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TAMPERE UNIVERSITY OF TECHNOLOGY

MIKKO IMMONEN

EFFECTS OF PHONE BOOTHS' COMPOSITION ON HEALTH AND DEVELOPMENT OF THE COMPOSITION DEFINITION PROCESS

Master of Science thesis

Examiner: Prof. Jouni Kivistö-Rahnasto
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ABSTRACT

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Open-plan offices have become popular in the recent decades and along with the popularity, noise has become a general problem in the offices around the world. Framery Oy, the case company of this thesis, manufactures phone booths that are being offered as a solution to the noise problem in open-plan offices. The case company has faced demands from the customers to have knowledge about what materials and substances the phone booths are composed of. To fulfill this demand the company has recognized that it needs Health Product Declaration (HPD) documents for their products. In practice these documents declare what materials and substances compose the phone booths.

This thesis studies what are the materials that compose the phone booths, how the composition determination process could be developed, do some of the materials cause hazards for the health of the end user and is there any alternatives for these hazardous materials. As a result the composition of the booths was recognized, a generalized process model was developed to help define the material composition of a product, two different possibly hazardous materials were recognized and few less hazardous alternatives were found for these two different materials.

TIIVISTELMÄ

MIKKO IMMONEN: Puhelinkoppien koostumuksien vaikutukset terveyteen ja koostumuksen määrittelyprosessin kehittäminen
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Avotoimistot ovat yleistyneet viime vuosikymmenien aikana ja yleistymisen myötä melusta on tullut ongelma toimistoissa yleisesti maailmalla. Tämän diplomityön kohdeyritys Framery Oy valmistaa puhelinkoppeja, joita tarjotaan ratkaisuksi meluongelmiin avotoimistoissa. Kohdeyritys on kohdannut asiakkailta vaatimuksia saada tietää mistä materiaaleista ja aineista kopit koostuvat. Tämän seurauksena yritys on tunnistanut, että täyttääkseen nämä vaatimukset, yrityksen tulisi koota tuotteilleen Health Product Declaration (HPD) dokumentit, jotka käytännössä kertovat mistä materiaaleista ja aineista kopit koostuvat.

Tässä työssä selvitetään mistä nämä puhelinkopit koostuvat, miten koostumuksen selvittämisprosessia voitaisiin kehittää, aiheuttavatko jotkin materiaalit kopeissa loppukäyttäjän terveydelle haittaa ja löytyykö haittaa aiheuttaville materiaaleille vaihtoehtoja. Tuloksena selvitettiin mikä on kopin koostumus, luotiin minkä tahansa tuotteen koostumuksen selvittämiselle yleispätevä prosessi malli, tunnistettiin kaksi materiaalia, joilla on mahdollisesti jotain terveydelle haitallisia vaikutuksia, ja löydettiin näille materiaaleille muutamia eri vaihtoehtoisia materiaaleja, jotka ovat vähemmän haitallisia terveydelle.

PREFACE

As my studies began in 2012 in Jyväskylä University, I didn't know what to expect and being the first one in my family studying in a university, I wasn't really sure what I would like to do after I graduated some day. After some exploring I finally found my self studying the things I love in Tampere University of Technology and now eventually graduating in the field of safety and environmental engineering.

Great appreciation goes to the examiner of this thesis Professor Jouni Kivistö-Rahnasto whose experienced guidance in the beginning of the thesis helped out a lot to make the process of writing this thesis a fluent process. I am also fortunate to have been given the possibility to do this thesis in Framery Oy, which has been the most extraordinary and amazing company I've ever been part of so far in my life. Thanks Ville for the tip of a possible thesis subject in Framery.

I want to thank all of the organizations, which I've been honoured to be part of during my studies: Flokki, Spinni, TCFA Unicorns and Autek and all of the friends that I've met during my studies – many of whom have become life long friends. On a broader scale I want to thank Kela for supporting me financially through out my studies and the Finnish education system for making it possible for me to get this degree, without paying any tuition fees. I am happy to pay my taxes after graduation.

Still my greatest appreciation goes to my parents and my brother whom have always supported me through out my life and especially my girlfriend Varpu who has been there supporting me through the ups and downs in my life and in my studies during the past three years. I wouldn't be here now if it wasn't for you.

Saddened by the fact, that my mother wasn't able to see me graduate since she passed away during my studies in 2014, I want to dedicate this thesis in her loving memory. Thank you mom for everything.

In Tampere, 17.9.2018

Mikko Immonen

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LIST OF ABBREVIATIONS

ASGB	Assessment Standard for Green Building
BEAM	Built Environmental Assessment Method
BOM	Bill of Materials
BRE	Building Research Establishment
BREEAM	Building Research Establishment Environmental Assessment Method
CAD	Computer Aided Design
CASBEE	Comprehensive Assessment System for Building Environmental Efficiency
CAS RN	Chemical Abstracts Service Registry Number
CML	Pharos Chemical and Material Library database
EPD	Environmental Product Declaration
EPRS	Estidama Pearl Rating System
ERP	Enterprise Resource Planning
GBI	Green Building Index
GSAS	Global Sustainability Assessment System
HBN	Healthy Building Network
HPD	Health Product Declaration
HPDC	Health Product Declaration Collaborative
IGBC	Indian Green Building Council
ILFI	International Living Future Institute
ISO	International Organization for Standardization
IWBI	International WELL Building Institute
LCA	Life Cycle Assessment
LEED v4	Leadership in Energy and Environmental Design Version 4
MHC	Material Health Certifications
PLC	Product Lens Certification
PMMA	Polymethyl methacrylate
PPM	Parts Per Million
PVC	Polyvinyl chloride
SME	Small or medium-sized enterprise
UL	Underwriters Laboratories
USGBC	United States Green Building Council
VOC	Volatile Organic Compound
WGBC	World Green Building Council

1. INTRODUCTION

Open-plan offices have become popular as an office type in the recent decades (Worthington 2005). This development has sprouted a lot of different problems for workers in the office environment and it has been a long known fact that noise is the most common cause for disturbance in the open-plan office environment (Banbury & Berry 1998). The case company of this thesis, Framery Oy, was founded to tackle this problem by manufacturing and selling sound isolated booths where people can go and make a phone call or have a short meeting.

Before the year 2010 there were basically no markets for sound isolated booths for open-plan offices, so Framery Oy began as a startup company and as the company has grown from a startup into an SME (small or medium-sized enterprise), it is anticipated that more and more expectations arise from the customers. (News Cision 2018) One expectation has been that the company should have knowledge about what materials or substances the company's produced products are composed of so the customer companies can make informed decisions when procuring the products.

Nowadays people responsible for procurement in companies or in any other organizations have a great responsibility for the health and safety issues concerning the products that are procured. This means that there is a need for a reliable way to make decisions in procurement so that the supplied products are for example safe and won't cause negative health issues. Many standards and regulations have been created to help manufacturers make a pledge, that the products they produce are safe to use and don't cause negative health issues. (Stark 2015, p.25; MEAE 2017, p.12)

So far for the case company this has meant that in order to achieve this pledge, at least to some extent in the countries in the European Union, the case company has declared that the products meet the requirements of relevant European Commission directives. With this declaration the company can give their products a CE marking. Also the company has given a very basic information package about the composition

of raw materials to some customers, that wanted to know more about the products composition. In addition, the case company has no specific or analyzed data about what is the composition of their products. Some of the major customers for the case company have recently began requesting composition information about the products and that is why the case company is now interested in gathering this information more accurately.

Many of the case company's major customers are situated in the United States of America and those customers value more the standards and regulations that are used widely in the United States. Case company's products can be classified as furniture and construction products. In United States, in the construction industry, Leadership in Energy and Environmental Design (LEED), created by the U.S. Green Building Council, is one of the most widely used green building certification programs (Curran 2012, p. 325). Because of the wide use of LEED in the United States, the case company is interested in fulfilling the certification requirements concerning the products the company produces.

In LEED certification buildings and building projects can get certification credit points from different categories of the certification. "Materials & Resources" - category is one where LEED credits credits can be gained by using products that have Health Product Declaration (HPD) documentation (USGBC 2017). Getting an HPD for the case company's products interests the case company because it gives a standardized platform to disclose what is the composition of the products they sell and also gives customers a possibility to use the products in their LEED projects. In order to achieve a compliant HPD the case company needs information and data about the material and substance composition of the products they produce.

From this the customers can analyze the HPD data and make purchasing decisions on for example the health hazards connected with different materials or substances used in the product (HPD 2018). For this reason it is also in the interest of the company to understand what is the material and subst composition of the products, so that the possible health hazardous materials and substances can be identified. Once the materials and substances have been identified, the case company needs information about what materials and substances could be used instead to make the product more safe for health and so more attractive for the customers. The case company also aims to develop the future product composition identification process more effective and easier. In conclusion this study aims to answer the following four

research questions:

1. What is the composition of the products?
2. What materials or substances in the products can cause harm for health?
3. What different materials or substances could be used instead to make the products less hazardous for health?
4. What can be done differently to make it easier for the manufacturer to disclose the materials and substances that compose a product?

With these research questions in mind the tasks and the sub-tasks for this thesis can be derived. The first task answers to question one with a simple set of lists where the composition of the product can be determined. Second question is answered with the task two by carrying out an analysis of the materials and substances in the product. Third question is answered with the third task by defining the properties required for the hazardous materials to serve their function in the product and then researching for materials with similar properties. Fourth question is answered with the task four by first determining what are the different ways to disclose the materials and substances easier and then discussing and determining which of these ways is the best for the case company. So the tasks and the sub-tasks can be listed as follows:

1. Determine the composition of the product.
    - 1.1 List the components of the product.
    - 1.2 List the materials of the components.
    - 1.3 List the substances of the materials.
2. Analysis of the products materials and substances effects on health.
3. Find more health beneficial options for the health hazardous materials and substances.
    - 3.1 Define the properties required for the hazardous material.
    - 3.2 Research more for more safe materials with similar required properties.

4. Find ways to make it easier for the manufacturer to compile products material and substance composition data.
    4.1 Determine different ways to make it easier to compile the material and substance composition data.
    4.2 Discuss and determine which is the best way to compile material and substance composition data.

As a conclusion the objective of this thesis is to find out what is the composition of the products the case company manufactures, find out the negative health effects of the products composition, what materials could be used instead to make the composition more safe for health and find out ways to make the composition definition process easier.

2. THEORETICAL BACKGROUND

Considering health, safety and environmental aspects of the products or services, that a company produces and procures, is often required by the customers as a part of ethical and sustainable entrepreneurship (Rahimi 1995). At least compulsory conformity with legislation forces companies to consider the health and safety aspects of the products the company produces and procures. Often it is hard for startups and SMEs to be in conformity with the changing legislation and even more problems arise when products are being exported to or imported from market areas where the regulations and legislation differ from the company's local market's regulations and legislation. Keeping up with different legislation requires a lot of resources from companies. (Vasara & Kivistö-Rahnasto 2017; Vasara & Kivistö-Rahnasto 2008) For these reasons there are many standards and certifications that aim to help manufacturers to make processes and products that would be compatible with regulations and legislation globally.

2.1 Green Building Certifications

The case company of this thesis faces the problems stated in the introduction of this chapter and tries to tackle the problems by gaining conformity with standards that aim to be global. As the company manufactures products that are mostly exported into different market areas to furnish offices, the company should aim to have its products to be compliant with global certifications that concern offices and buildings. Green building certifications attempt to provide a solution to this need by covering the sector of buildings' and offices' health, safety and environmental aspects. Green building certifications provide different possibilities to indicate more environmentally friendly, energy efficient, healthy and more productive buildings and building materials. (Wei et al. 2015; Vierra 2016) A building with a green building certificate brings more value to the building owner and thus there is an incentive for builders to be compliant with green building standards (Rochikashvili & Bongaerts

2018; DiNardo 2014). There are many different competing green building standards around the world and some aim to be global.

Globally a variety of different green building certifications have been developed in various market areas. World Green Building Council (WGBC), the head organization of green building certifications, recognizes more than 40 different rating systems world wide (Yong et al. 2012; WGBC 2018). Many of the standards are country specific and have been developed in the respective countries: Built Environmental Assessment Method (BEAM) developed in Hong Kong, Comprehensive Assessment System for Building Environmental Efficiency (CASBEE) developed in Japan, Green Star (GS) developed in Australia, Green Mark (GM) developed in Singapore, Assessment Standard for Green Building (ASGB) developed in China, Green Building Index (GBI) developed in Malaysia, Global Sustainability Assessment System (GSAS) developed in Qatar, Estidama Pearl Rating System (EPRS) developed in Abu Dhabi and Indian Green Building Council (IGBC) Rating system developed in India. (Table 2.1; Shan and Hwang 2018).

Table 2.1 *Different green building standards used globally and their year of origin (Shan & Hwang 2018).*

1990	Building Research Establishment Environmental Assessment Method (BREEAM)
1994	Leadership in Energy and Environmental Design (LEED)
1996	Built Environmental Assessment Method (BEAM)
2001	Comprehensive Assessment System for Building Environmental Efficiency (CASBEE)
2003	Green Star
2005	Green Mark
2006	Assessment Standard for Green Building (ASGB)
2009	Green Building Index (GBI), Global Sustainability Assessment System (GSAS)
2010	Estidama Pearl Rating System (EPRS)
2013	Indian Green Building Council (IGBC)

Most of these certifications were developed in the around the 2000s and haven't spread widely globally nor are aiming to spread globally. Many of these certifications are actually based on LEED (Leadership in Energy and Environmental Design) or BREEAM (Building Research Establishment Environmental Assessment Method) certifications, which aim to be global. (Aspinal et al. 2012; Shan & Hwang 2018)

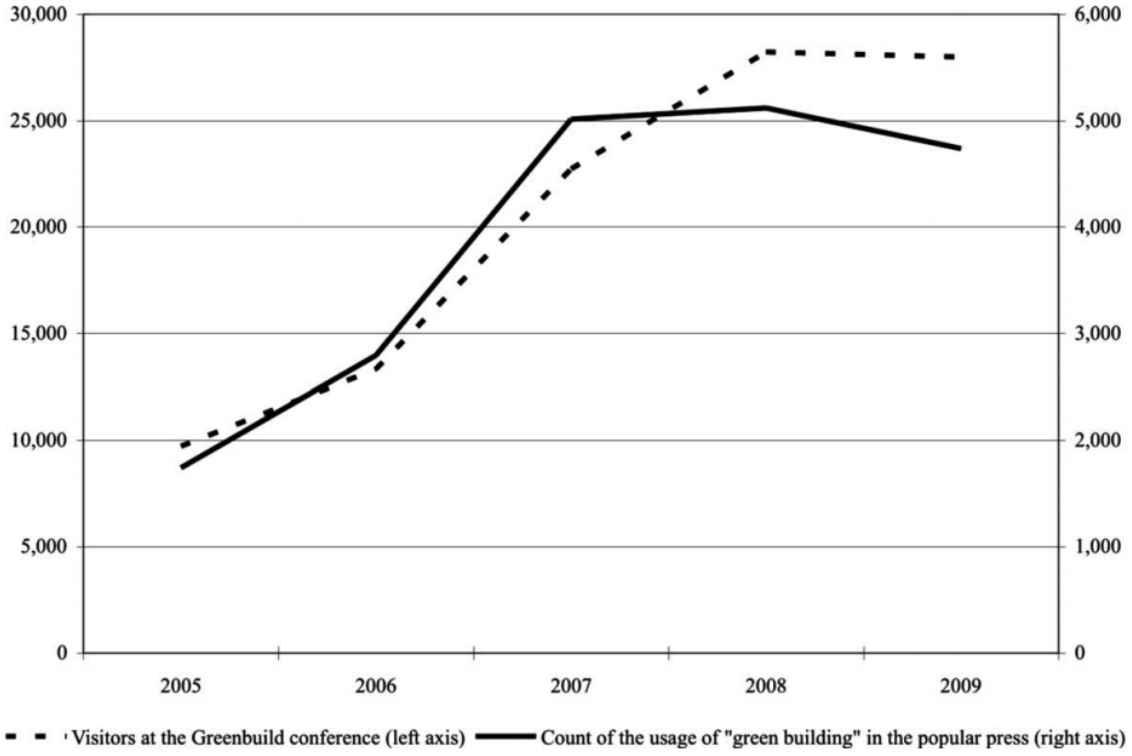

Figure 2.1 *Data indicating that Green Building certifications have solidified their position as de facto standard as a way to indicate sustainability of a building or building project (Eichholtz et al. 2013).*

Interest towards Green Building certifications has grown steadily after the first certifications were established in the 1990's and the growth has been steady until the 2010's (Figure 2.1). This indicates that Green Building certifications have solidified their position as certifications that a building or a building project should aim for in order to be sustainable. The popularity of Green Building certifications isn't hard to understand since studies have shown that they make the buildings overall more sustainable, energy efficient and profitable. (Eichholtz et al. 2013; Zhang et al. 2018)

2.1.1 Building Research Establishment Environmental Assessment Method (BREEAM)

The first ever green building certification is the Building Research Establishment Environmental Assessment Method (BREEAM), developed in the United Kingdom in 1990 by Building Research Establishment (BRE). First versions of BREEAM were only used in United Kingdom, but it has since launched internationally. (Aspinal

et al. 2012; Salomaa 2014) BREEAM is used to assess all kinds of buildings and the goal is to reduce buildings' environmental impact, ensure the best practices in the design, operation and management of the buildings and to increase awareness of the impacts of buildings' on the environment. (Say & Wood 2008) BREEAM has its strengths in methodology and accuracy and verification compared to the other global green building standard LEED. (Nguyen & Altan 2011)

Table 2.2 *BREEAM weightings and points (Sev 2011).*

Category	**Weightings %**	**Points available**
Management	12	10
Health and wellbeing	15	14
Energy	19	21
Transport	8	10
Water	6	6
Materials	12,5	12
Waste	7,5	7
Land use and ecology	10	10
Pollution	10	12
Innovation	10	10

BREEAM is divided into ten different categories where the assessed building can get points. Categories with the highest weighting are energy, health and wellbeing, materials and management. These categories cover nearly 60% of the certifications weighting. (Table 2.2; Sev 2011) Buildings are rated according to the points that they get from different categories and there are six different ratings a building can get, highest being Outstanding with over 85% of the maximum points and lowest being Unclassified with less than 30% of the maximum points. Getting a BREEAM rating begins with registration to BRE and then a BREEAM assessor reviews the project. The assessor creates an assessment report and then that report is reviewed by a member of the BREEAM team. Finally, if the building is applicable after the review, the certification is issued. (Say & Wood 2008)

2.1.2 Leadership in Energy and Environmental Design (LEED)

The most successfully globalized green building certification is Leadership in Energy and Environmental Design (LEED) rating system developed by the United States Green Building Council (USGBC) in 1994 and it has been since developed into its fourth version (Aspinal et al. 2012). According to Mark (2013) LEED has become the most dominant green building certification in recent years and in 2013 LEED had more buildings certified than BREEAM in every market area exept for United Kingdom. LEED is similar to BREEAM as it has different levels of compliance and points, or credits in LEED, can be gained by being in conformity with different requirements in different categories. (USGBC 2017)

Table 2.3 *LEED categories and credits (Alyami & Rezgui 2012).*

Category	**Credits available**
Sustainable sites	26
Water efficiency	10
Energy and atmosphere	35
Materials and resources	14
Indoor environmental quality	15
Innovation in design	6
Regional priority	4

LEED assesment process is nearly similar to BREEAM where it begins with registration and then submittal of the design and construction project by the applicant. Then the submissions are reviewed and credits are calculated for different categories and finally a rating is awarded. The most credits can be gained in the energy and atmosphere category. (Table 2.3, Alyami & Rezgui 2012) In some categories of LEED there are many different ways to gain credits. In the Materials and Resources category one way to get credits is by using products or materials that have a Health Product Declaration (HPD) in the building being assessed (HPD 2018).

2.2 Health Product Declaration (HPD) Open Standard

One way for a manufacturer to tell how the product isn't causing health hazards is to research what materials and substances compose the product and give this

information for the customer to analyze. HPD Open Standard, the standard studied in this thesis, is a voluntary stakeholder consensus standard created by the Health Product Declaration Collaborative (HPDC) and it is used to declare the material composition and specifications of a product. HPD gives a standardized way for the manufacturer to tell to the customer what kind of materials and substances construct their product and what are the associated health hazards that concern the constructive materials and substances. Another incentive for the customer to require an HPD for a product might be that the customer is aiming to be compliant with a Green Building certificate. The reason for this incentive can be seen in the flow chart shown in figure 2.2. HPD aims to be the leading industry standard for reporting building product content and associated health information. HPD has had three different versions, as of June 2018, which are the version 1.0, 2.0 and the latest version 2.1. (HPD 2018)

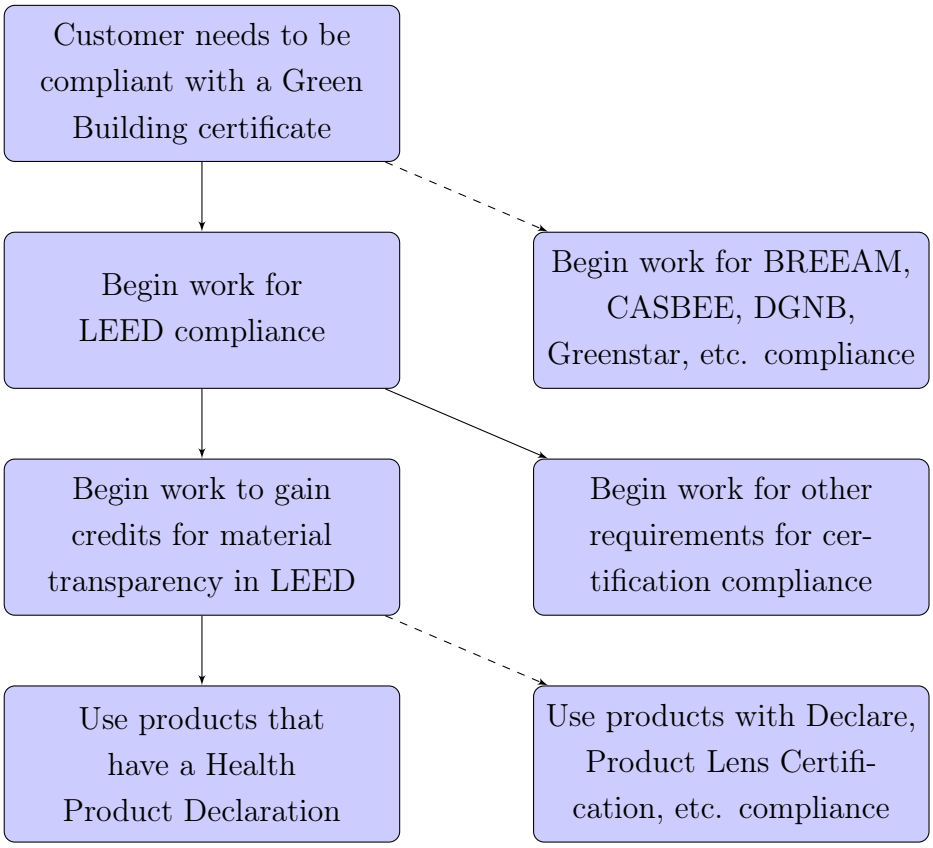

Figure 2.2 *Flow chart explaining the need for getting an HPD for a product*

The case company of this thesis has detected that the company needs HPDs for their products to meet the requirements of the needs of multiple customers. Case

company's products are high-quality and expensive compared to other similar products in the office furniture market (Framery 2016a). According to Janssen and Roy (2015) in this type of market situation, the company with high-quality products can have a competitive advantage against low-quality rivals by disclosing the quality of the products they produce. Disclosing the composition of the product reflects the quality of the product and so the information about the product's composition can also strengthen the market position of the case company. Information about the composition will also create some knowledge about the environmental impacts of the product and so disclosing this information will help even further strengthen the market position (Fagotto & Graham 2007, p. 78).

