleasantness outside
36. Adjustable to climate
37. Openness but privacy
6.3 Design criteria

Apart from requirements and wishes some design criteria are formulated. These criteria test the essence of the ideas and concepts. Besides these criteria can also be used to compare the different ideas and concepts (executed in the evaluation, chapter 9):

- Does it fit the Neptunus portfolio?
- Does it provide a good and comfortable solution for smokers in the catering industry or at companies?
- Is it better than current smokers solutions?
- How clear is the selling point?
- Does the competition have a similar product?

6.4 Concepts

The previous analysis about the environment and usage has led to a big amount of ideas to apply on the smoke tent. These are idea sketches are shown in appendix 13. A selection of the best ideas is shown on the following pages. The ideas are categorized according to catering industry, companies and events, although all ideas are applicable in every situation.

6.4.1 Smoke solution for the catering industry

The Transpa
When people are going out they want to smoke their cigarette in a similar environment as the bar, with the same interaction and the same sphere. This smoke solution is equipped with a couple of hanging tables that support this interaction. The tables contain ashtrays, can carry beers and people can hang on them during their conversation. The smoke solution is covered with transparent canvas. This way an openness is created in order that smokers and their behavior is still visible for the bar owner or other visitors.

In the summer when it is warm and dry outside the transparent canvas can be removed. An open environment where people can have a chat, drink a beer and smoke a cigarette in the sun is created. This way the smoke solution can still function with nice weather when people rather sit outside to enjoy the weather than in a smoke tent. The construction can stand the whole summer and only the canvas needs to be stored, this way storage is very easy and compact.

The tent is 9 m² and provides accommodation for approximately 15 persons.
Variant
In this round version of the Transpa only one tables is provided, but the canvas can slide away as wanted, which makes this solution also adjustable to the climate. The construction of this solution is connected to the middle pole.
Environment
The image on the left shows the Transpa in the winter period, for which the transparent canvas provides a pleasant environment out of the wind and rain. On the picture on the right the canvas is removed in order for customers to enjoy their cigarette and beer in the sun.

6.4.3: The Transpa in its environment

6.4.2 Smoke solution for companies

The Skew
This smoke solution has to provide accommodation for a moment of rest during working hours. Employees must be able to relax totally during their break. Therefore this solution is equipped with benches, which do not only function as a sitting support, but also give fixation to the poles. This smokers solution is installed for longer periods of time, therefore it has to have a solid construction and be able to stand almost all weather conditions.

Since the smoke solution is placed at companies it has to have a more severe appearance. With its straight lines and asymmetric roof it has a elegant exterior and will easily fit to many buildings. Both sides of the tent can be opened by sliding them away, and the sun will enter on sunny days.

15-20 people can be accommodated in this smokers solutions.
6.4.4: Smoke solution: The Skew

Variants
These smokers solutions only vary a little in shape, but they function exactly the same as the previous tent.
Environment
In the following picture the smoke solution is shown next to the entrance of a company. The smoke solution will probably not be positioned at such a prominent place next to the entrance, but more at the back of the company or in an alley.

6.4.3 Smoke solutions for the event business

The Smoke Dome
This tent is placed at events, which means the tent is mostly rented together with many other (bigger) tents. Therefore it is important that this solution fits the Neptunus portfolio. This also means that the tent will be build and dismantled by professional tent builders and the tent needs to be stored at the rental company.

In this solution the sides can also be opened depending on the weather conditions. The shape of the roof will stimulate the smoke to go up and will leave the tent trough the hole in the top.

The tent provides a smoke room for employees and visitors of the event. This means people are walking in and out all day long. In the tent is room for about for 15 to 20 people, but it can be expanded by putting several smoke solution next to each other.
The following picture shows the smokers tent in the environment of an event. Next to the big event tents the smoke solution will look very small. To cover more space, several smoke solutions can be coupled.
7. CONCEPT

In the previous chapter six ideas for a smoke solution have been handled. In this chapter one solution is chosen and elaborated into a final concept.

7.1 Choice

After generating many ideas, the idea phase has ended with six ideas for a smoke solution, two ideas for the catering industry, three ideas for companies and one idea to place at events. Although the designs are initially developed per environment all ideas can be applied in every environment. This is important to know since eventually one solution will be chosen that can be applied in all environments. This means the smoke solution has to fulfill all demands and as much wishes as possible for all environments.

All ideas will be compared according to six aspects, which are competitiveness with current smoke solutions, added value for the smoker, does it fit the Neptunus’ portfolio, stability and a couple of wishes concerning flexibility.

Existing smoke solutions are available from €2500,- , this means all following solutions can easily compete with current solutions on price. Since installation of the smoke solution is done by the owner itself, this does not lead to expensive installation costs and non of the smoke solutions are placed permanently. This means that they can easily be build in a busy period and dismantled in quiet period, when the weather is nice or with a removal.

The two first solutions distinguish themselves even more from current solutions because they can be adjusted to the weather very easily by removing the canvas or folding up the umbrella. Sides can be removed one by one at the other solutions, which makes them also adjustable to the climate.

In the catering industry people want to socialize, flirt and have a drink while smoking their cigarette, in companies people want to relax, be on their own or have a quiet chat with a friend during their cigarette, while at events both situations are possible. The first two solutions fit the catering business very well, since the whole setting is based on having a social chat. The other solutions provide a more quiet environment where people can do their own thing and get totally relaxed. Obviously tables and chairs can be placed to be more conform to behavior in the catering industry. The varying of opaque and transparent canvas which is used in the third solution provides an somewhat private area, where the smoker is not totally visible on the one hand and a open area where people can see what happens inside on the other. The latter is necessary to prevent unintended usage. Off course this canvas can be applied in all solutions.

The smoke solutions is not equipped with a fan (one can be added). This means there has to be some natural ventilation to get rid of the smoke. Except for the first solution all other smoke tents are provided with a higher point through which the smoke will leave the tent. However the two last models support this characteristic the best. The looks of the tents reveal the function of the tent.
The only tent which really fits the Neptunus’ portfolio is the last solution with its curved roof. The two previous solutions fit the portfolio still a little bit, because they also have a curve in the rooftop. The other tents do not fit the portfolio with their straight lines and flat roofs. The first two solutions fit the portfolio the worst, since they even make use of construction in a way Neptunus has never done before.