2.2.1 History of and reasons for creating the Health Product Declaration Open Standard

HPDC, the creator organization of the HPD, was formed out of the Health Product Declaration Working Group which was created by the Materials Research Collaborative at the University of Houston College of Architecture and Design. The need for an HPD originally came from two trends: Firstly builders and building material and product procurers wanted to make sure that they could select and manufacture materials and products, that weren't having harmful impact on human health and the environment. Secondly building product manufacturers wanted to provide information about their products and in the industry there has been a need for an efficient and effective tool, for providing this information. Thus the Health Product Declaration Open standard was created and the first version of the HPD was introduced in november 2012. The first version was quite compact but during the years HPD has developed into the current 37 page long 2.1 version which was released in may of 2017. (HPD 2018)

2.2.2 Content

HPD consists of an introduction and six different sections. Introduction gives basic information about the product: Product's commercial name, manufacturer's name, a short description of the product and a MasterFormat classification, which is is a six digit number code and category name that is given to the product disclosed in the HPD. (HPDC 2017) MasterFormat classification is a standard, created by the

Construction Specifications Institute and Construction Specifications Canada, that aims to unify the classification of construction products (CSI 2017).

First section of the standard gives information about the content inventory, what is the threshold level of the HPD and whether the residuals and impurities in the product have been considered, characterized, screened and identified. Threshold level indicates the accuracy of the HPD and discloses how accurately the materials and substances are disclosed. Section one also gives a short summary of the contents and results of the standard and lists the certifications and compliances that are disclosed in the section three. (HPDC 2017)

Product's content information is given the second section of the standard. The content inventory is given in descending order of quantity by weight and in either nested material or basic format. Nested material format shows first the material and then lists the substances that compose the material with their Chemical Abstracts Service (CAS) registry number. Basic format only lists product's substances with their CAS number and doesn't take separate materials into account. HPD doesn't define or imply the way the data for the materials and substances should be gathered for the second section. (HPDC 2017)

Third section of the standard lists all the Volatile Organic Compound (VOC) emission, VOC content, health and environmental certification and standard compliances that are associated with the product. Fourth section is about accessories and it lists all the products or materials that are required by the manufacturer to install, maintain, clean or operate the product. Fifth section gives general information about the product and can contain for example information about other possible MasterFormat classifications or other certifications that are associated with the product. Lastly the section six gives contact information about the manufacturer of the product and creator of the HPD. (HPDC 2017)

2.2.3 HPD Builder and screening of the health hazards associated with the materials and substances

HPDC has created a tool, the HPD Builder, for manufacturers to help create compliant HPDs. The HPD Builder is a web-based paid software where manufacturers can compile all the information needed for a compliant HPD and it automates the

required document formatting and the screening of health hazards. When composing an HPD with nested materials content inventory, HPD Builder defines materials as objects that are composed of different substances, so to add any substance to HPD Builder one needs to add a material first so that substance data can be added under the material data. In HPD Builder some of the health hazards caused by VOCs are indicated by the required VOC emission tests, but automated screening of health hazards is done with the CAS registry numbers. In a complete HPD the CAS numbers are given for every material or substance in the product and all of the CAS numbers are matched to a certain material or substance in the Pharos Chemical and Material Library (CML) database. (HPDC 2018)

CML contains over 85 000 chemicals, polymers, metals, wood species and other substances and CML has those materials and substances analyzed against human health concerns. (Pharos 2018) After the material and substance data of the product has been imported into the HPD Builder, the HPD builder produces a list of the health hazards associated with materials and substances of the product based on the CML data. CML database and the analyses it holds are a result of the Pharos Project created by the Healthy Building Network (HBN), which is a non-governmental organization that publishes and researches sustainability information about different building materials. (HBN 2018; Friar & Vittori 2015)

2.2.4 Strenghts and weaknesses

Product that has an HPD gives a possibility for the customer to further analyze the product. This indicates that compiling an HPD for a product gives an advantage for the manufacturer against competition when the manufacturer can be transparent on what materials and substances go into their products. As mentioned in the section 2.1.2 and shown in the figure 2.2, creating an HPD for a product makes the product desirable to be used in building projects that aim to get credits in the LEED rating system. HPD works as an acceptable documentation for credits in the Materials and Resources section of LEED. (HPD 2018) In addition the HPD can be utilized in the WELL Building Standard, which is a standard that focuses on human health and wellness in the built environment, instead of focusing mainly on environment like in LEED. WELL Building Standard is created and managed by the IWBI (International WELL Building Institute) and it measures the wellbeing and healthiness of the building occupant with seven different caregories – Air, Water, Light, Nourishment, Fitness, Comfort and Mind. (Morton 2015; Loria 2015)

There are also some problems and disadvantages that arise when compiling and publishing an HPD. Full transparency can be harmful for companies with valuable intellectual property information and for this reason some companies might be reluctant to disclose what their products contain. A balance for transparency and intellectual property information disclosure is possible to achieve with strict non-disclosure agreements. Also another fault lies in the HPDs materials and substances health effects analysis – It only indicates the health hazards associated with the materials and substances instead of giving a health risk based on reality. In order to give a realistic result on the health effects, the materials and substances have on human, the risk is required to be understood. In order to understand what is the risk, it is required to understand what is the exposure to the material or substance. In order to understand the exposure it is required to understand how, where, how much and how long does the material or substance cause health effects on humans.

So the HPD Builder doesn't take into account the fact that some materials, possibly harmful for health, aren't effectively harmful in the product. This results in potentially misleading information. For example some materials that can cause skin irritation, when in contact with skin, can be hidden inside the product so that it cannot be in contact with skin of the end user and still the material is considered in the HPD with its health hazards. This creates problems with automating the HPD creation process, as it is difficult to automate a process where these kind of situations could be overlooked. (Otto & Ahuja 2013)

As was mentioned in the previous subsection 2.2.2, HPD doesn't specify the ways the products material and substance composition data should be gathered and compiled. This gives the product manufacturer a possibility to freely decide how the products composition data will be gathered. This freedom is beneficial for many companies since the data collection can be done the way best suitable for the company conducting the data collection. There are also downsides to this freedom since it doesn't give a specific standardized way to gather the data and so the data collection can be done in various different ways. This creates the possibility of gathering faulty data extensively and so the accuracy of different HPD's can vary a lot.

2.3 Other material and substance disclosure certifications and labels

HPD isn't the only product disclosure standard and in fact there are many different competing disclosure certifications and labels around the world. Some manufacturer's are pursuing to get many disclosure certifications and labels for their products, because many of the standards overlap in the required information. (Ragusa 2018; PR.Newswire 2017) In addition to HPD there is also the Environmental Product Declaration (EPD), Declare label, Product Lens Certification (PLC) and Cradle to Cradle Material Health Certification, just to name a few of the most used disclosure certifications and labels around the world. Some of these are global and part of larger certifications, similar to LEED or BREEAM, and some are independent. As will be disclosed in this chapter, different labels and certifications are useful for companies since they are documents useful for gaining points and credits in different green building standards. In addition customers see value in products that have transparency labels. (Rochikashvili & Bongaerts 2018)

2.3.1 Environmental Product Declaration (EPD)

Like HPDs, Environmental Product Declarations (EPD) are a tool to disclose products composition. As the name suggests, EPDs have an emphasis on the environmental, sustainability and life cycle aspects of the product. First independent ideas for creating an EPD were developed independently and separately in Sweden and in the United States of America and so in the beginning there weren't any head organizations for deciding what is an EPD. As the EPDs developed in Sweden and in the United States weren't in conformity with each other, International Organization for Standardization (ISO) standards under the ISO 14020 were developed to clarify what is an EPD. With ISO standards multiple consultant auditions have become possible and so the credibility of EPDs has improved. By definition EPDs provide quantified environmental information, which is verified independently through the declared product's life cycle. (Gelowitz & McArthur 2016; ISO 14040: 2006)

As with an HPD, also a product with an EPD can get credits in LEED in the category of "Building Material Disclosure and Optimization – Environmental Product Declarations". This means that products with EPDs are also beneficial to be used in green building projects. (DiNardo 2014) Positive effects on environmental aspects

are expedited even more when multiple similar products have EPDs can be compared, as the product with better environmental attributes is more likely chosen. Different products with EPDs are comparable if they fall into same category in the product category rules, which are defined in a separate ISO standard. (Gelowitz & McArthur 2016)

2.3.2 Declare label

The Declare label has been created by the International Living Future Institute (ILFI) in Australia to declare product's composition and life cycle information. ILFI is a nonprofit institute that aims to build a green framework for living in today's world and does that with different programs. In addition Declare label ILFI has a Reveal label, that makes buildings energy usage transparent and a Just label, that aims to better the social equity in the workplace. ILFI also runs the Living Building Challenge green building standard, which is aiming to be one of the most strict green building standards. (ILFI 2018b)

A product can have a Declare label when these three questions have been answered: Where does a product come from? What is it made of? Where does it go at the end of its life? As an answer to these questions an actual label, shown in the figure 2.3 seen in the next page, can be provided with the product. (ILFI 2018a) Compared to the HPD the Declare label takes into account the products life cycle in addition to declaring the products composition, but it doesn't have as specific information about the materials and substances that compose the product. In addition the Declare label doesn't require volatile organic compound (VOC) emissions testing. Similarly to HPD, LEED v4 credits can be gained in the Materials and Resources category with a Declare label. (ILFI 2018b)

Figure 2.3 *Declare label template and information about how and what transparency data is represented in a Declare label (ILFI 2018a).*

2.3.3 Cradle to Cradle Material Health Certification

Cradle to Cradle Products Innovation Institute, a non-profit organization founded by William McDonough and Dr. Michael Braungart in 2010, has created the Cradle to Cradle Material Health Certification (MHC) to provide a tool for manufacturers to communicate the chemical composition of the products they manufacture to the customers. MHC is part of a Cradle to Cradle Certified Product Standard, which is a standard that takes into account products' material health and reutilization, energy and water consumption and social fairness. (C2C 2018b; C2C 2018a) In practice this means that a product to be compliant in MHC the product needs to be compliant with the requirements of VOC emissions testing and MHC specified banned materials list, there has to be developed a strategy to optimize material health and there can't be any exposure to known carcinogens, mutagens or reproductive toxicants. Also

the product and process chemicals need to be identified and assessed in the way specified in the MHC. (C2C 2018b)

A product can have four different levels of compliance in MHC: Bronze, Silver, Gold and Platinum. The Bronze level is the basis and as the levels get higher, compliance with different requirements for the product gets stricter. Difference with HPD is that to gain even the Bronze level in the MHC the product cannot contain any specific chemicals listed in MHC, where as HPD doesn't require any compliance with similar lists. Also compared to the HPD the MHC needs to be assessed by a third party and cannot be self-declared like HPD. The process of getting an MHC begins with selecting an accredited assessment body and together with that assessor the supply chain and product is researched. With this data the assessor will evaluate health and environmental impacts of the product and determine whether the product can be certified with an MHC. (C2C 2018b)

2.3.4 Product Lens Certification (PLC)

US based global safety consulting and certification company UL (Underwriters Laboratories) has created many different types of standards and certifications for many different industries. UL has also created a product life cycle ingredient disclosure tool, that competes with HPD, called Product Lens Certification (PLC). UL created the PLC with life cycle analysis company MBDC and Cradle to Cradle Product Innovation Institute, also mentioned in the previous subsection, to meet the demands of LEED. The PLC analyzes the product through four different phases of the products life cycle and concentrates on the human exposure of different chemicals. The materials that compose the product are ranked according to a five step system specified in the PLC. (UL 2018) The amount of information and data about PLC is quite scarce since PLC is one of the most recent transparency standards and it also has just been recognized to be compliant for LEED v4 credits in march of 2017. (UL 2017)

2.4 Life Cycle Assessments

Measuring the environmental effects of the whole life cycle of a building is an important part of understanding what kind of impact the buildings and the building

materials are having on the environment on the global scale. Green building certifications are a way to reduce building's effects on the environment and Life Cycle Assessments (LCA) are a way to measure how well a green building certificate reduces the negative environmental effects of a building. (Rashid & Yusoff 2015; Lessard et al. 2017; ISO 14040: 2006) ISO 14044 and ISO 14040 standards give a standardized framework on how to conduct an LCA for all kinds of products including buildings. Summary of the LCA framework can be seen in figure 2.4. LCAs measure what materials are used to manufacture a product, how much the manufacturing uses energy, how much the product it self uses energy during the life cycle of the product and lastly how the product is handled as waste and how much the waste disposal process uses energy (ISO 14044: 2006; Vigovskaya et al. 2018).

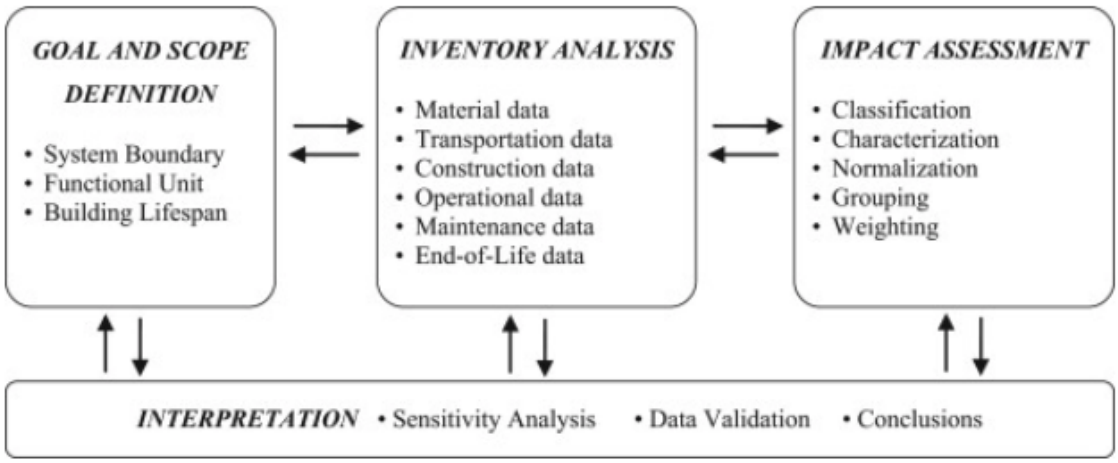

Figure 2.4 *LCA framework and the stages of an LCA created for the building industry (Rashid & Yusoff 2015)*

LCA begins with the process of defining the goals and scope of the LCA. After defining the goals and scope, an inventory analysis is required to be made. In inventory analysis various different types of data is required to be gathered about the product such as material and energy input data. Inventory analysis process can be seen in the figure 2.5. Inventory analysis can often be the most work intensive phase in an LCA conducted on a building since a building consists of many different physical components. LCA ends in an impact assessment where all of the data gathered in the inventory analysis phase is analyzed. (ISO 14044: 2006)

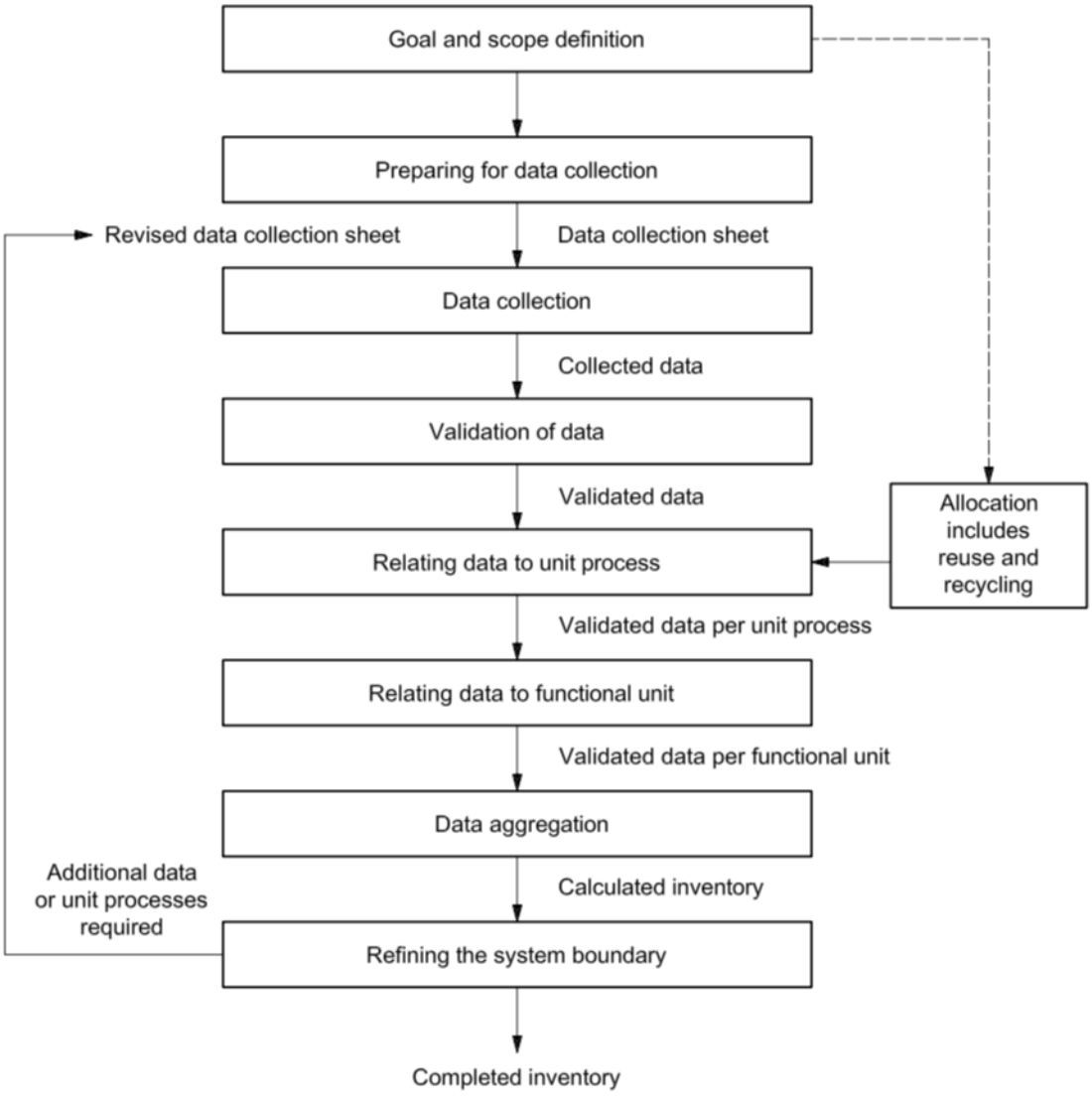

Figure 2.5 *Inventory analysis process in LCA (ISO 14044: 2006)*

HPD and the certifications and labels mentioned in the section 2.3 are useful for the inventory analysis since the data gathered for those certifications and labels is similar to the data required in the material data section in the inventory analysis. Especially the ISO specified EPDs are useful since the EPDs are connected to the LCA by definition. (ISO 14040: 2006) This indicates that getting an HPD or possibly some of the certifications or labels mentioned in the section 2.3 for a building product is useful if a customer of that building product is thinking about getting an LCA for their building or office.

2.5 Supply chains and international procurement

Companies manufacturing physical products often procure the different parts and raw materials for the components that compose the products from different suppliers, unless they produce the raw materials fully themselves. As for the suppliers, they need to procure their parts or raw materials from their suppliers and thus a supply chain is developed. (Thomas and Griffin 1996; Figure 2.6) These supply chains can be long and complex. Managing these supply chains is a challenging task not only for their complexity but also since various different risks are associated to the management of the whole supply chain (Tang 2006; Sodhi et al. 2012). Problems with information flow through the supply chain are inevitable and material information isn't an exception (Bai et al. 2012; Olsen & Aschan 2010). This creates challenges as information through the supply chain might not be reliable.

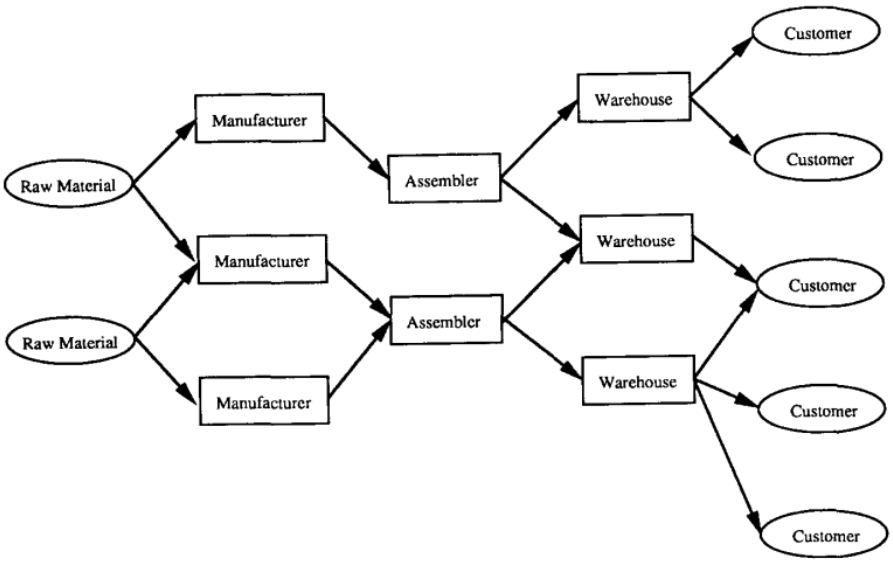

Figure 2.6 *Supply chains (Thomas & Griffin 1996)*

Globalization and free trade have made it to possible expand the procurement of components and raw materials around the world. This is done to have deliveries on time, to improve the quality of the products, lower the prices of the products and to gain availability of larger variety of components than domestic markets can offer. (Rajagopal & Bernard 1994) As was mentioned earlier, challenges will occur as the procurement and supply chains are extended across the world. These problems will get harder to solve as the supply chain scale goes global. In order to avoid some

of these challenges, local suppliers should be chosen over international suppliers, if competent local suppliers are available. (Ernst & Kim 2002) Choosing local suppliers is also more sustainable as the logistical chain becomes shorter.

3. STUDY SUBJECT AND EXECUTION

3.1 Framery Oy as a company

As open-plan offices have become popular in the recent decades, the disadvantages that are typical for open-plan offices have become problems. Many studies have been conducted on the open-plan office type and there is clear evidence that open-plan offices can cause concentration problems as there is often harmful noise in the open-plan office environment. (Worthington 2005; Bodin Danielsson & Bodin 2009) Many different solutions are being offered to help tackle these problems and one has been to give the office workers a possibility to do short phone calls or short meetings in a sound isolated booth. Using these booths make the workers gain more positive experiences during the work day and also make the workers more productive. (Haapakangas et al. 2018)

Table 3.1 *Brief quantitative history of Framery Oy (Appendix A).*

Year:	2014	2015	2016	2017
Turnover around:	1 262 000 €	5 065 000 €	17 619 000 €	40 000 000 €
Sales:	166 O booths Other sold models this year: Visia, Pax, Framery C and D	892 O booths	2400 O booths 400 Q booths	4292 O booths 1465 Q booths
Staff:	9	17	78	175

Framery Oy, the case company of this thesis, is a company that produces these sound isolated booths, also called phone booths or office pods, for open-plan offices. Framery was founded in 2010 when the founders realized that they needed a quiet

space for their office (Appendix D). Table 3.1 and appendix D reveal how the company's product spectrum has been wide in the past. As of June 2018 the company offers two main products with some product variations depending on what the customer needs. Framery O, the more popular model out of the two, is a booth that can seat one person. The other product available is the model Framery Q, which is designed to seat maximum of four people. (News Cision 2018)

Framery has grown rapidly after it was formed in 2010 and as of June 2018 it has grown from a small startup into a medium sized company with about 200 employees and turnover of about 40 million euros in just six years. As the growth continues, it is expected that the company will become a large enterprise with turnover more than 200 million euros within few years. (Table 3.1; Appendix D; News Cision 2018) Transformation from a startup to a large enterprise changes many expectations and requirements that the customers demand from the company. This change requires actions from the company and that is also a reason for the company to acquire information about the products that concern different standards and so also to investigate what materials and substances the product is composed of. (Fisher et al. 2016)

Framery has achieved its rapid growth with vast global sales. Local markets for Framery's products are quite small and the largest markets are where the biggest office clusters are located – In the big cities in Europe and in North America. Sales in the North America have been growing so much that Framery has expanded into United States of America with a logistics center. As the sales have grown in North America, the reasons for being in conformity with North American standards has been more often requested and this is the reason for the company to pursue getting an HPD for their products. (Appendix D)

Classifying Framery's products is hard. They can be considered to be furniture as they furnish offices and are movable, but on the other hand they are small rooms where you inhale the air inside the product, which makes the products in a way a part of the construction. Also the products use electricity and as they are plugged in they have lighting, mechanical ventilation and they provide electricity for devices through electrical sockets. Because of these different features there are multiple different standards and regulatory rules that the booths have to comply with.

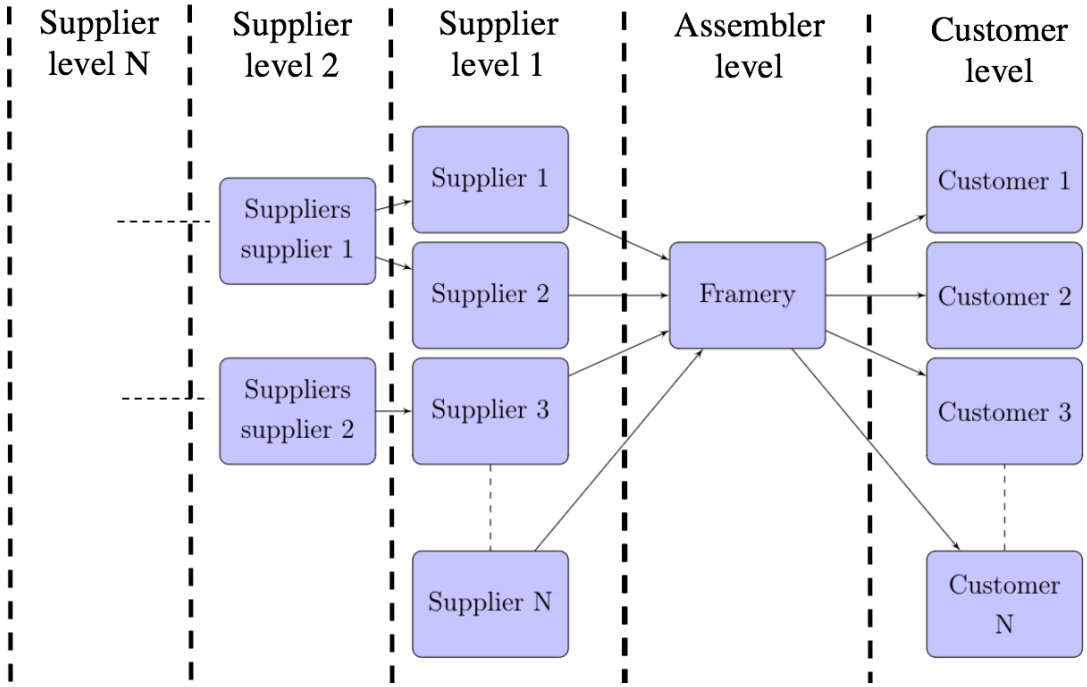

Figure 3.1 *Framery's supply chain simplified*

All of the materials and substances that compose the components which make the products that Framery sells are procured from different suppliers. Framery only assembles the modules, that are used to put the product it self together, from the supplier provided components. Framery's supply chain can vary a lot depending on the component. For some components the supply chain may be very long and some suppliers manufacture the components directly from raw materials. A simplification of Framery's supply chain can be seen in the figure 3.1.

After the different modules have been assembled, the modules that make the product are packed and shipped to the various different customers. Framery has many dealers around the world and that has made it possible for Framery to sell their products across the globe to a vast customer base. Even though the sales are across the globe, the products are manufactured at and also shipped from, the company's factory in Tampere Finland.

3.1.1 Framery O

In 2014 the case company decided to concentrate on the best product so far, the model O, that was developed from the feedback and experiences of different customer companies. After the decision the company abandoned the development of the previous models and continued on to develop the model O. (Appendix D) The model O is a single person phone booth that provides a space where the booth occupant can make a phone call or work for a while in a sound isolated environment. Depending on the work task at hand, one Framery O can help about 1-15 employees but as a general rule Framery recommends that one Framery O should be enough for the use of 10 people (Framery 2018).

Figure 3.2 *Framery phone booth standard model O (Appendix B).*

There are two different variations of the model O, standard model that has a stool and a table with electrical socket to charge devices, shown in the figure 3.2, and a quick call model that has only a table with electrical socket to charge devices (Appendix B). The model in the figure 3.2 is also the standard model with the standard colour scheme and standard electrical sockets as it is the most sold variation (Appendix F). This thesis uses the standard model as the basis of study. The shipped the model O package consists of six different modules, interiors, metallic body covers and various different small hardware that are used to the assemble of

the phone booth (Figure 3.3). As was mentioned previously in the section 3.1 the different modules, ceiling, floor and wall modules are manufactured from supplied components in the Tampere factory and the rest are supplied as complete directly to the factory. The phone booth package is shipped in a plywood box with assembly instructions. Customer can do the booth assembly itself or order an assembly for the booth.

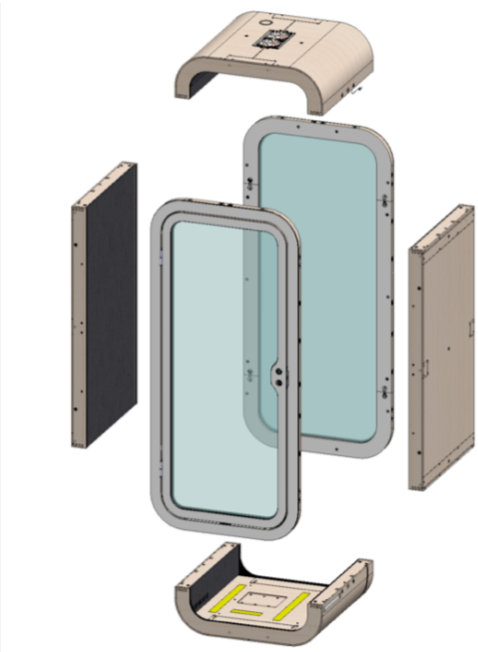

Figure 3.3 *Exploded view of the model O without furniture, carpet or metal covers.*

3.1.2 Framery Q

The need for a multiple person phone booth and a space for short meetings for two to four people was realized from customer feedback (Toivola 2017). Thus a booth that seats maximum of four people, the model Q, was created and official launch of the model Q was in June of 2016 (Framery 2016b). Depending on the work environment where the booth is placed, one Framery Q can help about 1-15 employees but as a general rule Framery recommends that one Framery Q should be enough for the use of 15 employees (Framery 2018).

The model Q has multiple different interior variants, depending on customer needs. There are interior possibilities for example for a meeting situation or working alone. Possible interiors are called Meeting Maggie, Working with PAL 90 or 110, Betty's

Café, MeTime and NapQ. These different variants can be seen in the appendix C. The model variant Meeting Maggie shown in the figure 3.4 is also the standard model with the standard colour scheme and standard electrical sockets as it is the most sold version of Q (Appendix F).

Figure 3.4 *Framery phone booth model Q with Meeting Maggie interior. (Appendix C).*

The shipped model Q consists of two roof modules, two wall modules, two floor modules, door and glass wall modules, interiors, metallic body covers and small hardware that are added during the assembly of the phone booth (Shown in the next page in the figure 3.5). Just as in model O, all of the modules are assembled from supplied components in the Tampere factory and the furniture's for the different models come fully assembled to the factory also. The model Q is shipped with assembly instructions in a plywood box and the customer assembles the phone booth or orders an assembly for the product. Furniture for the different variants is shipped separately.

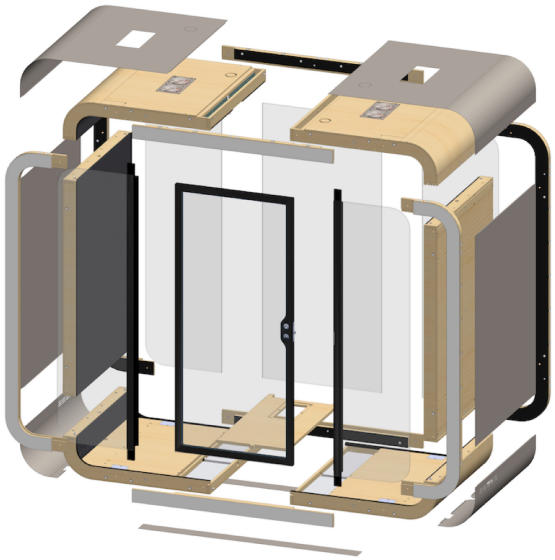

Figure 3.5 *Exploded view of the model Q without furniture, table and carpet.*

3.2 Determining the composition of the product

Composition determination process began by analyzing the Bill of Materials (BOM) documents provided by the company for the both products. BOM is a document that lists all of the components that compose a product and it is for example usually used by the procurement of a company. Framery BOMs have been created according to the Computer Aided Design (CAD) models of the products. Model O and Q BOMs made it possible to list every component contained in the different modules of the products. All the components listed in the BOM have information that can be linked into Framery's Enterprise Resource Planning (ERP) system where the contact information about every supplier of every component is available. This made it possible to contact the different suppliers about the material and substance composition of the components they produced for Framery.

The product composition determination process continued by listing all the similar materials, after the suppliers had given information about the components they produced for Framery. Some materials that weren't found in the BOM, for example wood glue used in the factory to glue wooden components together, were usually found in ERP under the model information. As mentioned Framery BOMs have been made from the CAD models and this is why some materials like wet applied glues aren't usually included in the BOM. The data for these types of materials was required to be gathered in a different way and the data usually could be found by

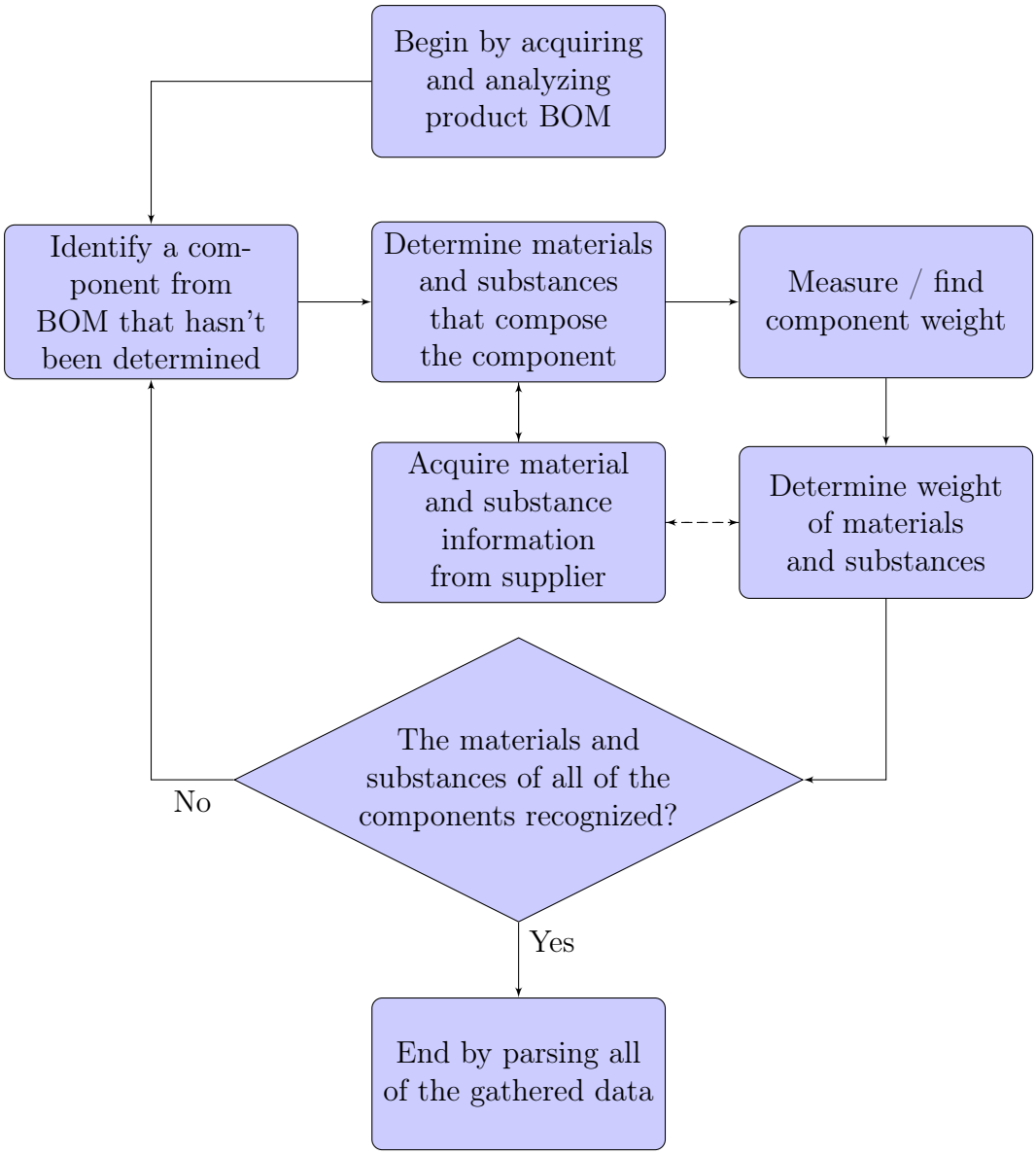

Figure 3.6 *Product composition determination flow chart*

conducting a research on how much different materials are being used. After this the process continued by measuring the weight of all of the different components. With the information gathered from suppliers, it was possible to determine what were the weights of the different materials and substances. Lastly, after the weight of all of the materials and substances had been recognized, all of the gathered data had to be parsed. This whole product composition determination process is shown in the flow chart presented in the figure 3.6. HPD Builder was used to create the HPDs and so all of the parsed data was then imported to the HPD Builder.

3.2.1 Listing the components of the product

To list the components of the product both models were first divided into the modules, shown in the figures 3.3 and 3.5, that compose the products. From the BOM data it was possible to deduce what components composed the different modules. The HPD requires to have content information determined by weight, as mentioned in the subsection 2.2.2, and so every component had to be weighted. Most of the components were available to be weighted in the Tampere factory in the different module assembly locations. Scale used to weight different components was a OHAUS manufactured Ranger 3000 scale, which could weight the components with an accuracy of one gram. The scale accuracy was enough for the purpose of this study.

The threshold chosen for the HPD was 100 parts per million (PPM), which means that every material that is present in the product for more than 0,01 % by weight needed to be disclosed. In practice this meant that the separate materials and substances that weighted less than 30 grams in Framery O and less than 60 grams in Framery Q wasn't required to be disclosed. As mentioned some components, for example lighting and electronics, are already assembled from different sub-components when the components arrive to the factory. With these components it was required to either ask the supplier for the sub-component material, substance and weight information or disassemble the components into the sub-components and to weight those sub-components separately.

3.2.2 Listing the materials of the components

With the BOM data it was possible to link every component to a different supplier and so every supplier was contacted through the ERP contact details to gain information about the material composition of the component that the supplier manufactures for Framery. For some components the material information was already available at the supplier company's website or the material was defined in the technical drawings of the components. The material information was inquired in a format where all of the materials were able to be connected to a CAS registry number or to a CML database recognized material. After all of the required material data had been gathered it was possible to import the material data to the HPD Builder so that the substance data could be added under the material data.

3.2.3 Listing the substances of the materials

Some of the materials are composed of a single substance but some, for example plywood, are composed of many different substances and with these type of materials a weight distribution of different substances in a material was inquired from the material supplier. In combination with the component weight data and the substance weight distribution data it was possible to calculate the different amounts of specific substances. This made it possible to add the substance information under the different materials in the HPD Builder. Some materials that have a varying composition, like biological matter or metal alloys, or are difficult to define in substance level, like housed printed circuit boards, don't need specific substance sorting or CAS numbering in HPD. These materials are defined separately in the HPD open standard and the CML database already recognizes these materials and their effects on health. In some cases CML database has specific rules on how to disclose these materials.

3.3 Analysis of the products' materials and substances effects on health

The analysis of the products' materials and substances effects on health can be done in various ways. One way is to check whether the materials and substances are part of a list where the materials and substances effects on health have been analyzed and then use the information provided in that list in an analysis. Some lists are made specifically for a standard or a label, for example "The Red List" has been made by ILFI for the Declare label (ILFI 2018a). Some, like the Pharos CML database, have been developed separately to any standard. HPD builder uses the Pharos CML database data to analyze the materials and substances effects on health and so in this thesis the health effects analysis is done with the HPD Builder and it is based on the Pharos CML database.

As was mentioned in the section 2.2.4, HPD has some faults in the philosophy behind what is harmful on health and what is not since it only gives the health hazards associated with the materials and substances as a result. Since it is hard to automate the process of determining the actual risk associated with a specific material or substance, some materials and substances need to be further analyzed by determining what is the exposure to those materials and substances. If there's

clear indication to whether the material or substance studied cannot possibly cause specific health hazards, for example because the material or substance is hidden inside the product, the hazards of those specific materials or substances in that specific area are not considered.

In this thesis the focus is on the health and safety of the booth's end user. The health effects during the manufacturing of the products and the processes after the products become waste aren't considered. It is expected that the user uses the product for a relatively short periods of time and the exposure to the product and its impacts are considered only from the time the product is used. Usual usage of the booth is expected to be short phone calls, few hours of working with a laptop inside and having meetings that last maximum of few hours.

3.4 Search for more health beneficial options

Since there is a possibility that there are no significant health hazards found, every material or substance that may even have some possible hazardous effects on health are taken into account and analyzed. After the analysis the search for alternative materials and substances with less harmful effects on health is conducted. The search is conducted studying alternative materials and substances with similar properties. Those materials and substances are also analyzed and so as a result the study finds alternative materials and substances with possibly less hazardous effects on health and have otherwise similar properties.

3.4.1 Defining the required properties of the hazardous materials and substances

After the hazardous materials and substances have been identified, it is required to define what properties the different hazardous materials and substances have. There are numerous different properties that a material or a substance can have and in this thesis the properties are defined by what is required from the hazardous material or substance in the product. Good acoustical properties are often required, since the products are made merely for acoustical purposes. Also, as the products are design elements in the office, it is required that the visible materials need to function visually. Distinct required properties are often required from various technical

materials, such as glues and structural or clear materials, which are required to work as intended despite the other properties the material might have.

It is also required to take all of the senses into account when defining the required properties. For example scent and material texture properties are also needed to be considered for some materials. The feeling or scent of a material can have high value since the product is used physically by touching it and being near it. When utilizing the product it is required for the user to go inside the product and inhale the air inside the product. It is hard to define how much value these properties can have and some users might for example prefer some scent over another. At least a feeling or a scent, that most feel like is unpleasant, should be avoided. It is also hard to define the required properties with some specific ruling for every material and substance. This is why the different required properties were defined separately for each different studied hazardous material and substance.

3.4.2 Optional materials for the hazardous materials

Different optional materials were searched for after it was defined what different properties were required from the optional materials. One property that isn't defined as a required quality is the monetary value of a material but when comparing optional materials also the costs are taken into consideration. The search for the possible alternative materials was conducted by discussing for different possibilities with the product designers and searching for substitute materials from the internet. The following questions were discussed with the product designers about every possibly hazardous material that required discussion on what alternative materials there could be:

- What are the reasons why (material name here) has been used in the product?
- What properties are required for that material?
- Is there any alternatives or has there been any discussion on alternatives for that material?

After the discussions and the search of substitute materials, the new possible materials were listed and briefly analyzed. The brief analysis was done by comparing the

health hazards of the new alternative materials to the health hazards of the materials used in the products at the moment. After the analysis the worst candidates were excluded and the best possible candidates for substitute materials were chosen from the list of analyzed alternative materials.

3.5 Compiling products material and substance composition data

As it was stated in the subsection 2.2.2, HPD doesn't specify the ways the products material and substance composition data should be gathered and compiled and so this makes it possible also for the case company to decide freely on how to collect the required material and substance composition data. Also it isn't defined how the weight data of the composition should be gathered and this gives also freedom for the manufacturer to decide how to gather the weight data. This section addresses these different possible ways for the case company to gather the composition data for future products and determines the ones best for the case company.

3.5.1 Different ways to gather material and substance data

It was noticed during the material composition determination process that the easiest and fastest way to compile an HPD for a product would be to acquire separate HPD's for the different components that the product is composed of from the suppliers. If product's component already has an HPD, that HPD can be used for that component in the HPD of final product. This however is nearly impossible to do for case company's products since there are very few optional components, that have an HPD, for the different components that compose Framery's products. This is also the reason why this method wasn't used in this study. This method requires separate measurement of the weight information of different the components since the weight composition of different materials in the end product cannot be disclosed with separate HPDs. Overall this method could be used easily with smaller products that are composed of just a few different components.

One way to get the material data for a new product would be to define rigorously the materials that compose the product during the products design and development process. The material data could be then added into the company ERP with a rule

that the component is required to be this specific material. This forces the suppliers to provide components that are composed of specific materials and substances. This way of gathering composition data is more realistic for the case company compared to the previous way, but this way still has its downsides. The way of defining the materials of the component requires the product designers and engineers to have a vast knowledge base about materials and chemistry. This method was used to define some of the materials in Framery's products in this study. Some components were defined to be specific material in the technical drawings of the components and so those materials could be defined just by examining the technical drawings.

One last way to gather the material and substance data is the way where the procurement of the product's manufacturing company requires every supplier to provide the specific material and substance information required. Material and substance information could be made as a requirement for a successful deal and so the material data would be gathered every time a new component would be procured. This doesn't require anyone in the manufacturing company to have the specific knowledge about materials and chemistry. Also this way the process of acquiring the information about the materials in a component is delegated to the suppliers. There are also risks for this method since the supplier data isn't acquired in a specifically defined way and so there is a possibility that the material data gathered from a diverse array of different suppliers isn't reliable. This is required to be taken into account when evaluating the scientific rigor of this study, since this method was the most used method in this thesis to find out what materials and substances composed the different components. To gather this data nearly all of the Framery's suppliers were contacted and an inquiry of the different materials and substances, that composed the supplied component, was requested.

These methods to gain material information about a product were developed during the study from the experiences through the study process, as the reasonable ways to gather material information became obvious. There are definitely more ways to gain material and substance data and so these methods developed here are just an opening to the subject. As a result, a best possible solution to gather material and substance data, was developed as combination of the methods mentioned in this section and this will be discussed in the following subsection.

Table 3.2 *Different methods for gathering material and substance data*

Method	Advantages	Disadvantages
Gathering HPD's from all of the different suppliers.	Fast and easy way to get composition data.	Nearly impossible for any product since there aren't that many HPD's available yet. Also requires separate weight data acquiring.
Defining the material during design process.	Streamlines the material data gathering process.	Designers and engineers are required to have a vast knowledge base about materials and chemistry.
Requiring suppliers to give specific material data for the supplied components.	Delegates the responsibility of gathering the material information from the manufacturer to the supplier.	There are no standardized ways to gather the data and so there is a risk of not getting reliable data from the suppliers.

All of the different methods to gather the material and substance data mentioned in this subsection have been gathered into the table 3.2 with their advantages and disadvantages. All of the different ways to gather material information about a product discussed in this subsection are only possible for a company to implement for a new product or during full redevelopment of an old product. For an already existing product, like the products studied in this thesis, basically the only realistic way to determine the product's composition is to examine if already some of the 3.2 table's methods have been used. If not, then it is required to acquire the needed material data from the supplier.

3.5.2 Determining which is the best way to gather the material and substance data

A solution that is the fastest, cheapest and most reasonable way to gather the material and substance data is obviously the best solution to choose but realistically a one-off solution cannot be found. There are certainly a lot of different ways to do the data gathering as was shown in the previous subsection 3.5.1 and as it was

brought up the best way is also dependent on the approach, because the product designers and procurement decide which materials and substances are used. The fastest way to gather the material and substance data would be a way that doesn't require any further research and the data would be readily available. The most cost effective and reasonable way would be to determine what is the way that requires least amount of change in the process of designing and producing a new product. Some change in the process is most likely unavoidable and this creates a freedom to choose from various different possibilities on how to gather the required data.