The smoke solution needs to be very stable, since it has to withstand a lot of weather conditions and it is often placed without any supervision, which can lead to unintended usage. With tables hanging on the construction and no horizontal poles on the sides of the roof, the first construction is not the best one to stand rough usage and weather conditions. The tables could be supported at the bottom to reinforce the construction. In the second solution the pole in the center supports the whole construction, which means this pole needs to be fixed to the ground very well to fix the construction. The following two concepts are equally stable. Although the skew corner parts make it harder to stabilize and produce, the construction it is feasible. However attention has to be kept that the water does not gather in the middle of the roof and naturally floats away. The next two concepts are more stable than the previous ones, since they have an extra roof profile to stabilize the whole construction.

The characteristic of being not permanent must be exploited to compete even on a higher level with existing smoke solutions. This can be done by making the tent also partially dismountable. At the first solution the canvas can be removed in its total in summertime. Only this part needs to be stored and the remaining part can function as a drink, smoke and flirt spot on the terrace. The sides of the second concept can be shoved open at any time and only the umbrella with table lasts. Whenever the weather is really nice even the umbrella can be folded and everyone can enjoy the sun. The sides off all other concepts can be opened and closed one by one, depending on wind and weather conditions, so only the rooftop remains. In appendix 14 a tables is given of all smoke solutions with their characteristics. The information in this table is applied in a Harris profile (appendix 15) to make a final concept choice. In the Harris profile is clearly indicated that the last solution scores the best on all aspects. Therefore this model will be applied as the new smoke solution.

7.2 Elaboration of concept

7.2.1 Model

To give the tent a more dynamic look than just a square box, the shape of the tent can differ. The following six pictures show different possibilities concerning: A skew construction, horizontal curved profiles, diagonal curved profiles, curved profiles inwards and a special entrance with a little overhang.

![Shapes of the smoke solution](image)

The first image shows a smoke solution in which the front pole is longer and the rear pole is shorter than the middle ones. This does not really add any lambency to the tent and only provides many crooked corner parts of which no part is identical. The second solution is equipped with three horizontal bended profiles. These profiles ensure that the sides form one whole with the rooftop. It
makes the smoke solution look less like a square box. This also counts for the third image, where the diagonal profile used in the roof returns in the sides of the smoke tent.

In the fourth image the side profiles are bended inwards. This gives the tent a more dynamic look, like the two previous solutions do. To construct these sides, the canvas needs to be sewed in a pattern, two connectors are needed, the profile needs to be bended and a mechanism to put the canvas under tension is needed. This results in very high costs. Furthermore this profile cannot be applied at the side of the entrance and the sides of the tent cannot be opened when the weather is nice, unless there is a profile crossing the open side. Therefore bended profiles are not a solution to make the tent more dynamic. The entrance in the fifth image will be very narrow and a corner profile will be in the middle of it. Although the little overhang makes the entrance more attractive, it looks kind of strange. Therefore the little entrance will not be applied. This means the smoke solution will not be made more dynamic by means of shape, but by means of varying the canvas. This canvas will be applied on image six, the square box. This is elaborated in the next chapter.

7.2.2 Canvas

Not only the shape can give another look to the smoke solution, but this can also be achieved with a canvas application. First of all with the design of the canvas the smoke tent can be distinguished from other tents and even from other smoke solutions, because the canvas has more freedom than a fixed smoke solution. Secondly there must be some kind of openness to prevent unintended usage, this can be reached by varying opaque canvases with transparent. But on the other hand the tent also has to offer some privacy. This means the right ratio between openness and privacy has to be found. Furthermore the transparent canvas is rather fragile, therefore the canvas sides need to be strengthened with opaque canvas. The following tables shows the different designs of the canvas.

![Canvas Designs](image)

*Picture 7.2.2: Design of canvas*

By the variation of opaque and transparent canvas in paths people inside are visible from the outside. This will protect against unintended usage. But the stripes also give a way of privacy, since people are only partly visible. Using the smoke tent will not feel like standing in a glass box with people looking at one.

Falling leaves and sandy rain will make the rooftop immediately dirty, this will be visible through a transparent roof. An opaque roof will not show this, hence the roof has to be opaque. Therefore the rooftops of picture five and picture seven are not possible.

The horizontal paths feel very prison like and only accentuate the cubic shape. The vertical straight lines, looking like lamellas, have the same effect. The asymmetric paths, picture one, give a more vivid look to the smoke solution, with the stripes which look like a forest. This design of the canvas gives the smoke solution an original look and makes the tent look less like a cubic box. Therefore this design will be applied on the smoke solution.
7.2.3 Anchorage

The smoke solution will not only be used in a supervised environment, but also in unguarded areas where it has to remain for longer periods of time. This means the construction has to be solid and the tent has to be able to withstand some rough usage. Since it is demanded that no poles are running over the floor, the four side poles have to be fixed in another way. This can be done by anchoring the 4 side poles of the tent individually in several ways:
- Putting weight on the poles individually
- Fixating the poles to the ground with 4 pins
- Putting weight in the whole tent
- The use of straps to fixate the tent to the ground

Fixating the tent to the ground with straps will provide several points people can stumble over. Furthermore the straps have to be fixed to ground with some kind of pins. This means holes have to be made in the ground, which is often covered with tiles. It also gives a very tent-like and non-solid appearance. Therefore this possibility is deleted immediately. The following chapters handle the remaining solutions.

Rotational molding anchorage
The tent can be equipped with one rotational molded part at every pole. This part will be filled with water or sand to add extra weight. Since the smoke solution will not be mass produced, but be produced in series, rotational molding is an appropriate technique to produce the anchorage parts. An extra function, like seating or ashtray can be added to the parts.

Several rotational molding parts are possible to anchor the smoke solution. The possibilities, A bench, a table, a big ashtray and a flower container are given in appendix 16. The best addition for the smoke solution is combining anchorage with seating facilities, since people (especially during their break) have indicated that they prefer to smoke their cigarette while seated and having a easy chat. Therefore the following scheme (7.2.3) shows rotational molded parts which combine anchorage and seating and tables.

![Picture 7.2.3: Seating anchorage]
**Standard concrete anchorage pin**

By the use of standard concrete anchors the tent can be fixed in the ground and a rigid construction occurs. On the four corners of the tent an anchor is put in the ground. The tent poles can be attached to these anchors and every corner is fixed to ground individually. The tent is now protected against squalls and misbehavior of the users. An advantage of this technique is this solution is standard and very cheap. The fact that four holes need to be drilled in the ground is a big disadvantage. This anchor is shown in picture 7.2.3.

![Picture 7.2.3: Concrete anchor](image)

**Floor**

A simple floor can be placed in the tent to fixate all the poles. This makes the construction rigid and protects the smoke solution against wind and rough behavior when the tent is empty. When the tent is in use the weight of the users will provide extra mass to keep the tent in place. A floor can only be placed on a reasonable flat surface. The surface can be leveled with tiles to provide a straight floor. When parts would be sticking out water would enter the tent when raining, therefore the dimension of the floor will be 3x3, like the tent is.