The best possible way is also dependent on the component that is being defined. For some components the easiest way might be to just search for a component that already has an HPD and choose to use that component, if it meets the criteria of price and quality. If the designers have the knowledge base for defining what materials the component should be, it might be the easiest to get the data with the method of defining the material during the design process. For example components that are known to be one specific material, like certain type of metal, can be specified during the design process. For some components, that have a complex material and substance composition, it might be easier to let the supplier gather the data. An example of this type of complex composition could be a glue that is composed of multiple different substances.

As a result for the best possible way to gather the material and substance data, a material and substance composition determination process model was created. The process model was created using a combination of the methods defined in the table 3.2. To validate this process model and to study how it could be developed, an anonymous survey was conducted. The survey of appendix E was sent to the product designers and procurement in Framery. In the survey it was emphasized that the answers should reflect the work flow of any product rather than just Framery's products. The survey was conducted with a Google forms survey tool and with the survey answers were given to these following questions:

1. Do you think you could work according to the model?
2. Would the model increase your workload notably?
3. Would it be easy to work according to the model?
4. Do you find something to develop in the model?

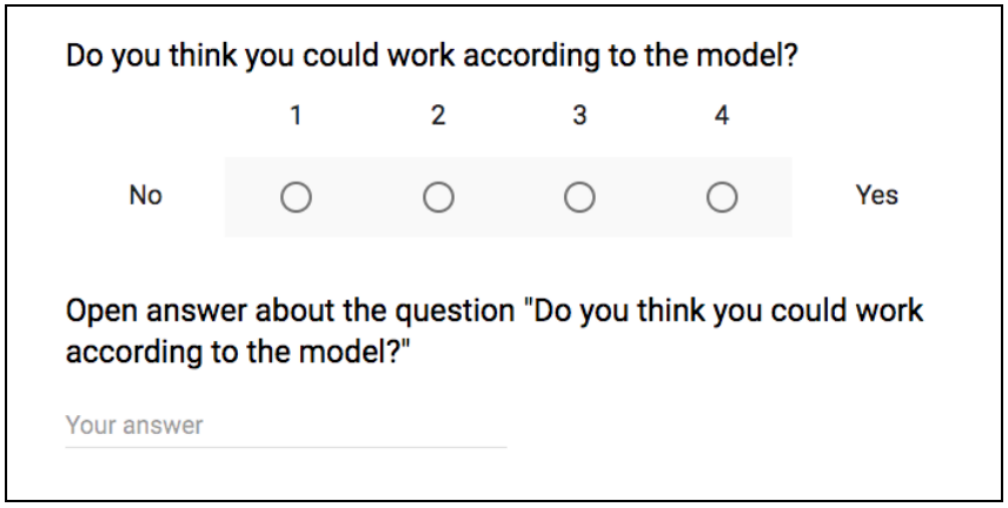

Figure 3.7 *Survey format*

The answers in the survey were given in two formats: giving a quantitative answer of yes or no with a value of 1 to 4 and giving a qualitative answer by answering openly on the question. To clarify this, the survey format can be seen in the example in the figure 3.7. Surveys objective was to help to evaluate how well the created material and substance composition determination process model works and how it could be further developed. If found that it is easy to work with and it doesn't notably increase the workload, it could then be used as a baseline model to define the materials and substances of any product. If it is found to increase the workload excessively, then the model should be further developed.

4. RESULTS

4.1 Composition of the products

The composition of the products Framery O and Framery Q was determined between May and August of 2018 according to the process introduced in the flow chart shown in the figure 3.6. Every component was weighted at the Framery's factory at Tampere. For a large majority the products are composed of plywood and laminated glass, as it can be expected from the appearance of the products. Any unexpected or unknown materials or substances weren't found. Most of the material and substance data of the different components was acquired from the suppliers. The material data for some components like the body cover and sound isolation materials were found from the technical drawings of the components. Weight and material information about the electronic components, for example the lighting and fan control units, was also acquired from the suppliers.

In order to gain the knowledge about the materials and substances, it was usually required to contact the suppliers in either the supply chain level one or the supply chain level two. There were only few exceptions where a higher level supplier on the supply chain was required to be contacted (Figure 3.1). Reliability of the data gathered from the suppliers is needed to be taken into account when the rigor of this study is examined, since the data might possibly be faulty. This possibility of faulty supplier information was mentioned and reasoned in the section 2.5.

4.1.1 Framery O composition

The BOM of Framery O had all of the separate modules and components of the modules listed. In Framery O all of the modules had a different composition and information for all of the materials and substances had to be gathered for every module. A truncated summary of the composition of Framery O can be seen in the

table 4.1 and a full HPD with all of the health hazards associated with the different materials and substances can be seen in the Appendix G.

Table 4.1 *Framery O material composition in decending order*

Material	**Percentage (%)**	**Material**	**Percentage (%)**
Birch Plywood	36,65	Aluminium	0,12
Laminated Glass	23,36	Polyurethane	0,12
Stainless steel	21,69	PBT plastic + 30% glass filled	0,11
Formpressed Birch Plywood	4,89	Printed circuit board	0,08
Felt Sheet	3,13	ABS plastic	0,08
Acoustic panel	2,64	Silicone sealant	0,07
Galvanized steel	1,53	Brass	0,07
Carbon Steel	1,48	Polyethersulfone	0,07
PVB plastic	0,75	Nylon 6	0,06
Laminate	0,74	Wood glue	0,05
Magnet	0,47	PDMS plastic	0,03
Nylon 66	0,40	Chromed stainless steel	0,03
Powder paint	0,37	Zinc	0,03
PVC	0,23	POM plastic	0,02
Copper	0,21	Tinned Copper	0,02
Seal	0,19	Wool	0,02
Steel	0,14	Zinc Alloy no. 3	0,02
Polycarbonate	0,12		

Roof module is mainly composed of plywood and sound isolation materials but it contains also the lighting and air ventilation fans and the electrical wires required for the lighting and fans. Floor and both of the wall modules are quite similar in composition and all are composed mainly of plywood and sound isolation materials. The door and glass wall modules are made mostly of laminated glass and laminated plywood. Inside walls of the booth are covered with sound isolation felt. The stool inside the booth is mostly powder painted stainless steel, plywood, fabric and polyurethane foam. The table is made of laminated plywood and it houses the

electronics that control the booth's lighting and fans. Outside body covers are made of powder painted stainless steel. Most of the mixed hardware, used to manufacture the different modules and to fasten the modules together, are made of galvanized steel.

4.1.2 Framery Q composition

Similarly to Framery O, a truncated summary of the composition of Framery Q can be seen in the table 4.2 and a full HPD with all of the health hazards associated with the different materials and substances in the Framery Q can be seen in the Appendix H. Framery Q's BOM contained data about all of the different components that composed the different modules that the Framery Q is composed of. Framery Q is composed of two similar roof, wall and floor modules. This meant that material data was needed to be gathered only for one roof, wall and floor module. Also the door and glass wall modules were quite similar but not identical.

Table 4.2 *Framery Q material composition in decending order*

Material	**Percentage (%)**	**Material**	**Percentage (%)**
Birch plywood	35,30	PMMA plastic	0,15
Laminated glass	29,13	Polyethersulfone	0,11
Stainless steel	19,39	PBT plastic + % 30 glass filled	0,11
Polyurethane	3,25	ABS	0,08
Acoustic panel	2,42	Cardboard	0,08
Felt sheet	2,30	Polycarbonate	0,07
Formpressed Birch Plywood	1,96	PVC	0,05
Steel	1,53	Silicone sealant	0,04
PVB	0,93	Printed Circuit Board	0,04
Nylon 66	0,66	Brass	0,03
Galvanized steel	0,64	Chromed steel	0,03
Laminate	0,45	Wood glue	0,03
Magnet	0,34	Tinned copper	0,03
Powder paint	0,26	PET	0,02
Aluminum	0,24	PDMS plastic	0,02
Seal	0,18	Wood	0,01
Wool	0,17	Zinc	0,01

Roof module is mostly composed of sound isolation materials and plywood but it also contains the air ventilation fans. Framery Q is nearly double in volume compared to Framery O, so both of the roof modules in Framery Q have separate air ventilation fans so that the air inside changes similarly to Framery O. Like in Framery O, the Framery Q's floor and wall modules are mainly plywood and sound isolation material, with the exception that the electricity and fan control electronics are housed inside the floor module in Framery Q. Also similarly to Framery O the door and glass wall modules are both mainly laminated plywood and laminated glass and the insides are also covered with sound isolation felt. The lighting in Framery Q is a separate component and it is held on to the roof with magnets. Furniture is basically powder painted steel, plywood, fabric and polyurethane foam. The table in Framery Q is laminated plywood and powder painted steel. Most of the mixed hardware used to fasten the different modules together and used to manufacture the separate modules are made of galvanized steel.

4.2 The materials and substances health effects analysis results

All of the different substances above the 100 ppm threshold that have been screened to have hazardous effects on human health, according to the CML database, are listed with the associated health hazards in the table 4.3. As can be seen in the table, most of the hazardous materials can be found in both Framery O and Framery Q, with only one exception being PMMA plastic which is only present in the Framery Q's ceiling light component. More detailed information about the associated health hazards of both of the products can be found from the appendices G and H.

Table 4.3 *Framery O and Q health hazard screening results*

Substance	**Present in Material**	**Hazards on human health**	**Present in Framery**	
			O	**Q**
Phenol Formaldehyde	Birch Plywood, Formica Laminate	Respiratory	X	X
Sodium Carbonate	Birch Plywood	Eye Irritation	X	X
Ammonium Chloride	Birch Plywood	Eye Irritation, Endochrine	X	X

Urea Formaldehyde	Formpressed Birch Plywood	Respiratory	X	X
Formic Acid	Formpressed Birch Plywood	Skin Irritation	X	X
Resorchinol	Formpressed Birch Plywood	Skin Sensitize, Skin Irritation, Eye Irritation, Endocrine	X	X
Zinc	Galvanized Steel, Zinc	Physical Hazard (Reactive), Endocrine	X	X
Neodymium-Iron-Boron Alloy	Magnet	Physical Hazard (Reactive), Skin Irritation, Eye Irritation, Organ Toxicant	X	X
Titanium Dioxide	Powder Paint	Cancer, Endocrine	X	X
Carbon Black	Powder Paint, Seal	Cancer	X	X
Polyvinyl chloride (PVC)	PVC Pipe	Respiratory	X	X
Paraffinic Process Oil	Seal	Cancer, Reproductive Toxicant	X	X
Aluminum	Aluminum parts, Printed Circuit Board	Respiratory, Endocrine, Physical Hazard (Reactive)	X	X
Polydimethyl-siloxanes	Silicone Sealant, PDMS plastic	PBT (Persistent, Bioaccumulative, inherently Toxic)	X	X
Silica, Amorphous	Silicone Sealant	Cancer	X	X

Distillates, Hydrotreated Middle	Silicone Sealant	Cancer, Reproductive Toxicant	X	X
Chromium	Chromed Stainless Steel	Respiratory, Endocrine, Skin Sensitize	X	X
Polymethyl methacrylate (PMMA)	PMMA plastic	Respiratory		X

As can be seen in the table 4.3 many of the hazardous substances can be found in the birch plywood components of the product. These substances have the most potential to cause health hazards to the end user since they are so vastly present in the end product as can be seen in the tables 4.1 and 4.2. Substances like phenol formaldehyde and urea formaldehyde can cause negative health effects on humans since both of the formaldehydes can volatilize, are asthmagens and can cause resipratory health issues when inhaled. In addition Polyvinyl chloride (PVC) can also cause respiratory issues. Respiratory exposure to these volatiles is non-exsistent, since Framery's products have been emission tested for volatile organic compounds (VOC) like the formaldehydes and the tests have shown that no harmful compounds have been found in the air surrounding the product nor inside the product. (Appendix G; Appendix H)

Other substances in the plywood like sodium carbonate, ammonium chloride, formic acid and resorchinol are all part of the hardener that binds the plywood veneers together and so are mostly confined inside the plywood components. These substances might cause eye and skin irritation and possibly cause problems in the endocrine system. In order to be exposed to these effects the substances should be in physical contact with the end user and since they are confined inside between the plywood veneers the contact isn't effectively possible. However there is a slight possibility to come in contact with the hardener substances at the sides of the plywood components which are usually available to touch. Neodymium-Iron-Boron alloy, Polydimethylsiloxanes, Amorphous Silica, hydro treated middle distillates and Aluminum are all also substances that require physical contact in order to have exposure to the hazardous health effects. All of these substances are confined so that a physical contact with the end user and the substances is not possible.

Zinc can be seen visibly in the product, as it is the top layer in the galvanized steel parts, and thus can be touched physically. Zinc causes physical hazards as it is reactive and can cause problems in the endocrine system in humans. In order to be exposed to the effective hazards, the zinc is required to be separate to the steel and in order to cause problems in the endocrine system, the zinc should be ingested. Special conditions are required to separate zinc from the galvanized steel parts. There are realistically two possible ways to peel the zinc off of the galvanized steel: high temperatures and mechanically deforming the galvanized steel. (Industrial Galvanizers Corporation 2013; Bernardo 2013) Usage temperatures of the products are always below the 200 Celsius degree temperature, which is the threshold after which the zinc begins peeling (Bernardo 2013). Deforming might happen during the mounting of mixed hardware into the product but usually the zinc coating stays inside the product if a screw or bolt bends as it is mounted. In the end the zinc content in the end product is small, as can be seen in the tables 4.1 and 4.2. Thus it is most probable that the end user's exposure to zinc is insignificant as zinc won't most likely be in physical contact with the end user and the end user won't be able to ingest hazardous amounts of zinc.

Titanium dioxide and carbon black, used in the powder paints and seals, have been identified to cause cancer and problems in the endocrine system. Those substances are used in the production process of powder paints and seals and are bounded in the produced material. Baan (2007) has stated that "No significant exposure to carbon black is thought to occur during the use of products in which carbon black is bound to other materials, such as rubber, printing ink, or paint." and "No significant exposure to titanium dioxide is thought to occur during the use of products in which titanium dioxide is bound to other materials, such as in paints." Thus as carbon black and titanium dioxide are bounded in the paint and seals, they won't most likely be effectively hazardous on human health. The paraffinic process oil is used similarly during the production process of seals as a softerner and so are bounded similarly in the material as carbon black and titanium dioxide (Dick & Rader 2014). However any specific source wasn't available to specifically explain how paraffinic process oils aren't effectively hazardous for health in seals. Thus there is a possibility that paraffinic process oils might be causing health hazards for the end user as the seals are available to be exposed to physically in the product.

Chromium and Polymethyl methacrylate (PMMA) plastic have both been identified to cause respiratory hazards. In addition chromium has been identified to sensitize

skin and cause problems in the endocrine system in humans. PMMA plastic is present in the lighting panel in Framery Q and chromium is present in the chrome plating of the finger fan guards of the fans. This means that chromium exposure to the end user is insignificant as end user isn't capable to touch the fan finger guards and thus cannot have physical contact with the chromium. The process of chrome plating can be hazardous for health but chrome plating it self is usually used to create an inert surface on metals and so it isn't expected to cause hazards in the Framery products (Wilbur et al. 2012; Plieth 2008). PMMA is also inert in solid form (Manoukian et al. 2018). PMMA is present in solid form in Framery Q and thus PMMA isn't expected to be effectively hazardous for health in Framery Q.

To conclude the only materials to have some potential to cause possible health hazards to the end user are the birch plywood materials and the seal materials that are manufactured with paraffinic process oil, as the exposure to these materials is possible through physical contact. Thus also a possible health risk has been identified to be associated with these materials. The birch plywood might cause hazards to health since it is so vastly available for the end user to physically touch in the end product. Also the seals that are manufactured with paraffinic process oil are available for the end user to touch and so are possibly hazardous for human health. It is also required to discuss the effective hazardousness of these hazardous materials. As Paracelsus wrote in the 16th century "The dose makes the poison" – the average daily exposure or dose that the end users will get by touching these materials is so small that the short term hazardous effects of these hazardous materials are most likely nonexistent. Still the identified materials might have some long term effects on health and thus it is required to consider alternatives for those materials.

4.3 Healthier alternatives for the health hazardous materials and substances

As was found in the previous section 4.2 none of the substances identified to have hazardous effects on health weren't found to effectively cause any serious health hazards for the end user. The most potential health hazards could be caused by substances in birch plywood and seals that contain paraffinic process oil. So substitutes for these materials was required to be discussed with the product designers. Questions used in the discussions with the product designers can be seen in the appendix I.

4.3.1 Alternative materials for plywood

There are many qualities that make plywood the ultimate material in both Framery O and Framery Q. In the discussions with the product designers it came apparent that plywood was a great material in the beginning as it was so widely available, domestic, formable, durable, structurally strong and small batches of it could be ordered relatively cheaply and quickly. These properties are also the properties required from the plywood as a material in the product. Dimensional accuracy is also one critical requirement for the plywood components. Dimensions in plywood often change as humidity changes and this has been a challenge with plywood some times, so with a new alternative material this challenge could also be overcome. In addition it is required from the plywood components to be great acoustically, readily available, clean and contain no splinters nor odour. These are also the requirements required from the alternative materials.

Table 4.4 *Alternative materials for plywood*

Required properties	**Solid wood**	**Sheet metal**	**Aluminum**	**Plastic**
Acoustical	X			X
Dimensional accuracy	∼X	X	X	X
Formability	X	∼X	∼X	X
Readily available	X	∼X	X	∼X
Structurally strong	X	X	X	X
Design (compared to plywood)	∼X			
Domestic	X	X	X	X
Pleasant scent	X	X	X	X
No splinters	∼X	X	X	X

Multiple alternative materials have already been tested and for example medium density fiber board was used before plywood. As the production grows, eventually alternatives for plywood are going to be thought of. At the moment the most promising alternatives for plywood are solid wood, sheet metal, aluminum and plastic. List of these alternative materials and how well each material fills the required properties can be seen in the table 4.4. In the table "∼X" indicates that the material fulfills the requirement in some level and "X" indicates that the material fulfills

the requirement fully. Metallic and plastic materials don't react with humidity like wooden materials and thus have an advantage, that isn't indicated in the table, against wooden materials.

According to the table solid wood would seem to be the best possible alternative for plywood since it nearly fulfills every requirement. As a material plain solid wood would also be more healthier than plywood as it doesn't contain the adhesives that were hazardous in the plywood. Although, as was mentioned earlier, wood is prone to change dimensionally as humidity changes. Also as production grows it might be too costly as a material to use compared to the other materials which could be mass manufactured more cheaply. One aspect to support the manufacturing of wooden products is the great sustainable properties of wood. Large scale manufacturing and using of wood and wooden based products mitigates climate change, as wood is a material that binds, rather than releases carbon dioxide. Especially when the wood used in the products is FSC and PEFC certified, as the wood used by Framery is. (Appendix G; Appendix H; Sathre and Gustavsson 2009; Valsta et al. 2008; FSC 2018; PEFC 2018; Ruuska 2013)

It came apparent in the discussions that plywood has been used because it functions well visually, it is a strong part of the products identity and that changing the plywood material to another would make the product wholly different product. Thus changing the plywood as a material would be reasonable only on a totally new product. Sheet metal, aluminum and plastic are all great materials for large scale production and thus could be potential materials for future products, as production grows, to replace plywood as constructive material. Even though sheet metal and aluminum might not have as good acoustical properties as plywood, they can be engineered and designed so that the end product would function well acoustically. Sheet metal and aluminum are safe materials to be used in the product as can be seen in the appendices G and H. Plastics on the other hand can be hazardous for health depending on the type of plastic. Different plastics have different properties, some are easy to manufacture and some not and also the price varies a lot between different plastics. This means that to finding the optimal plastic would require a lot of further research and knowledge about plastics.

A best possible one off solution isn't possible to be found as an alternative for plywood in Framery O and Framery Q. Solid wood would be a great possibility, but it would require new suppliers and thus would also add a lot to the workload of the

case company. Changing to solid wood would require an additional analysis on what would be the costs and profits compared to continuing with plywood and tolerating the possible health hazards that are recognized with plywood. For future products sheet metal, aluminum and plastic could be be great alternatives for plywood.

4.3.2 Alternative seal materials

In the discussions it came up that there weren't any specific reason for using the seal type that had paraffinic process oils used as softeners during the manufacturing of the seal. The seal was mainly used since it was readily available in bulk, cheap, it was the right color, the surface of the seal was suitable and it worked well according to various tests. These attributes are also required from the seal. Also it is required for the seal to be easy to install so that it stays put when installed, it should keep its shape, its dimensional accuracy should be good and it shouldn't have a disturbing scent nor have a scent at all.

There has already been been discussion about changing the seal to one that would have even better qualities than the one used at the moment. The problem with finding specific alternatives for the seal is that there are multiple different types of rubber alternatives, but there is not much information about the composition of those rubbers. Also if an alternative material is found, the specific shape of the seal is possibly not available and requiring the supplier to make a new extrusion mould for that alternative material would most likely cost a lot. Thus a best possible way would be to require the supplier to investigate if similar rubber could be manufactured with another safer softener. Another type of seal, based on TPE rubber, is used also in both of the products and manufacturing that seal type doesn't require paraffinic process oils. If possible, this type of sealant could be used instead if the required shape would be available.

4.4 Easier and better methods to gather material and substance data

The different methods to gather product's material and substance data was discussed in the section 3.5.1. As a result, for a best possible solution, a combination of all of these different methods was developed in a form of a process model. This process model can be seen in the figure 4.1. The process model consists of two consecutive

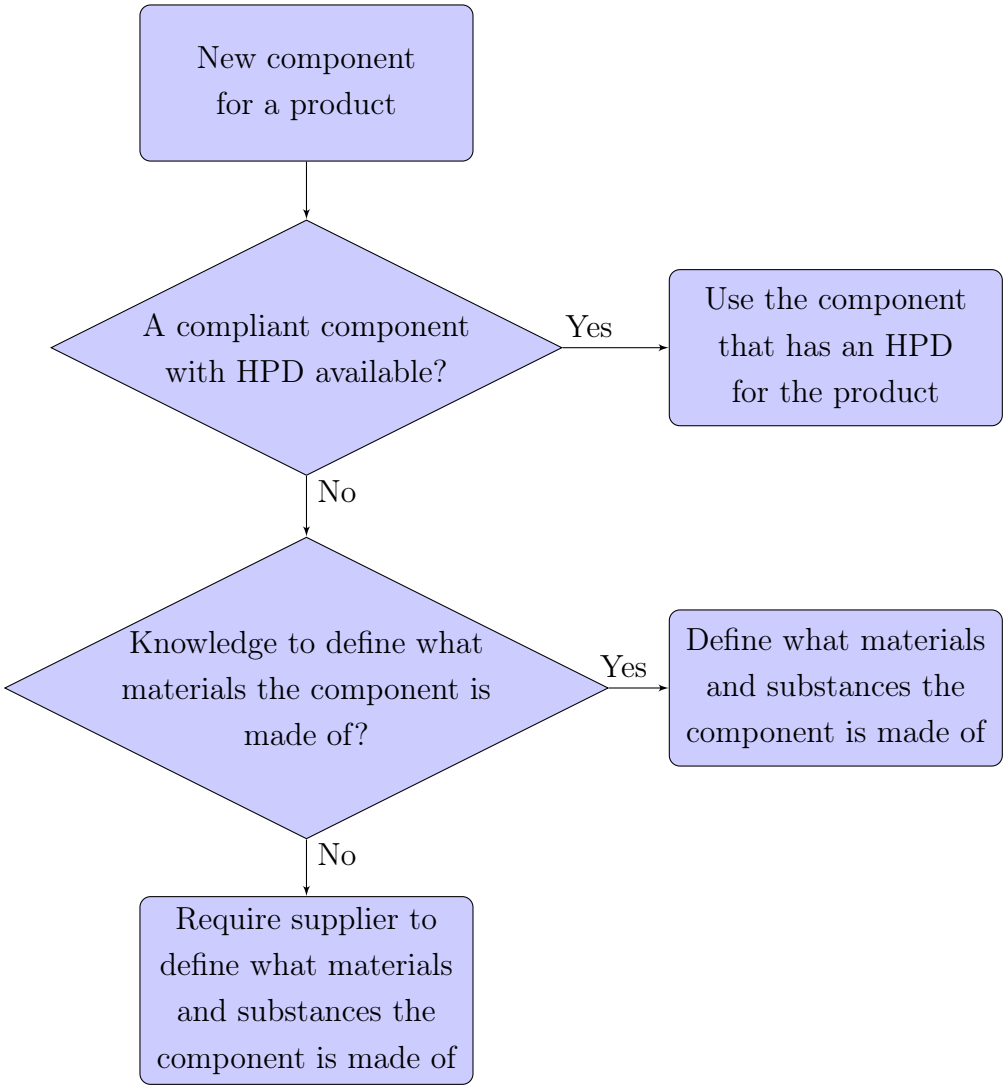

Figure 4.1 *Flow chart showing the process of gathering the required data for a product's material disclosure certification or label*

decisions after the beginning and three different end results depending on what are the results of the decisions. The model can be utilized when fully redeveloping an

existing product or when creating a totally new product. Model was formed so that the easiest and least work intensive decision was inserted in the beginning of the flow chart after a new component is being requested. If a component, that meets the requirements of quality and price, is found, with an HPD, then that component is chosen to be used in the product. Finishing the flow process through first decision will generally become more usual in the future as more and more HPDs and other material disclosure certifications and labels get published.

If an optional component with an HPD is not found or a component with an HPD doesn't fill the requirements of quality and price, then the component isn't chosen and the flow continues to the next decision. If the product designers have the knowledge base to define what materials and substances the component is composed of, then the component's material and substance composition is fully defined during the design process. This means that the designers should have a knowledge about the materials that are about to be used in the component. This could be possible when for example specific metal alloys are used or when specific glass is used. Problems arise when for example biological or complex mixture materials are used. Understanding the chemical composition of these materials requires a lot of intricate knowledge about materials. Thus it is understandable that the product designers don't have this knowledge and the material composition research is then delegated to the component suppliers.

An anonymous survey was conducted for the product designers and procurement of Framery to validate the process model. The survey format can be seen in the appendix E. Four answers were given, of which two were by product designers and two by procurement. As a result to the first question of the survey "Do you think you could work according to the model?" both designers answered yes with value 4 and both answers in procurement were yes with value 3. One product designer gave an open answer by bringing up that the model seems work clearly, but in practice some problems may arise. The second question of "Would the model increase your workload notably?" was answered diversely. Product designers answered no with value 2 and yes with value 3 and both procurement answers were no with value 1. The designer whom answered with no answered also openly by stating that the continuation might become work intensive, if there is know-how to define the materials accurately. Also one of the procurers answered openly to the question as follows "The material is defined during the prototyping phase anyway with the research and development team and a potential supplier, so it wouldn't add anything

to my workload".

Everyone answered similarly to the third question of "Would it be easy to work according to the model?" with a yes with a value 3. One of the designers stated "it seems so" in the open answer section. Last question of "Do you find something to develop in the model?" was only answered with an open answer. The last question was answered once and that answer was from one of the designers. He/She answered "I won't even try to find anything to develop before I'm testing it. I am used to develop models through testing." With these answers can be concluded that the model could be used at least as a base for further research or as an opening to the subject in any organization.

5. DISCUSSION

5.1 Actions required to answer the research questions

In order to answer the research questions stated in the introduction of this thesis one should perform the following actions: To find the answer to the first question of "What is the composition of the products?" it is required to define the process of how to gather the required composition data and then gather that data. In this thesis this was done by first creating the process model shown in the figure 3.6. Working with this process model it was possible answer to the first research question of defining what materials and substances composed the products. That material and substance data was then arranged to the lists in tables 4.1 and 4.2. With the data gathered to answer the first question it is possible to answer the second research question of "What materials or substances in the products can cause harm for health?" by analyzing the composition data.

In this thesis the analysis began by importing the composition data into the HPD Builder tool and then the tool produced a screened list with all of the possible health hazards of all of the different materials and substances. Then the materials and substances, recognized as hazardous for health, were listed in the table 4.3. Further analysis was required as most of the hazardous materials and substances weren't effectively hazardous in the products and thus all of the hazardous materials and their effects on health were analyzed separately. As a result only two of the materials were found to be possibly hazardous. These materials were birch plywood and a type of seal that has been manufactured with paraffinic process oil.

To answer the third question of "What different materials or substances could be used instead to make the products less hazardous for health?" alternative materials were searched for and a discussion was conducted with two product designers to discuss what substitutes could be used instead for the two hazardous materials. As a result solid wood, sheet metal, aluminum and plastics were found to be great

alternatives for the birch plywood but a one off solution could not be found since changing the main material in the product would require a lot of changes. The best possible alternative for the seal is hard to find as there isn't many ready-to-order alternatives available. Possible alternatives could be to ask the supplier to manufacture the same seal with a different, more safe, softener or ask another supplier to make a new extrusion mould which could make the same shape seal with a safer seal material. Both of these alternatives would most likely cost more than using the existing seal.

Various different answers could be given to the last question of "What can be done differently to make it easier for the manufacturer to disclose the materials and substances that compose a product?". In this thesis the answer was to create a new process model seen in the figure 4.1 to help the material data gathering during the creation of a new component for an already existing product or for a new product. This process model was created during the study as the ways, the material and substance disclosure should be conducted, became obvious. To validate this process model an anonymous survey was conducted for the product designers and procurement in Framery. Four answers were given, two of which were from designers and two from procurers, and as a result working according to the model was seen to be some what possible. Only one negative answer was given by one designer, whom believed that working according to the model might add the to workload. This means that the model could probably add to the workload of the product designers as they'd be required to define the material composition of some of the components. Usually the quantitative answers to the questions weren't absolute, meaning that there was also doubt in some sense. All in all, according to the survey, the model could be used as an opening to the subject and would be possible to be used as a base for further research.

5.2 Research validity and qualitative rigor

Quantitative and qualitative research methods and a mixed-method research method of using both qualitative and quantitative research methods, was used in this thesis to arrive at the results (Thomas & Magilvy 2011). Qualitative methods were used when the material and substance composition was determined, when the new method of gathering material and substance data was formed, when the alternatives for the hazardous materials and substances were discussed and determined and when the effective hazardous materials and substances were defined. Purely quantitative

methods were used when the mass of the components was measured, when the substance quantities in the materials was calculated and when the number of possibly hazardous substances was determined. There is a possibility of errors among the quantitatively determined results, because the measurements were done purely by one person and there were no systematic proofreading nor error checking of the results. Still the quantitative results can be considered to be reliable, even if they would have been prone to errors, as the quantitative measurements were often simple and usually unexpected results were checked for reliability.

Mixed-method research was used when studying the effective hazards of the materials and substances. First the possibly hazardous materials and substances were listed using a quantitative method of utilizing the HPD Builder tool and then the materials and substances were further studied with the qualitative method of studying their effective health hazards. As a result a list of materials was achieved where non-effective health hazardous materials and substances were excluded and effectively hazardous materials and substances were left. To study the reliability of the result it is required to divide the study into the quantitative and qualitative parts. Quantitative part of listing all of the possibly hazardous materials and substances can be considered to be reliable as the list is exported from the automated HPD Builder tool. In this case the true reliability is dependent on the data imported to the HPD Builder. The reliability of the qualitative part, among the other qualitative research done in this thesis, requires further discussion.

Lincoln and Guba (1985) discuss the subject of trustworthiness of qualitative study in their classic work of Naturalistic Inquiry. In the book they've created a model on how the trustworthiness of qualitative study can be divided into four sections: Credibility – How well the truths in the study represent reality, Transferability – How the findings in the study can be applied in another contexts, Dependability – How well the study arrives to similar results when the study is repeated and Confirmability – Neutrality of the study or how much biases, motivations and interests effect the results. Thomas and Magilvy (2011) have delved deeper into this subject and they talk about qualitative rigor.

According to Thomas and Magilvy (2011) the credibility of a qualitative study can be achieved by checking for the representativeness of the data produced. Some of the data gathered in this thesis lacks this credibility since it is known that there is a possibility of false information. As was mentioned in the sections 3.5.1 and 4.1 the

data gathered from suppliers might not be reliable and thus there is a possibility that the data gathered doesn't represent the reality. This decreases the credibility of the parts of this study where the supplier provided data was used. Credibility of the other qualitative results are some what hard to define as in reality the best possible alternative material might be impossible to find or the effectively hazardous materials and substances may have a wide variety of positive and negative health effects in reality.

The qualitative research conducted in this thesis is well transferable to any other similar study. In any study, where the material and substance composition of a product is required to be determined or the alternatives for the materials is required to be discussed and determined or where the effectiveness of the hazardous materials and substances is required to be determined, the methods used in this thesis can be used. If the qualitative methods used in this study would be conducted again, similar results are expected to be arrived at, since there are very few factors causing randomization in the results. Thus can be concluded that the qualitative research done in this study can be considered to be quite well transferable and dependable.

Confirmability of qualitative research methods used in the study requires background examination of all of the people and companies involved in the research. When communicating with the suppliers, the case company was often one of the biggest customers for suppliers and thus a bias can be recognized. As the suppliers provided information for the case company, they might have given the information as fast as possible to please the case company with fast response times. This makes it possible, that a thorough research hasn't been conducted about the material and substance composition of the component the supplier manufactures. Also if the supplier has a suspicion that the component they manufacture might contain health hazardous materials or substances, the supplier might be reluctant to provide that material and substance information about the component in fear of losing the case company as a customer. In addition there wasn't a lot of time to research whether the information acquired from the supplier was reliable, which meant that often the data acquired from the supplier was just required to be trusted on.

When the alternative materials were discussed, the product designers were often the same product designers that had already chosen the material for the product and thus there was a possibility that there weren't many new thoughts on the matter and that there weren't much interest to find new materials or substances. This

means that there was a possibility to have a bias against finding new alternative materials. When the effectively hazardous materials were determined, there was a possibility for a bias to work for the interest of the company. Thus it is reasonable to acknowledge that there is always a possibility for a ulterior motive to tone down the possibly hazardous effects. All in all this means, that the confirmability and the credibility of the qualitative methods used in this study, can be considered to be the weak links when examining the qualitative rigor of this study.

5.3 Scientific implications and further research

This study advanced the knowledge base on how the material and substance composition of a product could be determined. When evaluating a study on the material composition of an already existing product or an array of already existing products, the flow chart model in the figure 3.6 can be utilized to have a defined way on how to determine material composition of the products. Also the flow chart model in the figure 3.3 can be used when creating an HPD for a new product, which makes it easy to gather the data of the materials and substances that compose the product. This study also advanced the understanding of what are the faulty assumptions in the HPD documentation and gave an example on how these faulty assumptions can be reasoned through and gave an example on how to find the effectively hazardous materials in the product.

Every topic of this thesis could be researched further to advance the knowledge base of gathering material and substance data about a product and analyzing that data. The accuracy of the composition study could be more specific for further studies. In this study the threshold for the studied phone booths' was 100 ppm of weight meaning that every separate substance that weighted approximately more than 30 grams in Framery O and 60 grams in Framery Q had to be disclosed. That threshold could be even more accurate in further research to disclose greater amount of possibly hazardous materials and substances in the product.

In addition the phone booths' effects on health could be studied more accurately. In this study the health effects were based on the material and substance composition of the product, a list that automatically gave the hazards on health associated with the specific materials and substances and further analysis of the exposure to these materials and substances. This study didn't take into account the time frame of exposure to these materials or substances. In further research the long term health

effects could be studied to find out what effects Framery's phone booth's can cause for human health on a longer time period. Also a further study could be made about the long term health effects of the different materials and substances that compose the product's and in the study suppliers could be required to give more accurate and specific depictions of the material and substance composition of the components they provide.

The process models of material data gathering in figure 4.1 and the material composition determination for an already existing product in figure 3.6 could also be studied and developed more. Both of the models could be used as a baseline for further research and as new approaches arise to the topics the models could be developed so that they fulfill the new purposes of the specific needs. Both of the models or parts of them could also be applied as a part in another more broader model. Another good subject to continue studying on would be to research what consequences would result from deciding to use an alternative material for example when changing from plywood into the solid wood material. A costs versus profits analysis could be made to illustrate how much it would cost, how much change in general would be required to be made and how much would it require work to change the main raw material to another. After this it could be analyzed how the health effects have changed and how this has affected the end users health.

5.4 Practical implications

The HPD documents produced as a result in this thesis are useful for the case company since the HPD documents are applicable documentation for credits in the material transparency sections of different green building certificates. This makes the products more attractive for customers that aim to get green building certificates for their office or building projects. The HPD documents also communicate sustainability and health aspects of the products for the customers. HPDs are also a requirement for a deal for some customers and so having the HPD documents will also increase the profitability of the case company as new deals are most likely won with the HPD documents.

In the future the case company and companies alike now have the framework on how to begin creating HPDs for new products and existing products by working with the process models shown in figure 3.6 and figure 4.1. With these models a company can create a process in the company's structure where the material and

substance data can be gained, whenever a new component is being designed. The company can then begin to gather the data about the materials and substances that compose any product in the company's portfolio. With the results of this thesis the case company of this can now get other material transparency and eco labels and certifications with less effort, as a lot of different type of material composition data has been gathered for this thesis, in order to compile the HPD documents. Also with the results of this thesis the company has now identified some of the possibly health hazardous materials and has also some less hazardous alternatives for those materials.

6. CONCLUSIONS

It is important to understand what materials and substances compose a product, that is intended to be used by a human end user, so that it is understood what effects the materials and substances can cause for human health. When the effects are understood the safety of the product could be communicated to the end user and alternatives for the possibly hazardous materials could be considered. In this thesis a study on the material and substance composition of office phonebooth's Framery O and Framery Q was conducted to understand the material and substance composition of those products and to then understand the health effects of the materials and substances. After recognizing the possibly hazardous materials, it was required to find alternatives for those materials. It was also required to have a model on how to easier determine the composition of the future products.

First it was determined how this composition study should be conducted and a process model seen in figure 3.6 was created. Then the composition study was conducted according to the model. Also a process model seen in figure 4.1 was developed to ease the understanding of composition of future products during the development phase of a new product. As a result the compositions of the phone booths' materials were listed in the tables 4.1 and 4.2. Also an HPD document was compiled for both of the products, according to the composition study. The HPD documents can be seen in the appendices G and H.

An analysis was then conducted on the materials and as a result two different materials were seen to have some possible hazardous effects on health. Birch plywood and a seal that used paraffinic process oils in the production of the seal were both materials that required a physical contact to have the possibly hazardous health effects. These materials were both available to be physically touched by the end user in the product. Although it was reasoned that the materials aren't effectively hazardous in the short term, it is possible that the materials could cause negative health effects in the long run. A discussion was held on what could possibly be

alternative materials and thus a variety of materials were found. For plywood these were listed in the table 4.4 and for the seal the alternatives were discussed in the subsection 4.3.2.

Any company that manufactures physical products could benefit from the methods developed in this thesis, if they'd decide to gather material and substance data about their product or if they'd decided to get an HPD document for their existing or new products. The case company also benefited from this thesis as they can now sell their products with using the HPD documents as a credible selling point. With the results the company has now also detected less health hazardous alternative materials to use instead of the possibly hazardous materials.

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Framery marketing materials

Two different available Framery O models. Screenshots taken from the website `https://configurator.frameryacoustics.com/configurator` 6th of June 2018.

Six different available Framery Q models. Screenshots taken from the website `https://configurator.frameryacoustics.com/configurator` 6th of June 2018.

Framery Q
Working with PAL 110

Reset | Add to cart

Frame: White
Exterior: White Glossy
Door: Left
PAL: Black
Felt Cap: No cap

Electric System: SCHUKO
Outlets: Power (3 sockets)
LAN: No

Zoom | PDF

Framery Q
Betty's Café

Reset | Add to cart

Frame: White
Exterior: White Glossy
Door: Left

Electric System: SCHUKO
Outlets: Power (3 sockets)
LAN: No

Zoom | PDF

Framery Q
MeTime

Frame
White

Exterior
White
Glossy

Door
Left

Reset Add to cart

Electric System
SCHUKO

Outlets
Power (3 sockets)

LAN
No

Zoom PDF

Framery Q
NapQ

Frame
White

Exterior
White
Glossy

Door
Left

Table
Nap table

Reset Add to cart

Electric System
SCHUKO

Outlets
Power (3 sockets)

LAN
No

Zoom PDF

Interview conducted by TEKES

Mikä on yrityksen liikeidea ja milloin yritys on perustettu?
Frameryn idea on sekä ratkaista jatkuvat meluongelmat avo- ja monitilatoimistoissa että edesauttaa työntekijöitä nauttimaan ja olemaan onnellisia työssään äänieristettyjen työtilaratkaisujen avulla.

Mistä liikeidea syntyi ja ketkä yrityksen perustivat?
Liikeidea syntyi, kun perustajat Samu Hällfors ja Vesa-Matti Marjamäki työskentelivät yhdessä IT-yrityksessä kovaäänisen pomonsa alaisina. Eräänä päivänä kun miehet pyysivät esimiestään puhumaan puhelimeensa jossakin muualla, pomo totesi tarvitsevansa puhelinkopin. Hällfors ja Marjamäki ryhtyivät tuumasta toimeen ja perustivat Frameryn vuonna 2010.

Millaisiin asiakkaiden tarpeisiin tuotteenne käytännössä vastaa?
Framery auttaa avo- ja monitilatoimistoissa työskenteleviä keskittymään työhönsä joko häiritsemättä muita, tai poistumalla tilaan, jossa muut eivät pääse häiritsemään heitä. Tämä lisää työntekijöiden viihtyvyyttä ja tuottavuutta työpaikoilla.

Olisiko teillä tiedossa jotain tutkittua dataa haitoista, joita meluisa työympäristö aiheuttaa?
Tutkimukset osoittavat, että melu työtilassa voi alentaa työntekijöiden tuottavuutta huomattavasti, keskiarviolta noin 10%, mutta satunnaisissa tapauksissa jopa 35-50% (Työterveyslaitos & Taloustutkimus Oy). On arvioitu, että työntekijän keskittyminen häiriintyy 11 minuutin välein, ja voi kestää jopa 25 minuuttia ennen kuin ihminen pystyy keskittymään jälleen edessä olevaan tehtävään (Multitasking in the Digital Age, Gloria Mark, University of California).

Millaiset asiakkaat tuotteitanne ostavat, miksi he ostavat juuri teidän tuotteenne (kilpailuetu kuten design) ja voitteko nimetä muutaman tärkeän asiakkaan?
Frameryn asiakkaita ovat maailman suurimmat ja menestyneimmät yritykset, kuten Microsoft, SAP, Deloitte ja PWC. He luottavat Frameryn tuotteisiin, jotka eivät ole ainoastaan valmistettu korkealuokkaisista raaka-aineista ja -osista, vaan ovat myös selkeästi äänieristävimmät tilaratkaisut koko markkinoilla. Myös Frameryn pehmeä muotokieli ja värivalikoima ovat selkeästi erottuvia kilpailuetuja kilpailijoiden teräväkulmaisten ratkaisujen joukossa.

Mistä raaka-aineesta tuotteenne rakennetaan ja missä ne rakennetaan?
Pääraaka-aineina toimivat suomalainen koivuvaneri. Osat tulevat Tampereen tehtaalle lähinnä Suomesta ja Pohjois-Euroopasta. Suomessa eri komponentit kootaan valmiiksi, pakataan ja lähetetään maailmalle loppuasiakkaalle.

Business story: Miten liiketoimintanne lähti aikanaan käyntiin ja miten ja milloin pääsitte kansainväliseen kasvuun käsiksi?
Framery alkoi pienestä kuten kaikki uudet yritykset. Markkinakenttä oli Blue Ocean, uusi ja tyhjä vailla kilpailua. Kaikki opittiin tekemällä. Ensimmäiset tuotteet myytiin Suomeen ja tuotteita kehitettiin jatkuvasti. Nopeasti oltiin tilanteessa, jossa jokaiselle asiakkaalle tehtiin kustomoitu ratkaisu ja näin ollen tuotevalikoimassa olikin vuonna 2013 14 erilaista tuotetta ja satoja eri variaatioita. Lopulta teimme radikaalin päätöksen ja tapoimme kaikki muut paitsi parhaimman tuotteemme. Tämä vaikutti positiivisesti kasvuun ja 2016 tehtaallamme Tampereella valmistettiin jo tuhatkunta koppia. Framery on jo alusta asti pyrkinyt kansainväliseksi. Tämä on saavutettu osallistumalla näyttävästi erilaisiin messuihin ja tapahtumiin ympäri maailman. Lopulta tilanne on johtanut siihen, että tänä vuonna olemme laajentaneet USA:n markkinoille uuden logistiikkakeskuksen merkeissä.

Millaista on ollut liikevaihtonne ja henkilöstömäärän kehitys?
Frameryn liikevaihto kasvoi vuonna 2015 1,3 miljoonasta eurosta 5,1 miljoonaan. Vuonna 2016 liikevaihto räjähti 18 miljoonaan euroon. Tämän vuoden liikevaihtotavoite on 40 miljoonaa euroa. Seuraavien kolmen vuoden aikana on tavoite saavuttaa 200 miljoonan euron liikevaihto. Henkilöstön määrä oli alkuvuonna 2017 hieman yli 70 ja määrä kasvaa 200 tienoille loppuvuotta kohti mentäessä.

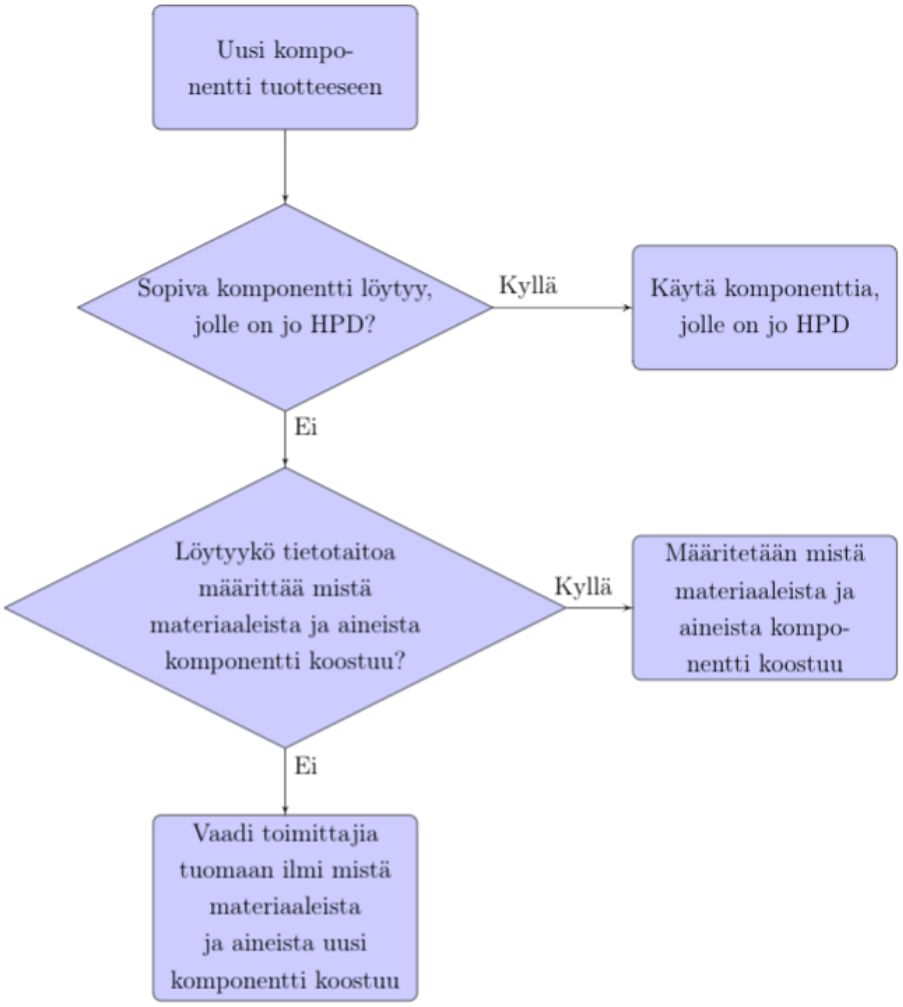
Miten digitaalisuuden hyödyntäminen on muuttanut toimintatapojanne/hyödyttänyt teitä uusin tavoin esim. tuotteiden valmistuksessa/asiakkaiden palvelussa tjs?
Digitaalisuuden implementointi tehtaallemme on ollut välttämättömyys. Pystymme nykyään valvomaan Tampereen tehtaan tuotantoprosessia erittäin tarkasti, mikä auttaa meitä kehittämään siitä entistä paremman ja tehokkaamman. Kehitämme logistiikkajärjestelmiämme jatkuvasti, jotta voimme helpotta työntekoa. Esimerkiksi tämän vuoden aikana olemme siirtyneet kaikkien työtilausten vastaanotossa mobiiliratkaisuun. Digitaalisuuden ansioista voimme olla saumattomasti yhteydessä ympäri maailmaa oleviin jälleenmyyjiin, mikä on meille sanomattoman tärkeä asia. Myös sisäinen työnteko on tehostunut verkossa olevien, jaettavien tiedostojen ja kommunikaatiovälineiden, sekä tilausjärjestelmien avulla. Tieto kulkee saumattomasti ja ihmiset pystyvät reagoimaan tilanteisiin yhä nopeammin. Tuotekehityksemme on parantunut huomattavasti, sillä erilaiset uudet mittauslaitteet ja -tavat auttavat meitä jatkuvasti tarjoamaan markkinoiden parhaita tuotteita. Tämä kaikki on kilpailuedun kannalta elintärkeää.