**Conclusion**

Since the concrete anchorage is a standard and very cheap solution, this can be an extra option to fixate the smoke solution. When buyers have to possibility to anchor the tent with pins in the ground they can choose the cheap solution of the anchorage pins.

In order to make a deliberate choice between a floor and rotational molded parts, all advantages and disadvantages are compared. These are summed up in appendix 17. The biggest advantage of a floor is that it is less expensive than rotational molded parts. Since the canvas can be attached to the floor rain cannot enter and users will always have dry feet. Furthermore the parts of a floor are smaller, thus easier to store and to transport. A smoke solution with a floor gives the feeling it is of better quality, the tent can stand on its own. Moreover, the electronics can run under the floor, so no wiring is visible inside the smoke solution.

The first advantages of rotational molded parts is, there is no step when entering the tent. Seating is available and the tent already is decorated a bit. This can also be a disadvantage when people do not like the rotational molded parts. Since all poles are anchored independently the tent can be placed on very unequal underground.

Comparing all advantages and disadvantages of both solutions a floor is the best solution to anchor the smoke solution. For this solution price and functionality (dry feet) are the most important parameters.

**7.3 Final conclusion**

The Vitalia is the smoke solution that will be detailed into a final product. The curved roof will stimulate smoke to leave the tent through the opening in the top. The roof and two sides will be made out of opaque canvas. The other two sides will exist out of a pattern of opaque and transparent canvas. The ends of the canvas need to have a strip of opaque canvas of at least 5 cm for strength. The tent can be bought with a floor or with anchorage pins to secure the tent to the ground against wind and unintended usage. The smoke solution will be handled in further detail in the next chapter.
8. DETAILLING

This chapter handles all technical information, material, profiles, costs and usage of the smoke solution in detail. The dimensions of all the parts of the smoke solution are given in appendix 33. The smoke solution is based on the construction of tents of Neptunus, appendix 34.

Introduction

The smoke solution has a ground surface of 3x3 meters. This counts up to about 15-20 people. The height of the vertical poles is 2m10 and the highest point of the smoke solution is 2,9m.

The smoke solution is constructed with 4 vertical profiles, 4 horizontal profiles and 1 bended profile that is connected diagonally to the construction. All profiles are connected by means of corner elements.

The tent can be secured to the ground with sand or concrete anchorage or by the weight of a floor. When a floor is applied, the 4 floor plates are hold together by four horizontal profiles. The construction of the smoke solution is visible in picture 8.1.1.

The canvas exists of four separate parts for the sides and one for the roof. They will all be fastened by sliding them into the profiles.

8.1 Model and Dimensions

All parts of the smoke solution are numbered and named in the following picture. These numbers and names are used throughout the detailing chapter for clarification.

1. vertical profile
2. horizontal profile
3. bended beam
4. connection piece
5. lower corner element
6. upper corner element
7. tension screw
8. Corner support
8.2 Profiles

The smoke solution is constructed with two different profiles, three when a floor is used. A profile for the horizontal and vertical poles, a bended profile for the roof and a floor profile. The floor profiles are elaborated in chapter 8.4 Anchorage.

8.2.1 Vertical (1) and horizontal (2) profiles

The vertical profiles have a length of 2100 mm and the horizontal have a length of 2856 mm. The canvas slides through the trench, box A in picture 8.2.3, and box B is used to connect the profiles to the corner elements. The profiles have a trench on two sides to drill in holes for connections and electricity.
**Vertical Profiles**  
The vertical profiles slide onto the lower corner elements and are fixed with a screw. When a floor is applied the profiles are fixed to the highest hole and when a concrete or sand anchor is used the profiles are fixed to the lowest hole in the corner element.

*Picture 8.2.4: Connection of the vertical profile to the lower corner element with and without floor*

**Horizontal profiles**  
At both ends of the horizontal profiles a metal bended plate is screwed, which slides in the corner element. It secures itself to the corner element due to the tension of the canvas roof. The tension of the roof causes the profile to turn slightly into a locked position. The construction is shown in picture 8.2.5-6-7.

*Picture 8.2.5-6-7: Connection of the horizontal profile to the upper corner*
8.2.2 Roof (3, 4 and 7)

The bended profile exists of two identical parts that are held together by a connection piece. Now the length of the roof profile is divided into two, which makes the profile easier to store and transport.

![Picture 8.2.8: Bended profile(3) with connection piece(4)](image)

The connecting piece is equipped with a click mechanism which secures itself into the two parts of the bended profile, by clicking into the foreseen holes in the bended profiles. This is shown in picture 8.2.9.

![Picture 8.2.9: Clicking the connection piece into the bended profiles](image)

The roof is constructed in a way it provides tension to the canvas. This is the only way the canvas will be fully strained and will give support to the construction.

![Picture 8.2.10: Bended profile with tension screws(7)](image)

The bended profile is connected to the frame, under an angle of 35 degrees, with a tension screw. This is shown in picture 8.2.11. The upper corner element positions the bended beam in the right angle.
The bended profile is lengthened (picture 8.2.12) while the canvas of the roof is already attached to the horizontal side profiles. This means the surface of the roof increases and the roof canvas will get its total strain.

Lengthening of the bended profile occurs by turning the tension screws 20 mm from below at the ends of the bended profile. A screw is welded on both ends of the bended profile, so the bended profile will go up when the screws are turned. The canvas roof will be fully expanded. When the smoke solution is constructed and the sun is shining on the roof all day, the canvas will expand and the tension screws can be turned more to bring the roof under tension again.

**8.3 Corner Elements**

To keep the costs low, every corner part, independent on the way of anchorage and presence of the bended beam, should be identical. Therefore the corner parts should be interchangeable. This means that if one buys the tent with concrete anchors, one can add a floor or sand anchors afterwards.
when the tent is replaced to another surface. Keeping this in mind a corner element is chosen in appendix 18. A distinction has been made between the upper and lower corner parts.

8.3.1 Lower corner element (5)

As already mentioned the vertical profiles slide on the corner elements and are fastened with a screw in the lower hole, or in the upper hole when a floor is used. The hole in the base plate is used to anchor the tent with a concrete or sand anchor. The two pins are used to fixate the floor profiles. This is further elaborated in chapter 8.4, anchorage

![Picture 8.3.1: Lower corner element](image)

8.3.2 Upper corner element (6)

The horizontal profile slides into the top of the corner element (picture 8.3.2), which in turn slides into the vertical profile and both are fastened with a screw. In two diagonal corners the corner element connects two horizontal profiles and a vertical profile (picture 8.3.3). In the other two corners the bended beam is also connected to the corner element (picture 8.3.4). The corner element is constructed to position and support the bended beam in the right angle. All corner elements are identical and producible with one mold.

![Picture 8.3.2: The upper corner element](image)
8.4 Corner Support (8)

To strengthen the construction and to assure the smoke solution will not deform with hard wind or under the weight of smokers leaning onto the vertical profiles, all corners are equipped with bended tubes in all three dimensions (picture 8.4.1). By this application, the directional forces on the corner element are decreased. The vertical and horizontal profiles have a trench on the surface in which the supports are connected with a screw. The trenches create the illusion that the supports originate from the profiles, which makes the supports blend in with the construction.

The function of the horizontal profile in the corner support is to prevent the horizontal profiles to deform into a diamond shape by the pressure of the bended beam (red in picture 8.4.2)
The vertical support profiles (picture 8.4.3) shore the construction when the vertical profiles are horizontally loaded by wind or human weight, by which the sides will deform into a diamond shape.

The support profiles are bended first. Secondly the three supports (horizontal, left and right vertical supports) are welded together. This causes a stiff construction which gives even more support to the corners.

Holes are drilled in the flat corners of the triangle support in which a blind pivot nut is put to connect the supports with a screw to the construction (picture 8.4.4).
8.5 Anchorage

Anchorage of the tent is needed to keep it resistant to unintended usage and to rough weather conditions. The tent can be anchored in three different ways. The choice of anchorage depends on the type of surface the tent is placed on and on the available budget. When a tent is placed on a soft surface, long anchorage pins can be used to anchor the smoke solution. When a tent will be placed on a concrete or stone surface, the tent can be fixed to the ground with concrete anchors. When it is not possible to fixate the tent in the ground with pins, since no holes can be made in the surface, the tent can be anchored with the more expensive solution, a floor. This floor not only anchors the tent, but will also add value to appearance and the smoke experience of the tent.

8.5.1 Sand Anchorage

This anchor is used to fix the tent to the ground in a sandy bottom. On all four corners one anchor is used. Four holes have to be drilled into the bottom. The anchor enters the ground 800mm. Calculations to confirm this length can be found in appendix 19.
8.5.2 Concrete anchorage

To anchor the tent in a concrete or stone foundation, four concrete (M12) anchors can be used. Four holes of only 54 mm of depth have to be drilled into the concrete to utilize the maximal loading capacity of the concrete. Washers are used to fit the concrete anchor into the lower corner element. The usage of the concrete anchorage is explained in appendix 20.

8.5.3 Floor

Appendix 21 shows two solutions for a floor. The most appropriate floor is applied to the smoke solution and will be elaborated in the following chapter. Picture 8.5.6 shows the top of the floor, this part is visible for the smokers. The floor is constructed with four aluminum profiles (1) in which four concrete wooden plates (2) can be slid (picture 8.5.7). These plates are supported on the sides with four pinewood beams (3) (picture 8.5.8). The beams assure that the floor boards do not bend down and create a crack between two floor boards when someone steps on it. The beams also assure that the corners of the floor boards do not come up in the middle when people are walking over the floor. The beams are connected with screws to the floor boards. This way the floor is mountable over and over again.

Picture 8.5.4-5: Concrete anchorage

Picture 8.4.6: Floor top

Picture 8.5.8: Floor bottom

Picture 8.5.7: Section view of a floor board in the profile
The floor profiles slide over two pins on the corner element. This fixates the profiles in two directions. The profiles are fixed in upper direction by placing the vertical profile on the corner element and fix it with a screw. This is shown in picture 8.6.9-10-11.

![Fixation of the floor profiles](image)

**Picture 8.5.9-10-11: Fixation of the floor profiles**

The floor profiles lean on the corner elements through which there is a gap between the surface and the profiles. This gap makes it possible to lay the floor flat on an uneven surface. The remaining opening can be filled up with pieces of wood. Even when a floor is applied, the corner elements can still be fixated to the ground to make it impossible to move the smoke solution.

### 8.6 Canvas

The tent consists of four separate sides and one roof part. The canvas is fabricated from opaque and transparent fire-resistant PVC.

### 8.6.1 Connection

The opaque sides are equipped with “keders” at three sides. A keder is a flexible profile which is sealed to the end of the canvas. These keders can slide into the provided space in the horizontal and vertical profiles (picture 8.6.2-3). This fixes the sides fully to the smoke solution. To slide the keder easily into trench in the horizontal and vertical profiles, the trench is milled out at one side (picture 8.5.2).

![A canvas roof, two opaque sides and two patterned sides](image)

**Picture 8.6.1: A canvas roof, two opaque sides and two patterned sides**
The patterned sides are equipped with curtain roles on top to slide them open, a keder on both sides to fixate the canvas to the construction and a zipper to function as entrance (picture 8.6.1). The roof slides over the bended profiles and is also connected to the vertical profiles with four keders.

![Diagram](image)

*Picture 8.6.2-3: Sliding the keder into the vertical profile and a section view of the keder in the provided space*

### 8.7 Entrance

The two patterned sides of the smoke solution are equipped with curtain roles and a zipper. With the roles the canvas sides can be shoved open after opening the zipper (picture 8.6.2), opening the sides only half is also an option. For safety reasons the zipper can be opened and closed from the in- and the outside.

![Diagram](image)

*Picture 8.7.1: Zippers in the smoke solution*
When the smoke solution is closed by closing the zipper after sliding the patterned sides back, it can be locked by connecting the foreseen holes in the sides with a padlock (picture 8.7.3).

![Picture 8.7.3: Locking the smoke solution](image)

**Option floor**
The patterned sides are connected to the floor (picture 8.7.6). After disconnecting the canvas from the floor, the sides can slide open. This connection to the floor makes sure that during cold and rainy weather the side can be opened only partial (picture 8.7.3) and no wind passes the tent under by the canvas. During nice weather all connections to the floor can be detached and the sides can be fully opened. This is shown in pictures 8.7.3-5.

![Picture 8.7.3-5: Smoke solution with sides partially open (at 850-1500-2250)](image)
Every canvas side is attached to the floor with three hooks, at 750, 1500 and 2250mm. The little elastic rubber band with a plastic ball attached to it, is put through a little hole in the canvas. A plastic hook is attached to the whole afterwards. Finally the plastic hook is hooked into a hole in the floor profile.

8.8 Technical information

This chapter will elaborate on the technical background of the smoke solution. The material, production techniques, costs and weight of the tent are looked at in detail.