Komponentin materiaalikoostumuksen määrittäminen

Skenaario: Ollaan suunnittelemassa uutta komponenttia tuotteeseen (esimerkiksi. huopaa, vaneria, lukkojärjestelmää jne. mitä vaan) ja tuotteen ei nyt tarvitse siis olla välttämättä Frameryn tuote vaan tässä muodostetaan yleispätevää mallia. Toimitaan seuraavan prosessimallin mukaisesti:

* Required

Mallissa HPD:llä tarkoitetaan raaka-aineluetteloa



Prosessimalli vielä selitettynä

Selvitetään ensin löytyykö sopiva komponentti, jolle on jo HPD (eli esimerkiksi etsitään löytyykö huopamateriaalia, vaneria tai lukkojärjestelmää jne, jolle löytyy jo HPD)? Mikäli löytyy ja on sopiva (eli hinta ja laatu kohtaa tavoitteet) niin otetaan kyseinen komponentti käyttöön.

Mikäli ei löydy niin löytyykö osaamista määrittää tarkasti mistä materiaaleista ja aineista komponentti

[illegible]

1. **Työtehtäväsi** *
   Mark only one oval.
   - [illegible]
   - [illegible]

2. **Koetko, että pystyisit toimimaan kyseisen mallin mukaisesti?** *
   Mark only one oval.

	1	2	3	4	
E	◯	◯	◯	◯	[illegible]

3. **Vapaa sana liittyen kysymykseen "Koetko, että pystyisit toimimaan kyseisen mallin mukaisesti?"**

4. **Isäisikö kyseinen malli työmääääsi mekittävästi?** *
   Mark only one oval.

	1	2	3	4	
E	◯	◯	◯	◯	[illegible]

5. **Vapaa sana liittyen kysymykseen "Isäisikö kyseinen malli työmääääsi mekittävästi?"**

6. **Koetko, että kyseisen mallin mukaisesti toimiminen mielestäsi helppoa?** *
   Mark only one oval.

	1	2	3	4	
E	◯	◯	◯	◯	[illegible]

7. **Vapaa sana liittyen kysymykseen "Koetko, että kyseisen mallin mukaisesti toimiminen mielestäsi helppoa?"**

8. **Keksitkö malliin jotain kehitettävää?**

Kiitos!

Standard Booth Definition

Framery O

after 1.1.2018

Module/Item	Color/type
Exterior color	*White Glossy*
Doorframe color	*White*
Seat	*Tovi*
Seat color	*Light Gray*
Table type	*Regular*
Table color	*White*
HIFI	*No*
LAN	*No*
Outlet type	*Power with USB*
Hard wire	*No*
Electric system	*Schuko*

before 1.1.2018

Module/Item	Color/type
Exterior color	*White Glossy*
Doorframe color	*White*
Seat	*Adjustable*
Seat color	*Light Gray*
Table type	*Regular*
Table color	*White*
HIFI	*No*
LAN	*No*
Outlet type	*Power only*
Hard wire	*No*
Electric system	*Schuko*

Changes in standard booth definition are highlighted.

Framery Q

Module/Item	Color/type
Furniture set	*Meeting Maggie*
Exterior color	*White Glossy*
Doorframe color	*White*
Seat color	*Gray*
Table typw	*Turnable table*
Backrest	*Left + Right / Right + Left*
Door handedness	*Left*
Center glass	*Normal*
Lighting	*Standard*
LAN	*No*
Outlet type	*Power only*
Hard wire	*No*
Electric system	*Schuko*

Changes in standard booth definition are highlighted.

Framery O
by Framery Oy

Health Product Declaration v2.1

created via: HPDC Online Builder

CLASSIFICATION: 12 51 00

PRODUCT DESCRIPTION: Framery O is designed for making important calls, participating in video conferences and focusing on demanding tasks. The soundproof Framery O tackles the noise issues of the open office, increasing employee satisfaction and productivity. Ideally, the booths are installed in the middle of the workstations for easy access. Framery O features a wide range of colours and a few options for seating and tables. Automatic air ventilation creates a fresh and comfortable working environment. The product is easy to assemble and relocate when necessary.

Section 1: Summary — Nested Method / Product Threshold

CONTENT INVENTORY

Inventory Reporting Format
- (•) Nested Materials Method
- ( ) Basic Method

Threshold Disclosed Per
- ( ) Material
- (•) Product

Threshold level
- (•) 100 ppm
- ( ) 1,000 ppm
- ( ) Per GHS SDS
- ( ) Per OSHA MSDS
- ( ) Other

Residuals/Impurities

Residuals/Impurities Considered in 35 of 35 Materials

Explanation(s) provided for Residuals/Impurities?
- (•) Yes ( ) No

Are All Substances Above the Threshold Indicated:

Characterized (•) Yes ( ) No
Percent Weight and Role Provided?

Screened (•) Yes ( ) No
Using Priority Hazard Lists with Results Disclosed?

Identified ( ) Yes (•) No
Name and Identifier Provided?

CONTENT IN DESCENDING ORDER OF QUANTITY

Summary of product contents and results from screening individual chemical substances against HPD Priority Hazard Lists and the GreenScreen for Safer Chemicals®. The HPD does not assess whether using or handling this product will expose individuals to its chemical substances or any health risk. Refer to Section 2 for further details.

MATERIAL | SUBSTANCE | *RESIDUAL OR IMPURITY* GREENSCREEN SCORE | HAZARD TYPE

BIRCH PLYWOOD [BIRCH (BIRCH PLYWOOD) NoGS PHENOL FORMALDEHYDE LT-P1 | RES WATER (WATER) NoGS LIMESTONE; CALCIUM CARBONATE LT-UNK CELLULOSE, MICROCRYSTALLINE (CELLULOSE) NoGS SODIUM CARBONATE LT-P1 | EYE AMMONIUM CHLORIDE LT-P1 | EYE | END] LAMINATED GLASS [SOLID / PLATE GLASS (FLOAT GLASS) LT-UNK] STAINLESS STEEL [304 STAINLESS STEEL (STAINLESS STEEL) NoGS] FORMPRESSED BIRCH PLYWOOD [BIRCH (BIRCH PLYWOOD) NoGS UREA FORMALDEHYDE LT-P1 | RES WATER (WATER) NoGS KAOLIN NoGS FORMIC ACID BM-2 | SKI RESORCINOL LT-P1 | END | AQU | SKI | EYE] FELT SHEET [POLYETHYLENE TEREPHTHALATE (PET) LT-UNK] ACOUSTIC PANELS [POLYETHYLENE TEREPHTHALATE (PET) LT-UNK] CARBON STEEL [STEEL NoGS] GALVANIZED STEEL [STEEL NoGS ZINC LT-P1 | AQU | END | MUL | PHY] PVB [POLYVINYL BUTYRAL (PVB) LT-UNK] FORMICA LAMINATE [KRAFT PAPER NoGS PHENOL FORMALDEHYDE LT-P1 | RES MELAMINE FORMALDEHYDE NoGS] MAGNET [STEEL NoGS NEODYMIUM-IRON-BORON ALLOY NoGS | PHY | SKI | EYE |] NYLON 66 [NYLON 6,6 LT-UNK] POWDER PAINT [POLYESTER NoGS UNDISCLOSED NoGS | TITANIUM DIOXIDE LT-1 | CAN | END CARBON BLACK LT-1 | CAN] PVC [POLYVINYL CHLORIDE (PVC) LT-P1 | RES] COPPER [COPPER LT-UNK] SEAL [ETHYLENE/PROPYLENE/DIENE TERPOLYMER (EPDM) LT-UNK CARBON BLACK LT-1 | CAN HYDROTREATED HEAVY PARAFFINIC PETROLEUM DISTILLATES (MINERAL OIL) (PARAFFINIC PROCESS OIL) LT-1 | CAN | MUL BENZENE, ETHENYL-, POLYMER WITH 1,3-BUTADIENE, HYDROGENATED LT-UNK] STEEL [STEEL NoGS] POLYCARBONATE [POLYCARBONATE LT-UNK] ALUMINUM [ALUMINUM LT-P1 | RES | END | PHY] POLYURETHANE [POLYURETHANE FOAMS LT-UNK] PBT GF30 [PBT GF30 NoGS] ELECTRONICS [PRINTED CIRCUIT BOARD (PCB) NoGS | RES | END | PHY] ABS [ACRYLONITRILE-BUTADIENE-STYRENE COPOLYMER LT-UNK] SILICONE SEALANT [SILOXANES AND

Number of Greenscreen BM-4/BM3 contents ... 0

Contents highest concern GreenScreen Benchmark or List translator Score ... LT-1

Nanomaterial ... No

INVENTORY AND SCREENING NOTES:

The Material "Electronics" is regarded as Special Condition Material by the HPD Collaborative and thus isn't fully screened. All of the Electronics in Framery O are RoHS compliant.

SILICONES, DI-ME, HYDROXY-TERMINATED BM-2 POLYDIMETHYLSILOXANES LT-P1 | PBT SILICA, AMORPHOUS LT-P1 | CAN DISTILLATES (PETROLEUM), HYDROTREATED MIDDLE LT-1 | CAN | MUL] BRASS [BRASS NoGS |] POLYETHER SULFONE [POLYETHER SULFONE NoGS] NYLON 6 [NYLON 6 LT-UNK] WOOD GLUE [POLYVINYL ACETATE (PVA) LT-UNK] PDMS [POLYDIMETHYLSILOXANES LT-P1 | PBT] CHROMED STAINLESS STEEL [STAINLESS STEEL NoGS CHROMIUM LT-P1 | RES | END | SKI] ZINC [ZINC LT-P1 | AQU | END | MUL | PHY] POM [POLY(OXYMETHYLENE) NoGS] TINNED COPPER [COPPER LT-UNK TIN LT-UNK] WOOL [SHEEPS WOOL NoGS] ZAMAK 3 [ZAMAK 3 NoGS]

VOLATILE ORGANIC COMPOUND (VOC) CONTENT

CERTIFICATIONS AND COMPLIANCE *See Section 3 for additional listings.*

VOC emissions: Compliance for Emission Classification of Building Materials - M1
Multi-attribute: CE marking
Other: IEC CB Scheme
Other: SGS NA NRTL

CONSISTENCY WITH OTHER PROGRAMS

Pre-checked for LEED v4 Material Ingredients, Option 1

Third Party Verified?
- ○ Yes
- ◉ No

PREPARER: Self-Prepared
VERIFIER:
VERIFICATION #:

SCREENING DATE: 2018-08-21
PUBLISHED DATE: 2018-09-03
EXPIRY DATE: 2021-08-21

Section 2: Content in Descending Order of Quantity

This section lists contents in a product based on specific threshold(s) and reports detailed health information including hazards. This HPD uses the inventory method indicated above, which is one of three possible methods:

- *Basic Inventory method with Product-level threshold.*
- *Nested Material Inventory method with Product-level threshold*
- *Nested Material Inventory method with individual Material-level thresholds*

Definitions and requirements for the three inventory methods and requirements for each data field can be found in the HPD Open Standard version 2.1, available on the HPDC website at: www.hpd-collaborative.org/hpd-2-1-standard

BIRCH PLYWOOD

%: 36.0500 - 37.1400 **HPD URL: N/A**

PRODUCT THRESHOLD: 100 ppm RESIDUALS AND IMPURITIES CONSIDERED: Yes

RESIDUALS AND IMPURITIES NOTES: No residuals or impurities are known or expected to be present at or above the Content Inventory Threshold indicated that have a GS score of BM-1, LT-1, LT-P1 or NoGS as predicted by process chemistry (Pharos CML).

OTHER MATERIAL NOTES: Range is given since the weight of the plywood parts vary due to humidity. If any residuals or impurities would be present, those residuals or impurities would be noticed during the quality inspection of the plywood parts and so there aren't expected to be any impurities above the Content Inventory Threshold.

BIRCH (BIRCH PLYWOOD)

ID: Not registered

%: 83.6000 - 91.0000 GS: NoGS RC: UNK NANO: No ROLE: Wood used in plywood.

HAZARDS:	AGENCY(IES) WITH WARNINGS:
None Found	No warnings found on HPD Priority lists

SUBSTANCE NOTES: Range is given from supplier provided information.

PHENOL FORMALDEHYDE

ID: 9003-35-4

%: 6.9000 - 7.5000 GS: LT-P1 RC: UNK NANO: No ROLE: Resin

HAZARDS:	AGENCY(IES) WITH WARNINGS:	
RESPIRATORY	AOEC - Asthmagens	Asthmagen (Rs) - sensitizer-induced

SUBSTANCE NOTES: Range is given from supplier provided information. Added during the plywood manufacturing process and forms plywood with hardener and birch wood veneers.

WATER (WATER)

ID: 558440-22-5

%: 5.0000 - 8.0000 GS: NoGS RC: None NANO: No ROLE: Moisture in the wood

HAZARDS:	AGENCY(IES) WITH WARNINGS:
None Found	No warnings found on HPD Priority lists

SUBSTANCE NOTES: Range is given because plywood moisture content depends on humidity. Other CAS RN: 7732-18-5

LIMESTONE; CALCIUM CARBONATE

ID: 1317-65-3

%: 0.3800 - 1.2000 GS: LT-UNK RC: UNK NANO: No ROLE: Part of hardener

HAZARDS:	AGENCY(IES) WITH WARNINGS:
None Found	No warnings found on HPD Priority lists

SUBSTANCE NOTES: Range is given from supplier provided information. Hardener is added during the plywood manufacturing process.

CELLULOSE, MICROCRYSTALLINE (CELLULOSE)

ID: 9004-34-6

%: 0.1500 - 0.6000 GS: NoGS RC: UNK NANO: No ROLE: Part of hardener

HAZARDS:	AGENCY(IES) WITH WARNINGS:
None Found	No warnings found on HPD Priority lists

SUBSTANCE NOTES: Range is given from supplier provided information. Hardener is added during the plywood manufacturing process.

SODIUM CARBONATE

ID: 497-19-8

%: 0.0800 - 0.2400 GS: LT-P1 RC: UNK NANO: No ROLE: Part of hardener

HAZARDS:	AGENCY(IES) WITH WARNINGS:	
EYE IRRITATION	EU - GHS (H-Statements)	H319 - Causes serious eye irritation

SUBSTANCE NOTES: Range is given from supplier provided information. Hardener is added during the plywood manufacturing process.

AMMONIUM CHLORIDE

ID: 12125-02-9

%: 0.0500 - 0.1200 GS: LT-P1 RC: UNK NANO: No ROLE: Part of hardener

HAZARDS:	AGENCY(IES) WITH WARNINGS:	
EYE IRRITATION	EU - GHS (H-Statements)	H319 - Causes serious eye irritation
ENDOCRINE	TEDX - Potential Endocrine Disruptors	Potential Endocrine Disruptor

SUBSTANCE NOTES: Range is given from supplier provided information. Hardener is added during the plywood manufacturing process.

LAMINATED GLASS

%: 23.3598 HPD URL: N/A

PRODUCT THRESHOLD: 100 ppm RESIDUALS AND IMPURITIES CONSIDERED: Yes

RESIDUALS AND IMPURITIES NOTES: No residuals or impurities are known or expected to be present at or above the Content Inventory Threshold indicated that have a GS score of BM-1, LT-1, LT-P1 or NoGS as predicted by process chemistry (Pharos CML).

OTHER MATERIAL NOTES: If any residuals or impurities would be present, those residuals or impurities would be noticed during the quality inspection of the glasses and so there aren't expected to be any impurities above the Content Inventory Threshold.

SOLID / PLATE GLASS (FLOAT GLASS) ID: 65997-17-3

%: 100.0000 GS: LT-UNK RC: UNK NANO: No ROLE: Glass

HAZARDS:	AGENCY(IES) WITH WARNINGS:
None Found	No warnings found on HPD Priority lists

SUBSTANCE NOTES: The material consists fully of this substance.

STAINLESS STEEL %: 21.6850 HPD URL: N/A

PRODUCT THRESHOLD: 100 ppm RESIDUALS AND IMPURITIES CONSIDERED: Yes

RESIDUALS AND IMPURITIES NOTES: No residuals or impurities are known or expected to be present at or above the Content Inventory Threshold indicated that have a GS score of BM-1, LT-1, LT-P1 or NoGS as predicted by process chemistry (Pharos CML).

OTHER MATERIAL NOTES: If any residuals or impurities would be present, those residuals or impurities would be noticed during the quality inspection of the stainless steel parts and so there aren't expected to be any impurities above the Content Inventory Threshold.

304 STAINLESS STEEL (STAINLESS STEEL) ID: 12597-68-1

%: 100.0000 GS: NoGS RC: UNK NANO: No ROLE: Stainless steel

HAZARDS:	AGENCY(IES) WITH WARNINGS:
None Found	No warnings found on HPD Priority lists

SUBSTANCE NOTES: The material consists fully of this substance.

FORMPRESSED BIRCH PLYWOOD %: 4.7120 - 5.2940 HPD URL: N/A

PRODUCT THRESHOLD: 100 ppm RESIDUALS AND IMPURITIES CONSIDERED: Yes

RESIDUALS AND IMPURITIES NOTES: No residuals or impurities are known or expected to be present at or above the Content Inventory Threshold indicated that have a GS score of BM-1, LT-1, LT-P1 or NoGS as predicted by process chemistry (Pharos CML).

OTHER MATERIAL NOTES: Range is given since the weight of the plywood parts vary due to humidity. If any residuals or impurities would be present, those residuals or impurities would be noticed during the quality inspection of the formpressed plywood parts and so there aren't expected to be any impurities above the Content Inventory Threshold.

BIRCH (BIRCH PLYWOOD)

ID: Not registered

%: 83.6000 - 91.0000 GS: NoGS RC: UNK NANO: No ROLE: Wood used in plywood.

HAZARDS:	AGENCY(IES) WITH WARNINGS:
None Found	No warnings found on HPD Priority lists

SUBSTANCE NOTES: Range is given from supplier provided information.

UREA FORMALDEHYDE

ID: 9011-05-6

%: 7.5000 GS: LT-P1 RC: UNK NANO: No ROLE: Resin

HAZARDS:	AGENCY(IES) WITH WARNINGS:	
RESPIRATORY	AOEC - Asthmagens	Asthmagen (Rs) - sensitizer-induced

SUBSTANCE NOTES: Adhesive substance in formpressed plywood

WATER (WATER)

ID: 558440-22-5

%: 5.0000 - 8.0000 GS: NoGS RC: None NANO: No ROLE: Moisture in the wood

HAZARDS:	AGENCY(IES) WITH WARNINGS:
None Found	No warnings found on HPD Priority lists

SUBSTANCE NOTES: Range is given because plywood moisture content depends on humidity. Other CAS RN: 7732-18-5

KAOLIN

ID: 12198-85-5

%: 0.1000 - 0.6000 GS: NoGS RC: UNK NANO: No ROLE: Part of hardener

HAZARDS:	AGENCY(IES) WITH WARNINGS:
None Found	No warnings found on HPD Priority lists

SUBSTANCE NOTES: Range is given to protect intellectual property of the hardener manufacturer.

FORMIC ACID

ID: 64-18-6

%: 0.1000 - 0.6000 GS: BM-2 RC: UNK NANO: No ROLE: Part of hardener

HAZARDS:	AGENCY(IES) WITH WARNINGS:	
SKIN IRRITATION	EU - GHS (H-Statements)	H314 - Causes severe skin burns and eye damage

SUBSTANCE NOTES: Range is given to protect intellectual property of the hardener manufacturer.

RESORCINOL

ID: 108-46-3

%: 0.0100 - 0.9000 GS: LT-P1 RC: UNK NANO: No ROLE: Part of hardener

HAZARDS:	AGENCY(IES) WITH WARNINGS:	
ENDOCRINE	EU - Priority Endocrine Disruptors	Category 1 - In vivo evidence of Endocrine Disruption Activity
ACUTE AQUATIC	EU - GHS (H-Statements)	H400 - Very toxic to aquatic life
SKIN IRRITATION	EU - GHS (H-Statements)	H315 - Causes skin irritation
EYE IRRITATION	EU - GHS (H-Statements)	H319 - Causes serious eye irritation
ENDOCRINE	ChemSec - SIN List	Endocrine Disruption
ENDOCRINE	TEDX - Potential Endocrine Disruptors	Potential Endocrine Disruptor
SKIN SENSITIZE	MAK	Sensitizing Substance Sh - Danger of skin sensitization

SUBSTANCE NOTES: Range is given to protect intellectual property of the hardener manufacturer.

FELT SHEET

%: 3.1325 HPD URL: N/A

PRODUCT THRESHOLD: 100 ppm RESIDUALS AND IMPURITIES CONSIDERED: Yes

RESIDUALS AND IMPURITIES NOTES: No residuals or impurities are known or expected to be present at or above the Content Inventory Threshold indicated that have a GS score of BM-1, LT-1, LT-P1 or NoGS as predicted by process chemistry (Pharos CML).

OTHER MATERIAL NOTES: If any residuals or impurities would be present, those residuals or impurities would be noticed during the quality inspection of the felt parts and so there aren't expected to be any impurities above the Content Inventory Threshold.

POLYETHYLENE TEREPHTHALATE (PET)

ID: 25038-59-9

%: 100.0000 GS: LT-UNK RC: PostC NANO: No ROLE: PET

HAZARDS:	AGENCY(IES) WITH WARNINGS:
None Found	No warnings found on HPD Priority lists

SUBSTANCE NOTES: The material consists fully of this substance. Supplier has stated that "30% of our felt material is made from recycled material".

ACOUSTIC PANELS

%: 2.6352 HPD URL: N/A

PRODUCT THRESHOLD: 100 ppm RESIDUALS AND IMPURITIES CONSIDERED: Yes

RESIDUALS AND IMPURITIES NOTES: No residuals or impurities are known or expected to be present at or above the Content Inventory Threshold indicated that have a GS score of BM-1, LT-1, LT-P1 or NoGS as predicted by process chemistry

(Pharos CML).

OTHER MATERIAL NOTES: If any residuals or impurities would be present, those residuals or impurities would be noticed during the quality inspection of the acoustic panel parts and so there aren't expected to be any impurities above the Content Inventory Threshold.

POLYETHYLENE TEREPHTHALATE (PET) ID: 25038-59-9

%: 100.0000 GS: LT-UNK RC: PostC NANO: No ROLE: PET

HAZARDS:	AGENCY(IES) WITH WARNINGS:
None Found	No warnings found on HPD Priority lists

SUBSTANCE NOTES: The material consists fully of this substance. Supplier has stated that part of the PET is recycled.

CARBON STEEL %: 1.4863 HPD URL: N/A

PRODUCT THRESHOLD: 100 ppm RESIDUALS AND IMPURITIES CONSIDERED: Yes

RESIDUALS AND IMPURITIES NOTES: No residuals or impurities are known or expected to be present at or above the Content Inventory Threshold indicated that have a GS score of BM-1, LT-1, LT-P1 or NoGS as predicted by process chemistry (Pharos CML).