8.8.1 Material and production of the smoke solution

To manufacture the smoke solution various production technologies are used. The extrusion of the profiles and casting of corner elements is outsourced. The processing of the parts, like drilling holes and welding is done at the factory in Poland. The canvas is bought by the role and is sewed and welded into the right models at the factory in Poland and the workshop in Kessel.

In appendix 23 an overview is given about all parts, their material and the production technology used.

8.8.2 Costs

The smoke solutions comes in three different editions. One contains a floor. This one has more comfort and looks better than the other versions. This smoke solution will cost € 1219,28 to produce and can be sold for € 1585,06. There is one version equipped with concrete anchors to fix to a concrete bottom. This solution has no floor and will cost € 1007,20 to produce and € 1209,36 to buy. The third version can be fixed to a sand bottom and costs Neptunus € 1016,68 to produce and can be purchased for € 1321,68.
In this calculation Neptunus will have a profit of 30% on every solution and the calculation has been made for 1000 smoke solutions. This calculation can be found in appendix 24. Appendix 24 also provides calculations for 100 smoke solutions and a cheap version without a transparent pattern.

8.8.3 Weight

The weight of the tent also differs for all different versions of the smoke solution. The floor serves as an anchorage for the tent by its weight. Therefore the floor adds approximately 40 kg to the general weight of the tent, which is 125 kg. The total weight of the smoke solution will be 154 kg and will therefore be hard to move without help. An overview of the weight of the smoke solution can be found in appendix 25. Since legally people are only allowed to carry packages of no more than 23 kg, the smoke solution will be transported in several packages weighing at most 23 kg. This will keep the smoke solution transportable by hand and not only by machines.

8.9 Force Calculations

8.9.1 Own weight and tension, wind resistance and unintended usage

To find out whether the construction remains standing during rough weather and unintended usage, the construction of the tent has been calculated for several load combinations in Scia Engineer 9.0.158. The outcome of the calculations can be found in appendix 27.

The smoke solution can be considered safety class 1. This class concerns buildings where during extreme bad weather conditions nobody has to be inside, and in case of possible collapsing the caused damage will only affect the building itself and its internal assets (appendix 26). This safety class determines the load factors needed to make the calculations.

To make the calculations an approximation of the profiles has been used. The horizontal and vertical profiles have a thickness of 2 mm and different chambers that supply more strength and stiffness. Therefore a standard square profile with thickness 3mm is used to make the calculations (appendix 27, table 9 section data, p.70). The upper joints are calculated as infinite stiff.

Calculations have been made for load of own weight of the construction (LC1), load of own weight of the canvas (LC2), load of the canvas tension (LC3), load of the wind in x- and y-direction (LC4-5) and load by unintended usage (LC6).

The different load situations are shown in appendix 28. LC3 is shown on image 1a; LC2: 1b; LC3:1a; LC4:2a; LC5:2b; LC6:3b.

Different load situations have been combined to find the influences on the joints and the construction. The most important force situations are described here.

The largest section forces take place on bar 3 (S3, appendix 28, image 3b) during a load combination of own weight/construction, own weight/canvas and wind force in the y-direction (load combination 9, appendix 27, table 14, p.76). In the least favorable situation a force of 2,2 kN and a moment of 1,6 kN/m can be found on bar 3 (appendix 27, table 21.1.1, p.83: extreme forces).

The load combinations for maximal joint deformation are given in appendix 27, table 23, p.86. This table states that the largest displacement takes place in joint 9 during a load combination (load combination 13) of own weight/construction, own weight/canvas, canvas tension and wind in y-direction. De displacement in joint 9 in the x-direction is 21,7 mm, in the y-direction is 260,9 mm and 52,8 mm in the z-direction.
The reaction force on the lower joints is a normal force of 2.2 kN in the least favorable situation. There is a force upwards of 0.5 kN on the lower joints.

Conclusion: the smoke solution will displace during load, but the displacements and deformations will not be significant enough to endanger the tent of destruction. The profiles and the construction, assisted by the corner supports are stiff enough to handle the loads. The Scia engineer program had an outcome of several calculations, thereby proving the construction is in balance and will keep standing during combinations of various loads.

8.9.2 Buckling

It is known now that the smoke solution will keep standing, but to find out whether the profiles are not dimensioned to big another calculation has to be made. Therefore the buckling stress of the profiles can be calculated with the following formula. If the outcome is smaller than 1, the profiles will not buckle.

\[ \frac{N_{c:s:d}}{N_{c:u:dy}} + \frac{M_{y:s:d}}{My \, el:u:d} \leq 1 \]

\( M_{y:s:d} \) is the greatest moment on the corner elements in the most unfavorable situation. In this case 1,646 kNm (appendix 27, 21.1.1).

\( N_{c:s:d} \) is the ultimate tolerable force on the section of the given profiles during M=1,646 kNm. In this case 2,243 kN (appendix 27, 21.1.1).

The steel quality can be derived from the minimal slenderness of the profile in order that the buckling stress is smaller than the yield strength.

\[ L_k = 2100 \text{ mm (system length)} \]

\[ \lambda y = \frac{L_k}{l} = \frac{2100}{191} = 110.1 \text{ (slenderness)} \]

\[ \lambda rel = \frac{110.0}{53.65} = 2.05 \text{ (relative slenderness)} \]

\[ \lambda e = \pi \sqrt{\frac{0.7 \times 10^5}{240}} = 53.65 \]

With \( \lambda rel \) the \( \omega_{buc} \) (buckling factor) can be found in appendix 29.

\( \Omega_{buc} = 0.212 \)

Surface area = 545.3 mm²

Yield strength aluminum = 240 N/mm²

\( M_y \, el= \) allowable moment of resistance of the profile = 8,076x10³

\[
\frac{2,243}{0,212 \times 545.3 \times 240} + \frac{1,646}{8,076 \times 10^3 \times 240} = 2,243 + 1,646 = 0,080 + 0,849 = 0,929 \leq 1
\]

This means the buckling stress is lower than the yield strength, thus the profiles are strong enough to carry the construction. Even with a wind force of 0.36 kN/m and two aggressors, pushing with 50 kg both against the construction.

Since the outcome is close to 1, the construction is not dimensioned to heavy. If the profiles would be a little more slender the outcome would pass 1 and the profiles would buckle under this load.
8.10 Usage

In this chapter several subjects concerning the smoke solution, its usage and its users will be treated. To start with ‘building and dismantling’ and ‘transport and storage’ are reviewed. Furthermore this chapter is about the smoke solution in practical use, smoke circulation, adjusting to climate, environment, maintenance and coupling of multiple tents.

8.10.1 Building – Dismantling – Transport – Storage

Building & Dismantling

To build the smoke solution it is important that all actions are performed in the right order. In appendix 30 a detailed manual to construct the smoke solution, pictures included, is elaborated. In this chapter only a brief explanation about the building of the smoke solution is given.

Building of the smoke solution starts with constructing the roof. Slide the bended profile through the loop in the canvas roof and also connect the horizontal profiles to the kaders in the roof. Then attach the horizontal profiles and the bended beam to the upper corner elements. The roof canvas is not yet under tension. Continue with the sliding the vertical profiles onto the corner elements one by one and fasten them with a screw. To give strength to the construction, the support triangles need to be screwed on in every corner.

Next the floor, when present, has to be assembled. Start with screwing the floor boards onto the pinewood beams and sliding the floor profiles onto the floor boards. Connect the lower corner elements in every corner. Now take the tent construction, slide it over the four corner elements and fasten the vertical profiles to the corner elements with a screw.

When the smoke solution is assembled without a floor the lower corner elements can be attached to the vertical profiles immediately. After placing the smoke solution in the right position, the holes for anchorage need to be drilled. Anchor the tent by using a concrete or sand anchor.

Now the smoke solution is fully constructed, the canvas sides have to be connected to the horizontal and vertical profiles by sliding the kaders and curtain roles through the foreseen boxes in the profiles. After opening the zippers the patterned sides can slide open and the smoke solution can be locked by attaching a padlock to the zippers.

Finally the roof still needs to be tensioned. This is done by turning the tension screws from below at both ends of the bended profile.

To dismantle the smoke solution the guidelines above can be followed in the reverse order.

Transport and Storage

The smoke solution is composed from rather large parts, since a surface of 9 m² is covered. Although the smoke solution can function the year round, the all parts need to be stored when it is not fully constructed. This space will most likely be available at companies and institutions, but for a bar it will be harder to store the smoke solution. Since the bended beam covers a length of 4,2 m, it is divided into two parts to make the transportation and storage of the smoke solution easier and therefore cheaper.

The smoke solutions that are intended for sale are packed in cardboard stacks, weighing no more than 23 kg per package, as prescribed by the Arbo legislation.
2x horizontal profile | 12 kg  
2x horizontal profile | 12 kg  
4x vertical profile | 16.8 kg  
4x floorboard | 20 kg  
4x floor profile | 12.5 kg  
4x fire wood beam | 8 kg  
4x lower corner element | 22 kg  
4x upper corner element | 22 kg  
4x corner support | 8 kg  
1x roof canvas, 2x with canvas, 2x patterned canvas | 23 kg  

All packages are piled up to form one big package and attached to each other with a strap to preserve the whole package during transport.

The smoke solutions that are rented out and build by Neptunus are transported and stored with three together in one wooden box. These boxes are easily piled up for transportation and storage at Neptunus. The boxes are handled with forklift at the event site and at Neptunus. The upper corner elements will be stored attached to the horizontal profiles, while the lower corner elements will be stored individually. This positioning of all parts can be included in the design of the wooden box. This design will show what parts are still missing when packing the smoke solution at an event site, which will make it easier to complete all wooden boxes before storage. The boxes will be identical for storing the smoke solution with and without floor.

In the wooden box the horizontal (upper corner elements attached) and floor profiles are all stored together, since they all have a length of about 3m. The vertical profiles, the fire wood beams and the floor boards form an individual stack. The lower corner elements will all be stored individually at their foreseen place. The box is equipped with a compartment to store all screw, bolts and little parts, like the tension screws. All canvas parts will be packed in one big bag.

<table>
<thead>
<tr>
<th>Item</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bag with canvas</td>
<td>23 kg</td>
</tr>
<tr>
<td>Wooden box (without floor)</td>
<td>394 kg</td>
</tr>
<tr>
<td>Wooden box (floor included)</td>
<td>515 kg</td>
</tr>
</tbody>
</table>

8.10.2 Smoke circulation

To make sure the smoke leaves through the roof of the smoke solution and does not keep circulating inside, two sides of the smoke solution have been equipped with a piece of wire gauze in the canvas to make air circulation possible. Air can enter the smoke solution through the two strips at the bottom (picture 8.10.2). The smoke is able to rise and will leave through the air-permeable strip in the roof (picture 8.10.3). The strip will let air through easily, but the gauze and the overhanging canvas will keep the rain out.
8.10.3 Adjust to climate

The smoke solution can be adjusted to the climate in two ways. With just little effort the two patterned sides can be shoved open fully (after disconnecting the canvas from the floor, if present and opening the zipper). This makes a very open environment of the tent (picture 8.10.4). When a longer period of nice weather is forecasted, all four sides of the smoke solution can be removed by sliding them out of the horizontal en vertical profiles the same way the canvas sides slid in by building. This leaves the smoke solution with only a roof to protect people from the sun and the rain like a shelter (picture 8.10.5).
8.10.4 Environment

The smoke solution is developed to function as a space where smokers can enjoy their cigarette protected from rain, wind and sun. Smokers occur in every layer of the society and in a widespread collection of environments and activities. Therefore the smoke solution will be situated on many different locations, accommodating a very diverse public.

The following three pictures show the smoke solution in its possible environment, a car show room, an event and a restaurant.

![Picture 8.10.6: The smoke solution at a showroom](image)

![Picture 8.10.7: The smoke solution at an event](image)
8.10.5 Maintenance

Since the smoke solution is developed to serve as a permanent smoke accommodation it is composed to function longer periods in time and to withstand very tough weather conditions. This means the tent does not have to be dismantled for maintenance, only if the weather condition exceeds all limits (wind force bigger than 0,35 kN). Therefore the maintenance of the smoke solution is minimal. Depending on its environment (sand or concrete surface, closeness of trees) the canvas must be cleaned yearly to wash off sand, leaves and dirt coming from rain. To keep the smoke solution fire-resistant the canvas needs to be impregnated once a year. When parts break because of wear and tear or an unfortunate incident; spare parts can be ordered at Neptunus.

8.10.6 Coupling
Several smoke solutions can be coupled to each other to cover a wider space. When the tents are coupled, the total frames of the tents are needed. When they are placed against each other, there still is an opening between the different horizontal profiles and an opening between the different vertical profiles. This opening will let rain and wind enter the smoke solution. This is solved with 4 gutters of 2100 mm (to connect the vertical profiles) and 4 gutters of 3000 mm (to connect the horizontal profiles) of which the keders are pulled through the available trenches in the profiles. Picture 8.10.9 and 8.10.10 show a vertical gutter and a horizontal gutter.