OTHER MATERIAL NOTES: If any residuals or impurities would be present, those residuals or impurities would be noticed during the installation of carbon steel parts and so there aren't expected to be any impurities above the Content Inventory Threshold.

STEEL ID: 12597-69-2

%: 100.0000 GS: NoGS RC: UNK NANO: No ROLE: Carbon steel

HAZARDS:	AGENCY(IES) WITH WARNINGS:
None Found	No warnings found on HPD Priority lists

SUBSTANCE NOTES: The material consists fully of this substance.

GALVANIZED STEEL %: 1.4600 HPD URL: N/A

PRODUCT THRESHOLD: 100 ppm RESIDUALS AND IMPURITIES CONSIDERED: Yes

RESIDUALS AND IMPURITIES NOTES: No residuals or impurities are known or expected to be present at or above the Content Inventory Threshold indicated that have a GS score of BM-1, LT-1, LT-P1 or NoGS as predicted by process chemistry (Pharos CML).

OTHER MATERIAL NOTES: If any residuals or impurities would be present, those residuals or impurities would be noticed when the galvanized steel parts are handled and so there aren't expected to be any impurities above the Content Inventory Threshold.

STEEL ID: 12597-69-2

%: **98.5000 - 99.9000** GS: **NoGS** RC: **UNK** NANO: **No** ROLE: **Steel part of galvanized steel**

HAZARDS:	AGENCY(IES) WITH WARNINGS:
None Found	No warnings found on HPD Priority lists

SUBSTANCE NOTES: Range is given since the galvanizing varies depending on the galvanized steel component.

ZINC

ID: **7440-66-6**

%: **0.1000 - 1.5000** GS: **LT-P1** RC: **UNK** NANO: **No** ROLE: **Zinc part of galvanized steel**

HAZARDS:	AGENCY(IES) WITH WARNINGS:	
ACUTE AQUATIC	EU - GHS (H-Statements)	H400 - Very toxic to aquatic life
CHRON AQUATIC	EU - GHS (H-Statements)	H410 - Very toxic to aquatic life with long lasting effects
ENDOCRINE	TEDX - Potential Endocrine Disruptors	Potential Endocrine Disruptor
MULTIPLE	German FEA - Substances Hazardous to Waters	Class 2 - Hazard to Waters
PHYSICAL HAZARD (REACTIVE)	EU - GHS (H-Statements)	H250 - Catches fire spontaneously if exposed to air
PHYSICAL HAZARD (REACTIVE)	EU - GHS (H-Statements)	H260 - In contact with water releases flammable gases which may ignite spontaneously

SUBSTANCE NOTES: Range is given since the galvanizing varies depending on the galvanized steel component.

PVB

%: 0.7473 **HPD URL: N/A**

PRODUCT THRESHOLD: 100 ppm RESIDUALS AND IMPURITIES CONSIDERED: Yes

RESIDUALS AND IMPURITIES NOTES: No residuals or impurities are known or expected to be present at or above the Content Inventory Threshold indicated that have a GS score of BM-1, LT-1, LT-P1 or NoGS as predicted by process chemistry (Pharos CML).

OTHER MATERIAL NOTES: If any residuals or impurities would be present in PVB, those residuals or impurities would be noticed during the quality inspection of the glasses and so there aren't expected to be any impurities above the Content Inventory Threshold.

POLYVINYL BUTYRAL (PVB)

ID: **63148-65-2**

%: **100.0000** GS: **LT-UNK** RC: **UNK** NANO: **No** ROLE: **Acoustical material**

HAZARDS:	AGENCY(IES) WITH WARNINGS:
None Found	No warnings found on HPD Priority lists

SUBSTANCE NOTES: The material consists fully of this substance.

FORMICA LAMINATE %: 0.7400 HPD URL: N/A

PRODUCT THRESHOLD: 100 ppm RESIDUALS AND IMPURITIES CONSIDERED: Yes

RESIDUALS AND IMPURITIES NOTES: No residuals or impurities are known or expected to be present at or above the Content Inventory Threshold indicated that have a GS score of BM-1, LT-1, LT-P1 or NoGS as predicted by process chemistry (Pharos CML).

OTHER MATERIAL NOTES: If there would be any residuals or impurities above the Content Inventory Threshold level, those residuals or impurities would be noticed since amount of the material in the end product is low.

KRAFT PAPER ID: Not registered

%: 60.0000 - 77.0000 GS: NoGS RC: UNK NANO: No ROLE: Kraft paper

HAZARDS:	AGENCY(IES) WITH WARNINGS:
None Found	No warnings found on HPD Priority lists

SUBSTANCE NOTES: Range is given from supplier provided information.

PHENOL FORMALDEHYDE ID: 9003-35-4

%: 20.0000 - 25.0000 GS: LT-P1 RC: UNK NANO: No ROLE: Resin

HAZARDS:	AGENCY(IES) WITH WARNINGS:	
RESPIRATORY	AOEC - Asthmagens	Asthmagen (Rs) - sensitizer-induced

SUBSTANCE NOTES: Range is given from supplier provided information.

MELAMINE FORMALDEHYDE ID: 94645-56-4

%: 5.0000 - 12.0000 GS: NoGS RC: UNK NANO: No ROLE: Resin

HAZARDS:	AGENCY(IES) WITH WARNINGS:
None Found	No warnings found on HPD Priority lists

SUBSTANCE NOTES: Range is given from supplier provided information.

MAGNET %: 0.4708 HPD URL: N/A

PRODUCT THRESHOLD: 100 ppm RESIDUALS AND IMPURITIES CONSIDERED: Yes

RESIDUALS AND IMPURITIES NOTES: No residuals or impurities are known or expected to be present at or above the Content Inventory Threshold indicated that have a GS score of BM-1, LT-1, LT-P1 or NoGS as predicted by process chemistry (Pharos CML).

OTHER MATERIAL NOTES: If there would be any residuals or impurities above the Content Inventory Threshold level, those residuals or impurities would be noticed since amount of the material in the end product is low.

STEEL

ID: 12597-69-2

%: 58.5000 - 59.5000 GS: NoGS RC: UNK NANO: No ROLE: Steel part of magnets

HAZARDS:	AGENCY(IES) WITH WARNINGS:
None Found	No warnings found on HPD Priority lists

SUBSTANCE NOTES: Amount of steel depends on the size of the magnet.

NEODYMIUM-IRON-BORON ALLOY

ID: 918106-59-9

%: 38.5000 - 39.5000 GS: NoGS RC: UNK NANO: No ROLE: Magnetic alloy

HAZARDS:	AGENCY(IES) WITH WARNINGS:	
PHYSICAL HAZARD (REACTIVE)	EU - GHS (H-Statements)	H228 - Flammable solid
PHYSICAL HAZARD (REACTIVE)	EU - GHS (H-Statements)	H250 - Catches fire spontaneously if exposed to air
SKIN IRRITATION	EU - GHS (H-Statements)	H315 - Causes skin irritation
EYE IRRITATION	EU - GHS (H-Statements)	H319 - Causes serious eye irritation
ORGAN TOXICANT	EU - GHS (H-Statements)	H335 - May cause respiratory irritation
ACUTE AQUATIC	EU - Manufacturer REACH hazard submissions	H402 - Aquatic Acute 3 - Harmful to aquatic life (unverified)
CHRON AQUATIC	EU - GHS (H-Statements)	H412 - Harmful to aquatic life with long lasting effects

SUBSTANCE NOTES: Amount of neodymium-iron-boron alloy depends on the size of the magnet.

NYLON 66

%: 0.3983 HPD URL: N/A

PRODUCT THRESHOLD: 100 ppm RESIDUALS AND IMPURITIES CONSIDERED: Yes

RESIDUALS AND IMPURITIES NOTES: No residuals or impurities are known or expected to be present at or above the Content Inventory Threshold indicated that have a GS score of BM-1, LT-1, LT-P1 or NoGS as predicted by process chemistry (Pharos CML).

OTHER MATERIAL NOTES: If there would be any residuals or impurities above the Content Inventory Threshold level, those residuals or impurities would be noticed since amount of the material in the end product is low.

NYLON 6,6

ID: 32131-17-2

%: 100.0000 GS: LT-UNK RC: UNK NANO: No ROLE: Nylon 66

HAZARDS:	AGENCY(IES) WITH WARNINGS:
None Found	No warnings found on HPD Priority lists

SUBSTANCE NOTES: The material consists fully of this substance.

POWDER PAINT %: 0.3659 HPD URL: N/A

PRODUCT THRESHOLD: 100 ppm RESIDUALS AND IMPURITIES CONSIDERED: Yes

RESIDUALS AND IMPURITIES NOTES: No residuals or impurities are known or expected to be present at or above the Content Inventory Threshold indicated that have a GS score of BM-1, LT-1, LT-P1 or NoGS as predicted by process chemistry (Pharos CML).

OTHER MATERIAL NOTES: Colours are black and white, because these colours are used in the standard models. If there would be any residuals or impurities above the Content Inventory Threshold level, those residuals or impurities would be noticed since amount of the material in the end product is low.

POLYESTER ID: 113669-95-7

%: 50.0000 - 70.0000 GS: NoGS RC: UNK NANO: No ROLE: Adhesive

HAZARDS:	AGENCY(IES) WITH WARNINGS:
None Found	No warnings found on HPD Priority lists

SUBSTANCE NOTES: Range is given to protect powder coat manufacturer intellectual property.

UNDISCLOSED ID: Not Registered

%: 5.0000 - 50.0000 GS: NoGS RC: UNK NANO: No ROLE: Filler and auxiliary agents

HAZARDS:	AGENCY(IES) WITH WARNINGS:	
CHRON AQUATIC	EU - GHS (H-Statements)	H412 - Harmful to aquatic life with long lasting effects

SUBSTANCE NOTES: Range is given since the amount of fillers and auxiliary agents depend on the colour. Powder paint supplier identifies that as the powder paint is applied to the metallic parts of the product, the chemistry of the powder paint filler and auxiliary agents is changed and thus a specific CAS number listing is incredibly difficult. HPDC recognises these reaction products as Special Condition in Version SC-1.0. Hazards have been identified from the supplier provided SDS.

TITANIUM DIOXIDE ID: 13463-67-7

%: 0.0000 - 30.0000 GS: LT-1 RC: UNK NANO: No ROLE: Pigment

HAZARDS:	AGENCY(IES) WITH WARNINGS:	
CANCER	US CDC - Occupational Carcinogens	Occupational Carcinogen
CANCER	CA EPA - Prop 65	Carcinogen - specific to chemical form or exposure route
CANCER	IARC	Group 2B - Possibly carcinogenic to humans - inhaled from occupational sources
ENDOCRINE	TEDX - Potential Endocrine Disruptors	Potential Endocrine Disruptor
CANCER	MAK	Carcinogen Group 3A - Evidence of carcinogenic effects but not sufficient to establish MAK/BAT value
CANCER	MAK	Carcinogen Group 4 - Non-genotoxic carcinogen with low

	risk under MAK/BAT levels

SUBSTANCE NOTES: Range is given to protect powder coat manufacturer intellectual property and because the pigment depends on the colour.

CARBON BLACK ID: 1333-86-4

%: 0.0000 - 1.0000 GS: LT-1 RC: UNK NANO: No ROLE: Pigment

HAZARDS:	AGENCY(IES) WITH WARNINGS:	
CANCER	US CDC - Occupational Carcinogens	Occupational Carcinogen
CANCER	CA EPA - Prop 65	Carcinogen - specific to chemical form or exposure route
CANCER	IARC	Group 2B - Possibly carcinogenic to humans - inhaled from occupational sources
CANCER	MAK	Carcinogen Group 3B - Evidence of carcinogenic effects but not sufficient for classification

SUBSTANCE NOTES: Range is given to protect powder coat manufacturer intellectual property and because the pigment depends on the colour.

PVC %: 0.2331 HPD URL: N/A

PRODUCT THRESHOLD: 100 ppm RESIDUALS AND IMPURITIES CONSIDERED: Yes

RESIDUALS AND IMPURITIES NOTES: No residuals or impurities are known or expected to be present at or above the Content Inventory Threshold indicated that have a GS score of BM-1, LT-1, LT-P1 or NoGS as predicted by process chemistry (Pharos CML).

OTHER MATERIAL NOTES: If there would be any residuals or impurities above the Content Inventory Threshold level, those residuals or impurities would be noticed since amount of the material in the end product is low.

POLYVINYL CHLORIDE (PVC) ID: 9002-86-2

%: 100.0000 GS: LT-P1 RC: UNK NANO: No ROLE: PVC

HAZARDS:	AGENCY(IES) WITH WARNINGS:	
RESPIRATORY	AOEC - Asthmagens	Asthmagen (Rs) - sensitizer-induced

SUBSTANCE NOTES: The material consists fully of this substance.

COPPER %: 0.2040 HPD URL: N/A

PRODUCT THRESHOLD: 100 ppm RESIDUALS AND IMPURITIES CONSIDERED: Yes

RESIDUALS AND IMPURITIES NOTES: No residuals or impurities are known or expected to be present at or above the Content Inventory Threshold indicated that have a GS score of BM-1, LT-1, LT-P1 or NoGS as predicted by process chemistry (Pharos CML).

OTHER MATERIAL NOTES: Residuals or impurities above the Content Inventory Threshold level would make over 5% of the weight of the material and so residuals and impurities above the Content Inventory Threshold level aren't expected to be present in the material.

COPPER ID: 7440-50-8

%: 100.0000 GS: LT-UNK RC: UNK NANO: No ROLE: Copper

HAZARDS:	AGENCY(IES) WITH WARNINGS:
None Found	No warnings found on HPD Priority lists

SUBSTANCE NOTES: The material consists fully of this substance.

SEAL %: 0.1875 HPD URL: N/A

PRODUCT THRESHOLD: 100 ppm RESIDUALS AND IMPURITIES CONSIDERED: Yes

RESIDUALS AND IMPURITIES NOTES: No residuals or impurities are known or expected to be present at or above the Content Inventory Threshold indicated that have a GS score of BM-1, LT-1, LT-P1 or NoGS as predicted by process chemistry (Pharos CML).

OTHER MATERIAL NOTES: Residuals or impurities above the Content Inventory Threshold level would make over 5% of the weight of the material and so residuals and impurities above the Content Inventory Threshold level aren't expected to be present in the material.

ETHYLENE/PROPYLENE/DIENE TERPOLYMER (EPDM) ID: 25038-36-2

%: 20.0000 - 60.0000 GS: LT-UNK RC: UNK NANO: No ROLE: Seal

HAZARDS:	AGENCY(IES) WITH WARNINGS:
None Found	No warnings found on HPD Priority lists

SUBSTANCE NOTES: Range is given from the supplier provided information. Range is also given since the seal substances are dependent on the seal.

CARBON BLACK ID: 1333-86-4

%: 20.0000 - 60.0000 GS: LT-1 RC: UNK NANO: No ROLE: Pigment

HAZARDS:	AGENCY(IES) WITH WARNINGS:	
CANCER	US CDC - Occupational Carcinogens	Occupational Carcinogen
CANCER	CA EPA - Prop 65	Carcinogen - specific to chemical form or exposure route
CANCER	IARC	Group 2B - Possibly carcinogenic to humans - inhaled from occupational sources
CANCER	MAK	Carcinogen Group 3B - Evidence of carcinogenic effects

		but not sufficient for classification

SUBSTANCE NOTES: Range is given from the supplier provided information. Range is also given since the seal substances are dependent on the seal.

HYDROTREATED HEAVY PARAFFINIC PETROLEUM DISTILLATES (MINERAL OIL) (PARAFFINIC PROCESS OIL) ID: 64742-54-7

%: 15.0000 - 50.0000 GS: LT-1 RC: UNK NANO: No ROLE: Softener

HAZARDS:	AGENCY(IES) WITH WARNINGS:	
CANCER	EU - GHS (H-Statements)	H350 - May cause cancer
CANCER	EU - REACH Annex XVII CMRs	Carcinogen Category 2 - Substances which should be regarded as if they are Carcinogenic to man
MULTIPLE	ChemSec - SIN List	CMR - Carcinogen, Mutagen &/or Reproductive Toxicant
CANCER	EU - Annex VI CMRs	Carcinogen Category 1B - Presumed Carcinogen based on animal evidence
CANCER	Australia - GHS	H350 - May cause cancer

SUBSTANCE NOTES: Range is given from the supplier provided information. Range is also given since the seal substances are dependent on the seal.

BENZENE, ETHENYL-, POLYMER WITH 1,3-BUTADIENE, HYDROGENATED ID: 66070-58-4

%: 0.0000 - 100.0000 GS: LT-UNK RC: UNK NANO: No ROLE: Seal

HAZARDS:	AGENCY(IES) WITH WARNINGS:
None Found	No warnings found on HPD Priority lists

SUBSTANCE NOTES: Range is given from the supplier provided information. Range is also given since the seal substances are dependent on the seal.

STEEL %: 0.1416 HPD URL: N/A

PRODUCT THRESHOLD: 100 ppm RESIDUALS AND IMPURITIES CONSIDERED: Yes

RESIDUALS AND IMPURITIES NOTES: No residuals or impurities are known or expected to be present at or above the Content Inventory Threshold indicated that have a GS score of BM-1, LT-1, LT-P1 or NoGS as predicted by process chemistry (Pharos CML).

OTHER MATERIAL NOTES: Residuals or impurities above the Content Inventory Threshold level would make over 5% of the weight of the material and so residuals and impurities above the Content Inventory Threshold level aren't expected to be present in the material.

STEEL ID: 12597-69-2

%: **100.0000** GS: **NoGS** RC: **UNK** NANO: **No** ROLE: **Steel**

HAZARDS:	AGENCY(IES) WITH WARNINGS:
None Found	No warnings found on HPD Priority lists

SUBSTANCE NOTES: The material consists fully of this substance.

POLYCARBONATE %: 0.1236 HPD URL: N/A

PRODUCT THRESHOLD: 100 ppm RESIDUALS AND IMPURITIES CONSIDERED: Yes

RESIDUALS AND IMPURITIES NOTES: No residuals or impurities are known or expected to be present at or above the Content Inventory Threshold indicated that have a GS score of BM-1, LT-1, LT-P1 or NoGS as predicted by process chemistry (Pharos CML).

OTHER MATERIAL NOTES: Residuals or impurities above the Content Inventory Threshold level would make over 5% of the weight of the material and so residuals and impurities above the Content Inventory Threshold level aren't expected to be present in the material.

POLYCARBONATE ID: 25037-45-0

%: **100.0000** GS: **LT-UNK** RC: **UNK** NANO: **No** ROLE: **Polycarbonate**

HAZARDS:	AGENCY(IES) WITH WARNINGS:
None Found	No warnings found on HPD Priority lists

SUBSTANCE NOTES: The material consists fully of this substance.

ALUMINUM %: 0.1229 HPD URL:

PRODUCT THRESHOLD: 100 ppm RESIDUALS AND IMPURITIES CONSIDERED: Yes

RESIDUALS AND IMPURITIES NOTES: No residuals or impurities are known or expected to be present at or above the Content Inventory Threshold indicated that have a GS score of BM-1, LT-1, LT-P1 or NoGS as predicted by process chemistry (Pharos CML).

OTHER MATERIAL NOTES: Residuals or impurities above the Content Inventory Threshold level would make over 5% of the weight of the material and so residuals and impurities above the Content Inventory Threshold level aren't expected to be present in the material.

ALUMINUM ID: 91728-14-2

%: **100.0000** GS: **LT-P1** RC: **UNK** NANO: **No** ROLE: **Aluminum**

HAZARDS:	AGENCY(IES) WITH WARNINGS:	
RESPIRATORY	AOEC - Asthmagens	Asthmagen (ARs) - sensitizer-induced - inhalable forms only
ENDOCRINE	TEDX - Potential Endocrine Disruptors	Potential Endocrine Disruptor

PHYSICAL HAZARD (REACTIVE)	EU - GHS (H-Statements)	H228 - Flammable solid
PHYSICAL HAZARD (REACTIVE)	EU - GHS (H-Statements)	H250 - Catches fire spontaneously if exposed to air
PHYSICAL HAZARD (REACTIVE)	EU - GHS (H-Statements)	H261 - In contact with water releases flammable gases

SUBSTANCE NOTES: Material consists fully of this substance. Hazards identified concern aluminum in powder or fumigated state. Aluminum parts used in Framery products are machined or extruded solid aluminum parts and thus the hazards identified do not concern the parts used in Framery's products.

POLYURETHANE

%: 0.1169 **HPD URL: N/A**

PRODUCT THRESHOLD: 100 ppm RESIDUALS AND IMPURITIES CONSIDERED: Yes

RESIDUALS AND IMPURITIES NOTES: No residuals or impurities are known or expected to be present at or above the Content Inventory Threshold indicated that have a GS score of BM-1, LT-1, LT-P1 or NoGS as predicted by process chemistry (Pharos CML).

OTHER MATERIAL NOTES: Residuals or impurities above the Content Inventory Threshold level would make over 5% of the weight of the material and so residuals and impurities above the Content Inventory Threshold level aren't expected to be present in the material.

POLYURETHANE FOAMS

ID: 9009-54-5

%: **100.0000** GS: **LT-UNK** RC: **UNK** NANO: **No** ROLE: **Foam**

HAZARDS:	AGENCY(IES) WITH WARNINGS:
None Found	No warnings found on HPD Priority lists

SUBSTANCE NOTES: The material consists fully of this substance.

PBT GF30

%: 0.1137 **HPD URL: N/A**

PRODUCT THRESHOLD: 100 ppm RESIDUALS AND IMPURITIES CONSIDERED: Yes

RESIDUALS AND IMPURITIES NOTES: No residuals or impurities are known or expected to be present at or above the Content Inventory Threshold indicated that have a GS score of BM-1, LT-1, LT-P1 or NoGS as predicted by process chemistry (Pharos CML).

OTHER MATERIAL NOTES: Residuals or impurities above the Content Inventory Threshold level would make over 5% of the weight of the material and so residuals and impurities above the Content Inventory Threshold level aren't expected to be present in the material.

PBT GF30

ID: Not registered

%: **100.0000** GS: **NoGS** RC: **UNK** NANO: **No** ROLE: **PBT GF30**

HAZARDS:	AGENCY(IES) WITH WARNINGS:
None Found	No warnings found on HPD Priority lists

SUBSTANCE NOTES: The material consists fully of this substance.

ELECTRONICS %: 0.0796 HPD URL: N/A

PRODUCT THRESHOLD: 100 ppm RESIDUALS AND IMPURITIES CONSIDERED: Yes

RESIDUALS AND IMPURITIES NOTES: No residuals or impurities are known or expected to be present at or above the Content Inventory Threshold indicated that have a GS score of BM-1, LT-1, LT-P1 or NoGS as predicted by process chemistry (Pharos CML).

OTHER MATERIAL NOTES: Special Condition Applied: Electronics

PRINTED CIRCUIT BOARD (PCB) ID: Not Registered

%: 100.0000 GS: NoGS RC: UNK NANO: No ROLE: Printed Circuit Board

HAZARDS:	AGENCY(IES) WITH WARNINGS:	
RESPIRATORY	AOEC - Asthmagens	Asthmagen (ARs) - sensitizer-induced - inhalable forms only
ENDOCRINE	TEDX - Potential Endocrine Disruptors	Potential Endocrine Disruptor
PHYSICAL HAZARD (REACTIVE)	EU - GHS (H-Statements)	H228 - Flammable solid
PHYSICAL HAZARD (REACTIVE)	EU - GHS (H-Statements)	H250 - Catches fire spontaneously if exposed to air
PHYSICAL HAZARD (REACTIVE)	EU - GHS (H-Statements)	H261 - In contact with water releases flammable gases

SUBSTANCE NOTES: Version = SCElec/2018-02-23. Electronics used to control the electrical sockets, lights and fans in the product. All electronics in Framery O are RoHS compliant. As a take-back program Framery is member of Elker: http://www.elker.fi/en/producers/producer-responsibility/producer-responsibility. Hazards have been identified from the aluminum contained in the electronics. Aluminum used in electronics is in solid state form and thus the hazards don't concern the electronics (Check further information from the "Aluminum" material).