Picture 8.10.9-10: A gutter connecting the horizontal and vertical profiles

Picture 8.10.11-12: A gutter connecting the floors at coupled tents
8.11 Choice of color

The smoke solution is produced in two colors. One light colored version to be sold and one white version to fit the Neptunus portfolio at event sites. Ascending smoke will in time color the canvas and give the smoke solution a dirty, unhygienic look. This will not cause any problems in the rental business, since Neptunus has in-house equipment to clean the canvas professionally. But in the sales business owners are responsible for cleaning the smoke solution themselves. It cannot be expected that they clean it every month. Thus the smoke solution will be colored, that way a discoloration will be less visible. The color should be as neutral as possible for many people to like it and to fit many environments. A bright, shiny color can discourage people to buy the smoke solution and dark colors will be too hot in summer. In appendix 31 the smoke solution is shown in several colors.

The floor boards are covered with a brown traction layer at the supplier. This color is not adjustable.

8.12 Various possibilities

In this chapter possible extensions to the regular smoke solutions are reviewed. The owner of the smoke solution has the freedom and the possibility to add these options, but they are not initially present.
8.12.1 Electricity

In all vertical profiles one hole at the bottom and one hole at the top are present. These holes can be used to pull an electrical wire through the profile. This can be done by the owner of the smoke solution when he wants to put up lighting in the smoke solution. Electrical devices, like heating and ventilation, can also be connected through the vertical profiles.

8.12.2 Ventilation and heating

Initially the smoke solution only protects against rain, wind and sun. To increase the air circulation for smoke removal a ventilator can be installed by the owner itself. Pictures 8.11.2-3 show the possible positioning for a ventilator. The ventilator has to be positioned near the bottom to draw clean air and to create an overpressure from below which makes the smoky air rise faster and leave the smoke solution through the air-permeable strip in the roof.
When heating is desired, the owner can place a heater in the smoke solution. This can be done by connecting a shelf to the horizontal profiles on which the heater can be placed, this is shown in pictures 8.12.4-5. When placing the heater make sure the heater is attached to the shelf and there is at least 0,2m space between the canvas and the heater. This heater is shown in appendix 32.

As visualized in the picture above, the wiring of the heater can be guided through the hole in the vertical profile.

**8.12.3 Lighting**

To add functional lighting which also increases the appearance of the smoke solution spots can be placed in the floor boards (picture 8.12.7). They provide a curtain of light which gives an elegant look to the tent. This is visible in picture 8.12.6. This lighting is only a suggestion and can be executes by the owner of the smoke solution. The wiring can run under the floor.
8.13 Implementation

The smoke solution is originally designed to provide an environment for smoking a cigarette protected against rain and wind. A private environment where one can get totally relaxed while smoking a cigarette as a break in a period of hard work.
Aside from that, the smoke solution can also be used in the market of small tents. For instance it can function as a bar or cash register at an event or a market booth at a fair, since it has the same characteristics as other tents in this segment, apart from the air-permeable strip.

Although the tent can be used in other ways than a smoke cabin, the implementation will mostly take place in this field.

8.13.1 Promotion

The promotion will start in the catering industry. Therefore different initiatives can be taken. First of all publicity in several specialist magazines can be made to promote the smoke solution at bars, local brewery distributors and brewers, e.g. Heineken and Jupiler. These three parties can purchase the smoke solution. A bar could purchase the smoke solution to position a more or less permanent smoke cabin for instance in the backyard. They could also rent it for a party, especially in winter.
Furthermore brewers are contacted to use the smoke solution as way of promotion. The canvas can be fully colored and logos of a brand can be printed on it for approximatly €150,- per logo (picture 8.13.1). The brewers can donate the smoke solutions to bars that serve their brand of beverage for free advertisement. In this way the smoke solution can also be used at festivals to accommodate the bar or the ticket sale. This can happen by sponsoring or by renting the smoke solution out to the event.
A local brewery distributor can purchase the smoke solution to put it for rent to bars when having a party, at a fair in the village or during carnival. When supplying a company or an institute with beverages for a party, the smoke solution can be rented to provide smoke space for possible smoking guests. In this case the smoke solution can also be fitted with publicity for the distributor.

In the field of events, in which Neptunus is very active, event organisers and agencies can be contacted and informed by Neptunus about the smoke solution or a new tent in general. While renting many event tents from Neptunus they can rent the smoke solution for a song.

And finally if companies and institutes were not informed about the smoke solution yet (from the catering industry and events) promotion can be made in real estate magazines which are often looked in by building caretakers. They can purchase the smoke solution to serve as a permanent smoke cabin for employees. The smoke solution can also be used by companies for promotional purposes after customizing at events or a job fair for instance. This is shown in picture 8.13.2-3.
8.13.2 Neptunus

The smoke solution will be produced in Neptunus’ factory in Poland. The current production of event tents and semi-permanent constructions does not occupy the production capacity of the factory entirely, especially not in this quiet economic period. This gap can be filled by the production of the smoke solution. In a quiet period a lot of smoke solutions can be manufactured and in a busy period there will be a hold on the production of the smoke solution. In concrete terms this means all machines are available and no additional manpower is needed to start the production of the smoke solution.

8.13.3 Logistics

The smoke solution can be purchased from Neptunus for own use, as a free give-away/promotion gift or to rent it out. It can also be directly rented from Neptunus. In either way the smoke solution will be transported to the customer by Neptunus. Neptunus is responsible for all logistics. Since this is their core business they are very experienced and it will not cause any difficulties.
9. PROTOTYPE

In the workshop at Neptunus a prototype of the smoke solution has been manufactured. The prototype is an approximation of the smoke solution for mass production to test the stability of the tent and roof construction, the design of the patterned sides and the view of the roof with its bended beam.

![Picture 9.1: The Smoke Dome](image)

9.1 Approach

Since a mold is needed to extrude the horizontal and vertical profiles these parts in the prototype differ a lot from the original. The profiles are approached by using open profiles which give less strength to the construction (picture 9.2). Therefore the construction will even be more stable in reality.

![Picture 9.2.1: A open vertical profile](image)
In the mass produced smoke solution, the upper corner element is casted in aluminum. In the prototype this is approached by welding together steel parts. The bended beam is not positioned in the corner element, because this could not be realized. Instead the beam is connected on top of it with a screw (picture 9.2.3).

![Picture 9.1.3: The upper corner element]

The room in the profile to slide through the keder is much smaller in the prototype. This means there is not enough space to place the rollers that can shove the patterned sides open. This is simulated by equipping the patterned sides with two zippers. The sides can be opened in two stages, this is shown in chapter 9.2.1-2.

The angle of the bended beam should be 55°, the current angle is much bigger. This makes the roof look like a flat arch, this was not at all the intention. The prototype is currently under construction to solve this problem.

9.2 Usage

The patterned sides can be opened partly to function as an entrance or fully to adjust the smoke solution to the weather condition creating an open shelter. This is shown in the following pictures.

![Picture 9.2.1: The smoke solution partly opened]

![Picture 9.2.2: The smoke solution fully opened]
When the weather allows it the entrance can be kept open while the smoke solution is in use, if not the entrance can also be closed from the inside (picture 9.2.3-4).

9.3 Evaluation of the prototype

As mentioned before, the prototype was constructed to test the stability, the design of the patterned sides and the view of the bended roof.

After constructing the prototype with its weaker open profiles, the roof construction tended to deform into a diamond shape when the bended beam was brought under tension. The sides had a similar intention. Although the smoke solution would deform less when using the correct vertical and horizontal profiles, the deformation would still be too big. Therefore support profiles have been added to the corners of the construction, which have solved that problem (picture 9.3.1).
To start with, the patterned sides were designed to create openness and privacy at the same time. Secondly the sides were designed to distinguish this solution from current smoke solution and small tents, since this had never been done before. The artistic looking pattern give the smoke solution an original look, which makes the Smoke Dome look more special than other small tents. The subtle curved lines form the ideal mediator between the bended roof and straight construction. Therefore the pattern functions and looks very well. When looking from outside into the tent, the smokers are still visible enough to check whether they are misbehaving themselves or not. When standing inside the smoke solution, the smoker can position himself fully visible, half visible or barely visible as desired. This is shown in picture 9.3.2. The pattern ensures smokers are able to look outside, therefore not feeling claustrophobic, and in the meanwhile keep their privacy (picture 9.3.3). This means the right level of openness is reached.

The shape of the roof in the prototype is very different from the intended shape. This is visible in picture 9.3.4 and 9.3.5. The flat arch in the prototype should look more like a shelter to cover the air-permeable strip in the canvas. This can be reached by making the angle of the bended beam smaller and replacing the point where the two sides of the canvas meet to a higher point. The prototype is currently under construction to realize these changes. This is shown in picture 9.3.6-8.
In these pictures the angle of the bended beam is smaller. The effect on the looks of the roof is remarkable. This roof already approaches the intended look of the design and does look less like a flat arch. The point where the two roof sides join, will be positioned higher and improve the roof even more.
10. EVALUATION

In this chapter the smoke solution is evaluated according to the already formulated demands, wishes and design criteria. The evaluation concludes with a recommendation for the smoke solution would it be taken into production.

10.1 Demands and wishes

In general the smoke solution looks and functions very well, it fulfills all demands; e.g. it is easy to maintain, not to difficult to build, it can be sold for €1500 and although some space should be available, the smoke solution is not too difficult to store after dismantling the bended beam into two parts. As for the wishes many are met. The smoke solution can be adjusted to the climate, by sliding open the patterned sides and even remove the sides at the back. With the patterned sides the right balance between privacy and openness is reached.

For companies and events the smoke solution should be a relaxing environment. Since the smoke solution provides a shelter for wind and rain, it is relaxing during these weather conditions, even though this can be increased by placing furniture in the solution. The latter is de responsibility of the managers.

For the catering industry it would be an advantage if the smoke solution would be adjustable in size. This is not really the case, the surface can only be increased by coupling several smoke solutions.

The smoke solution should create awareness of comfort inside and unpleasantness outside. The awareness will only be present with cold, raining and windy weather, since no furniture is there to create a comfortable and fine environment, off course this can be provided by the owner.

10.2 Design criteria

In chapter 6 five design criteria have been formulated according to which the strengths of the smoke solution can be evaluated.

With its bended roof profile, the smoke solutions shows a little resemblance to The Ocean of Neptunus, which has a curved roof. Thus the roof does fit the Neptunus portfolio. However, the patterned sides are new for Neptunus and have not yet seen anywhere before in the market. With this pattern the smoke solution distinguishes itself from its competitors, the smoke cabins and small tents. The smoke solution costs only approximately €1500,- and can be installed and displaced by bars and companies themselves, which gives the smoke solution many advantages in comparison with current smoke solutions. It provides a comfortable environment for smokers to have a drink, a chat or just relax, certainly after placing furniture. Finally, with the shape of the roof showing the function of the tent, the smoke solution is ready to enter the market.

10.3 Recommendations

To improve the smoke solution even more, the following considerations can be taken into account when the smoke solution is developed into the final mass product, The Smoke Dome.

The tent is constructed using three different styles; gothic looking support profiles; a modern bended beam and artistic patterned canvas. Although the pattern is artistic, with its big curves it actually does fit the structure of the bended roof very well. It looks like a whole.

The bended support profiles do not fit in with the roof and the pattern, therefore they can be replaced by little straight flat profiles. These little profiles will make the corner infinitely stiff as well.
The sides will not deform into a diamond shape and the horizontal and vertical profiles will not bend or twist. This is ensured by the Scia calculations in appendix 27. The flat profiles will look rather modern instead of gothic. This will make the smoke solution look like one whole and fit the Neptunus profile even more.

The bended beam will tension the canvas roof mostly in one direction, away from the bended beam. This means that the front side of the roof canvas will hang down a little. This will decrease after rising the joint of the two sides of the roof canvas, but rain will stay in the corner of the front canvas.

Since only the back of the canvas is fully tensioned with the tension screw, the front needs to be tensioned more in another way. This can be done by providing the front with 3 buckles positioned over the air-permeable strip. After building the complete tent and tensioning the roof, the front canvas can be fully tensioned by tightening the three buckles from the inside. The strip will be a little crumpled, but this can be tucked away between the canvas and the buckles. The front roof will be fully tensioned and when raining no water will remain on the roof.

To improve the stability of the smoke solution even more the lower corner elements could be dimensioned even larger. This will mainly bring stability to the construction when the corner elements are not fixated to the bottom with anchorage pins.

When the smoke solution would be used in the rental business, it means the tent would be build and dismantled very often. It is possible to do this with the smoke solution as it is currently dimensioned. However, builders at the site can tread the equipment and tent parts pretty roughly. Therefore it would be advisable, but not necessary, to dimension all profiles and corner elements a little heavier.

Apart from these comments and recommendations the Smoke Dome is a good looking and functional smoke solution to be used at events, companies and in the catering industry.
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