ABS %: 0.0774 HPD URL: N/A

PRODUCT THRESHOLD: 100 ppm RESIDUALS AND IMPURITIES CONSIDERED: Yes

RESIDUALS AND IMPURITIES NOTES: No residuals or impurities are known or expected to be present at or above the Content Inventory Threshold indicated that have a GS score of BM-1, LT-1, LT-P1 or NoGS as predicted by process chemistry (Pharos CML).

OTHER MATERIAL NOTES: Residuals or impurities above the Content Inventory Threshold level would make over 5% of the weight of the material and so residuals and impurities above the Content Inventory Threshold level aren't expected to be present in the material.

ACRYLONITRILE-BUTADIENE-STYRENE COPOLYMER ID: 9003-56-9

%: 100.0000 GS: LT-UNK RC: UNK NANO: No ROLE: ABS plastic

HAZARDS:	AGENCY(IES) WITH WARNINGS:	

None Found	No warnings found on HPD Priority lists

SUBSTANCE NOTES: The material consists fully of this substance.

SILICONE SEALANT %: 0.0708 HPD URL: N/A

PRODUCT THRESHOLD: 100 ppm RESIDUALS AND IMPURITIES CONSIDERED: Yes

RESIDUALS AND IMPURITIES NOTES: No residuals or impurities are known or expected to be present at or above the Content Inventory Threshold indicated that have a GS score of BM-1, LT-1, LT-P1 or NoGS as predicted by process chemistry (Pharos CML).

OTHER MATERIAL NOTES: Residuals or impurities above the Content Inventory Threshold level would make over 5% of the weight of the material and so residuals and impurities above the Content Inventory Threshold level aren't expected to be present in the material.

SILOXANES AND SILICONES, DI-ME, HYDROXY-TERMINATED ID: 70131-67-8

%: 50.0000 - 60.0000 GS: BM-2 RC: UNK NANO: No ROLE: Adhesive

HAZARDS:	AGENCY(IES) WITH WARNINGS:
None Found	No warnings found on HPD Priority lists

SUBSTANCE NOTES: Range is given from supplier provided information.

POLYDIMETHYLSILOXANES ID: 63148-62-9

%: 15.0000 - 20.0000 GS: LT-P1 RC: UNK NANO: No ROLE: Adhesive

HAZARDS:	AGENCY(IES) WITH WARNINGS:	
PBT	EC - CEPA DSL	Persistent, Bioaccumulative and inherently Toxic (PBiTH) to humans

SUBSTANCE NOTES: Range is given from supplier provided information.

SILICA, AMORPHOUS ID: 7631-86-9

%: 5.0000 - 10.0000 GS: LT-P1 RC: UNK NANO: No ROLE: Adhesive

HAZARDS:	AGENCY(IES) WITH WARNINGS:	
CANCER	Japan - GHS	Carcinogenicity - Category 1A
CANCER	Australia - GHS	H350i - May cause cancer by inhalation

SUBSTANCE NOTES: Range is given from supplier provided information.

DISTILLATES (PETROLEUM), HYDROTREATED MIDDLE ID: 64742-46-7

%: 1.0000 - 10.0000 GS: LT-1 RC: UNK NANO: No ROLE: Adhesive

HAZARDS:	AGENCY(IES) WITH WARNINGS:	
CANCER	EU - GHS (H-Statements)	H350 - May cause cancer
CANCER	EU - REACH Annex XVII CMRs	Carcinogen Category 2 - Substances which should be regarded as if they are Carcinogenic to man
MULTIPLE	ChemSec - SIN List	CMR - Carcinogen, Mutagen &/or Reproductive Toxicant
MULTIPLE	German FEA - Substances Hazardous to Waters	Class 2 - Hazard to Waters
CANCER	EU - Annex VI CMRs	Carcinogen Category 1B - Presumed Carcinogen based on animal evidence
CANCER	Australia - GHS	H350 - May cause cancer

SUBSTANCE NOTES: Range is given from supplier provided information.

BRASS %: 0.0686 HPD URL: N/A

PRODUCT THRESHOLD: 100 ppm RESIDUALS AND IMPURITIES CONSIDERED: Yes

RESIDUALS AND IMPURITIES NOTES: No residuals or impurities are known or expected to be present at or above the Content Inventory Threshold indicated that have a GS score of BM-1, LT-1, LT-P1 or NoGS as predicted by process chemistry (Pharos CML).

OTHER MATERIAL NOTES: Residuals or impurities above the Content Inventory Threshold level would make over 5% of the weight of the material and so residuals and impurities above the Content Inventory Threshold level aren't expected to be present in the material.

BRASS ID: 63338-02-3

%: 100.0000 GS: NoGS RC: UNK NANO: No ROLE: Brass alloy

HAZARDS:	AGENCY(IES) WITH WARNINGS:	
ACUTE AQUATIC	Australia - GHS	H400 - Very toxic to aquatic life M = 10

SUBSTANCE NOTES: The material consists fully of this substance. Substance hazards have been identified from a SDS about Brass.

POLYETHER SULFONE %: 0.0682 HPD URL: N/A

PRODUCT THRESHOLD: 100 ppm RESIDUALS AND IMPURITIES CONSIDERED: Yes

RESIDUALS AND IMPURITIES NOTES: No residuals or impurities are known or expected to be present at or above the Content Inventory Threshold indicated that have a GS score of BM-1, LT-1, LT-P1 or NoGS as predicted by process chemistry (Pharos CML).

OTHER MATERIAL NOTES: Residuals or impurities above the Content Inventory Threshold level would make over 5% of the weight of the material and so residuals and impurities above the Content Inventory Threshold level aren't expected to be present in the material.

POLYETHER SULFONE ID: 25667-42-9

%: 100.0000 GS: NoGS RC: UNK NANO: No ROLE: Polyether sulfone

HAZARDS:	AGENCY(IES) WITH WARNINGS:
None Found	No warnings found on HPD Priority lists

SUBSTANCE NOTES: The material consists fully of this substance.

NYLON 6 %: 0.0604 HPD URL: N/A

PRODUCT THRESHOLD: 100 ppm RESIDUALS AND IMPURITIES CONSIDERED: Yes

RESIDUALS AND IMPURITIES NOTES: No residuals or impurities are known or expected to be present at or above the Content Inventory Threshold indicated that have a GS score of BM-1, LT-1, LT-P1 or NoGS as predicted by process chemistry (Pharos CML).

OTHER MATERIAL NOTES: Residuals or impurities above the Content Inventory Threshold level would make over 5% of the weight of the material and so residuals and impurities above the Content Inventory Threshold level aren't expected to be present in the material.

NYLON 6 ID: 25038-54-4

%: 100.0000 GS: LT-UNK RC: UNK NANO: No ROLE: Nylon 6

HAZARDS:	AGENCY(IES) WITH WARNINGS:
None Found	No warnings found on HPD Priority lists

SUBSTANCE NOTES: The material consists fully of this substance.

WOOD GLUE %: 0.0463 HPD URL: N/A

PRODUCT THRESHOLD: 100 ppm RESIDUALS AND IMPURITIES CONSIDERED: Yes

RESIDUALS AND IMPURITIES NOTES: No residuals or impurities are known or expected to be present at or above the Content Inventory Threshold indicated that have a GS score of BM-1, LT-1, LT-P1 or NoGS as predicted by process chemistry (Pharos CML).

OTHER MATERIAL NOTES: Residuals or impurities above the Content Inventory Threshold level would make over 5% of the weight of the material and so residuals and impurities above the Content Inventory Threshold level aren't expected to be present in the material.

POLYVINYL ACETATE (PVA) ID: 9003-20-7

%: 99.0000 - 99.5000 GS: LT-UNK RC: UNK NANO: No ROLE: Adhesive

HAZARDS:	AGENCY(IES) WITH WARNINGS:
None Found	No warnings found on HPD Priority lists

SUBSTANCE NOTES: Range is given from supplier provided information.

PDMS

%: 0.0339 **HPD URL: N/A**

PRODUCT THRESHOLD: 100 ppm RESIDUALS AND IMPURITIES CONSIDERED: Yes

RESIDUALS AND IMPURITIES NOTES: No residuals or impurities are known or expected to be present at or above the Content Inventory Threshold indicated that have a GS score of BM-1, LT-1, LT-P1 or NoGS as predicted by process chemistry (Pharos CML).

OTHER MATERIAL NOTES: Residuals or impurities above the Content Inventory Threshold level would make over 5% of the weight of the material and so residuals and impurities above the Content Inventory Threshold level aren't expected to be present in the material.

POLYDIMETHYLSILOXANES

ID: 63148-62-9

%: **100.0000** GS: **LT-P1** RC: **UNK** NANO: **No** ROLE: **PDMS**

HAZARDS:	AGENCY(IES) WITH WARNINGS:	
PBT	EC - CEPA DSL	Persistent, Bioaccumulative and inherently Toxic (PBiTH) to humans

SUBSTANCE NOTES: The material consists fully of this substance.

CHROMED STAINLESS STEEL

%: 0.0278 **HPD URL: N/A**

PRODUCT THRESHOLD: 100 ppm RESIDUALS AND IMPURITIES CONSIDERED: Yes

RESIDUALS AND IMPURITIES NOTES: No residuals or impurities are known or expected to be present at or above the Content Inventory Threshold indicated that have a GS score of BM-1, LT-1, LT-P1 or NoGS as predicted by process chemistry (Pharos CML).

OTHER MATERIAL NOTES: Residuals or impurities above the Content Inventory Threshold level would make over 5% of the weight of the material and so residuals and impurities above the Content Inventory Threshold level aren't expected to be present in the material.

STAINLESS STEEL

ID: 12597-68-1

%: **95.0000** GS: **NoGS** RC: **UNK** NANO: **No** ROLE: **Stainless steel core of chromed stainless steel**

HAZARDS:	AGENCY(IES) WITH WARNINGS:
None Found	No warnings found on HPD Priority lists

SUBSTANCE NOTES: Works as a structural substance.

CHROMIUM ID: 7440-47-3

%: 5.0000 GS: LT-P1 RC: UNK NANO: No ROLE: Chrome coating in chromed stainless steel

HAZARDS:	AGENCY(IES) WITH WARNINGS:	
RESPIRATORY	AOEC - Asthmagens	Asthmagen (ARs) - sensitizer-induced - inhalable forms only
ENDOCRINE	TEDX - Potential Endocrine Disruptors	Potential Endocrine Disruptor
SKIN SENSITIZE	MAK	Sensitizing Substance Sh - Danger of skin sensitization

SUBSTANCE NOTES: Works as the surface material.

ZINC %: 0.0254 HPD URL: N/A

PRODUCT THRESHOLD: 100 ppm RESIDUALS AND IMPURITIES CONSIDERED: Yes

RESIDUALS AND IMPURITIES NOTES: No residuals or impurities are known or expected to be present at or above the Content Inventory Threshold indicated that have a GS score of BM-1, LT-1, LT-P1 or NoGS as predicted by process chemistry (Pharos CML).

OTHER MATERIAL NOTES: Residuals or impurities above the Content Inventory Threshold level would make over 5% of the weight of the material and so residuals and impurities above the Content Inventory Threshold level aren't expected to be present in the material.

ZINC ID: 7440-66-6

%: 100.0000 GS: LT-P1 RC: UNK NANO: No ROLE: Zinc

HAZARDS:	AGENCY(IES) WITH WARNINGS:	
ACUTE AQUATIC	EU - GHS (H-Statements)	H400 - Very toxic to aquatic life
CHRON AQUATIC	EU - GHS (H-Statements)	H410 - Very toxic to aquatic life with long lasting effects
ENDOCRINE	TEDX - Potential Endocrine Disruptors	Potential Endocrine Disruptor
MULTIPLE	German FEA - Substances Hazardous to Waters	Class 2 - Hazard to Waters
PHYSICAL HAZARD (REACTIVE)	EU - GHS (H-Statements)	H250 - Catches fire spontaneously if exposed to air
PHYSICAL HAZARD (REACTIVE)	EU - GHS (H-Statements)	H260 - In contact with water releases flammable gases which may ignite spontaneously

SUBSTANCE NOTES: The material consists fully of this substance.

POM %: 0.0243 HPD URL: N/A

PRODUCT THRESHOLD: 100 ppm RESIDUALS AND IMPURITIES CONSIDERED: Yes

RESIDUALS AND IMPURITIES NOTES: No residuals or impurities are known or expected to be present at or above the Content Inventory Threshold indicated that have a GS score of BM-1, LT-1, LT-P1 or NoGS as predicted by process chemistry (Pharos CML).

OTHER MATERIAL NOTES: Residuals or impurities above the Content Inventory Threshold level would make over 5% of the weight of the material and so residuals and impurities above the Content Inventory Threshold level aren't expected to be present in the material.

POLY(OXYMETHYLENE) ID: 9002-81-7

%: 100.0000 GS: NoGS RC: UNK NANO: No ROLE: POM plastic

HAZARDS:	AGENCY(IES) WITH WARNINGS:
None Found	No warnings found on HPD Priority lists

SUBSTANCE NOTES: The material consists fully of this substance.

TINNED COPPER %: 0.0227 HPD URL: N/A

PRODUCT THRESHOLD: 100 ppm RESIDUALS AND IMPURITIES CONSIDERED: Yes

RESIDUALS AND IMPURITIES NOTES: No residuals or impurities are known or expected to be present at or above the Content Inventory Threshold indicated that have a GS score of BM-1, LT-1, LT-P1 or NoGS as predicted by process chemistry (Pharos CML).

OTHER MATERIAL NOTES: Residuals or impurities above the Content Inventory Threshold level would make over 40% of the weight of the material and so residuals and impurities above the Content Inventory Threshold level aren't expected to be present in the material.

COPPER ID: 7440-50-8

%: 97.8000 - 99.5000 GS: LT-UNK RC: UNK NANO: No ROLE: Copper part of tinned copper

HAZARDS:	AGENCY(IES) WITH WARNINGS:
None Found	No warnings found on HPD Priority lists

SUBSTANCE NOTES: Range is given since the tin layer varies depending on the tinned copper component.

TIN ID: 7440-31-5

%: 0.5000 - 2.2000 GS: LT-UNK RC: UNK NANO: No ROLE: Tin part of tinned copper

HAZARDS:	AGENCY(IES) WITH WARNINGS:
None Found	No warnings found on HPD Priority lists

SUBSTANCE NOTES: Range is given since the tin layer varies depending on the tinned copper component.

WOOL **%: 0.0183** **HPD URL: N/A**

PRODUCT THRESHOLD: 100 ppm RESIDUALS AND IMPURITIES CONSIDERED: Yes

RESIDUALS AND IMPURITIES NOTES: No residuals or impurities are known or expected to be present at or above the Content Inventory Threshold indicated that have a GS score of BM-1, LT-1, LT-P1 or NoGS as predicted by process chemistry (Pharos CML).

OTHER MATERIAL NOTES: Residuals or impurities above the Content Inventory Threshold level would make over 50% of the weight of the material and so residuals and impurities above the Content Inventory Threshold level aren't expected to be present in the material.

SHEEPS WOOL ID: Not registered

%: 100.0000 GS: NoGS RC: UNK NANO: No ROLE: Wool

HAZARDS:	AGENCY(IES) WITH WARNINGS:
None Found	No warnings found on HPD Priority lists

SUBSTANCE NOTES: The material consists fully of this substance.

ZAMAK 3 **%: 0.0173** **HPD URL: N/A**

PRODUCT THRESHOLD: 100 ppm RESIDUALS AND IMPURITIES CONSIDERED: Yes

RESIDUALS AND IMPURITIES NOTES: No residuals or impurities are known or expected to be present at or above the Content Inventory Threshold indicated that have a GS score of BM-1, LT-1, LT-P1 or NoGS as predicted by process chemistry (Pharos CML).

OTHER MATERIAL NOTES: Residuals or impurities above the Content Inventory Threshold level would make over 40% of the weight of the material and so residuals and impurities above the Content Inventory Threshold level aren't expected to be present in the material.

ZAMAK 3 ID: Not registered

%: 100.0000 GS: NoGS RC: UNK NANO: No ROLE: Zamak 3

HAZARDS:	AGENCY(IES) WITH WARNINGS:
None Found	No warnings found on HPD Priority lists

SUBSTANCE NOTES: The material consists fully of this substance.

Section 3: Certifications and Compliance

This section lists applicable certification and standards compliance information for VOC emissions and VOC content. Other types of health or environmental performance testing or certifications completed for the product may be provided.

VOC EMISSIONS — **Compliance for Emission Classification of Building Materials - M1**

CERTIFYING PARTY: Third Party
APPLICABLE FACILITIES: All
CERTIFICATE URL:
ISSUE DATE: 2016-12-30
EXPIRY DATE:
CERTIFIER OR LAB: VTT Technical Research Centre of Finland

CERTIFICATION AND COMPLIANCE NOTES: Analysis method used for TVOC emissions was EN ISO 16000-6 and for formaldehyde EN 717-1. The laboratory has stated that "The emissions into indoor air from the telephone booth can be related to a M1- classified product, when the air exchange is continuously on." Emissions from the telephone booth into indoor air (volatile organic com-pounds VOC, formaldehyde, ammonia) were measured at standard conditions (temperature, humidity, air exchange). The test report and certificate is available upon request.

MULTI-ATTRIBUTE — **CE marking**

CERTIFYING PARTY: Self-declared
APPLICABLE FACILITIES: All
CERTIFICATE URL:
ISSUE DATE: 2018-02-01
EXPIRY DATE:
CERTIFIER OR LAB: None

CERTIFICATION AND COMPLIANCE NOTES: Framery's products are CE marked. EC directives relevant to Framery's CE marking are: Low Voltage Directive (LVD) 2006/95/EC, Electromagnetic Compatibility Directive (EMC) 2004/108/EC, Restriction of Hazardous Substances (RoHS) Directive 2011/65/EU and Ecodesign Directive 2009/125/EC

OTHER — **IEC CB Scheme**

CERTIFYING PARTY: Third Party
APPLICABLE FACILITIES: All
CERTIFICATE URL: https://www.sgs.com/en/certified-clients-and-products/electrical-products/modal-electrical-certificate-view?certno=FI+9050+M2%7cProcert
ISSUE DATE: 2018-04-25
EXPIRY DATE:
CERTIFIER OR LAB: SGS Fimko Ltd.

CERTIFICATION AND COMPLIANCE NOTES: Safety of electrical and electronic components. The electrical safety of our products is tested and found to meet CB requirements by an accredited testing laboratory, SGS Finland, as indicated by the CB test certificate. Furthermore, our products are NRTL certified in the USA and Canada.

OTHER — **SGS NA NRTL**

CERTIFYING PARTY: Third Party
APPLICABLE FACILITIES: All
CERTIFICATE URL: https://www.sgs.com/en/certified-clients-and-products/electrical-products/modal-electrical-certificate-view?certno=SGSNA%2f17%2fSUW%2f00038%7cProcert
ISSUE DATE: 2018-05-15
EXPIRY DATE:
CERTIFIER OR LAB: SGS North America Inc.

CERTIFICATION AND COMPLIANCE NOTES: Safety of electrical and electronic components.

SUSTAINABLE FORESTRY — **PEFC International Sustainability Benchmark - from sustainably managed forests Chain of custody**

CERTIFYING PARTY: Third Party
APPLICABLE FACILITIES: All
CERTIFICATE URL: https://www.koskisen.com/file/pefc-certificate/?download

ISSUE DATE: 2018-01-23
EXPIRY DATE: 2019-06-30
CERTIFIER OR LAB: DNV CERTIFICATION OY/AB

CERTIFICATION AND COMPLIANCE NOTES: Applies to all of the plywood parts.

SUSTAINABLE FORESTRY — **FSC Certification - Chain of Custody (COC)**

CERTIFYING PARTY: Third Party
APPLICABLE FACILITIES: All
CERTIFICATE URL: https://www.koskisen.com/file/fsc-certificate/?download

ISSUE DATE: 2013-05-17
EXPIRY DATE: 2023-05-16
CERTIFIER OR LAB: DNV GL

CERTIFICATION AND COMPLIANCE NOTES: Applies to all of the plywood parts.

OTHER — **EU Ecolabel - Textiles**

CERTIFYING PARTY: Third Party
APPLICABLE FACILITIES: All
CERTIFICATE URL: https://static.kvadrat.dk/assets/pdf/collection/environment/a4/e-2968-seu-ecolabel-certificate.pdf

ISSUE DATE: 2017-11-01
EXPIRY DATE: 2020-12-05
CERTIFIER OR LAB: Ecolabeling Denmark

CERTIFICATION AND COMPLIANCE NOTES: Applies to the fabrics used in the seat.

Section 4: Accessories

This section lists related products or materials that the manufacturer requires or recommends for installation (such as adhesives or fasteners), maintenance, cleaning, or operations. For information relating to the contents of these related products, refer to their applicable Health Product Declarations, if available.

No accessories are required for this product.

Section 5: General Notes

Other possible MasterFormat classifications: 13 22 00 (Office Shelters and Booths), 13 20 00 (Special Purpose Rooms), 13 21 48 (Sound-Conditioned Rooms). This HPD has been compiled according to the standard version of Framery O. This HPD applies also to the Quick call version of Framery O, other different variants of the standard Framery O and variants of Quick call Framery O.

Section 6: References

MANUFACTURER INFORMATION

MANUFACTURER: **Framery Oy**
ADDRESS: **Patamäenkatu 7**
Tampere Pirkanmaa 33900, Finland
WEBSITE: **https://www.frameryacoustics.com/en/**

CONTACT NAME: **Mikko Immonen**
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KEY

OSHA MSDS Occupational Safety and Health Administration Material Safety Data Sheet
GHS SDS Globally Harmonized System of Classification and Labeling of Chemicals Safety Data Sheet

Hazard Types

AQU Aquatic toxicity
CAN Cancer
DEV Developmental toxicity
END Endocrine activity
EYE Eye irritation/corrosivity
GEN Gene mutation
GLO Global warming
MAM Mammalian/systemic/organ toxicity
MUL Multiple hazards
NEU Neurotoxicity
OZO Ozone depletion
PBT Persistent Bioaccumulative Toxic
PHY Physical Hazard (reactive)
REP Reproductive toxicity
RES Respiratory sensitization
SKI Skin sensitization/irritation/corrosivity
LAN Land Toxicity
NF Not found on Priority Hazard Lists

GreenScreen (GS)

BM-4 Benchmark 4 (prefer-safer chemical)
BM-3 Benchmark 3 (use but still opportunity for improvement)
BM-2 Benchmark 2 (use but search for safer substitutes)
BM-1 Benchmark 1 (avoid - chemical of high concern)
BM-U Benchmark Unspecified (insuficient data to benchmark)
LT-P1 List Translator Possible Benchmark 1
LT-1 List Translator Likely Benchmark 1
LT-UNK List Translator Benchmark Unknown (insufficient information from List Translator lists to benchmark)
NoGS Unknown (no data on List Translator Lists)

Recycled Types

PreC Preconsumer (Post-Industrial)
PostC Postconsumer
Both Both Preconsumer and Postconsumer
Unk Inclusion of recycled content is unknown
None Does not include recycled content

Other Terms
Inventory Methods:

Nested Method / Material Threshold Substances listed within each material per threshold indicated per material
Nested Method / Product Threshold Substances listed within each material per threshold indicated per product
Basic Method / Product Threshold Substances listed individually per threshold indicated per product

Nano Composed of nano scale particles or nanotechnology
Third Party Verified Verification by independent certifier approved by HPDC
Preparer Third party preparer, if not self-prepared by manufacturer
Applicable facilities Manufacturing sites to which testing applies

The Health Product Declaration (HPD) Open Standard provides for the disclosure of product contents and potential associated human and environmental health hazards. Hazard associations are based on the HPD Priority Hazard Lists, the GreenScreen List Translator™, and when available, full GreenScreen® assessments. The HPD Open Standard v2.1 is not:

- *a method for the assessment of exposure or risk associated with product handling or use,*
- *a method for assessing potential health impacts of: (i) substances used or created during the manufacturing process or (ii) substances created after the product is delivered for end use.*

Information about life cycle, exposure and/or risk assessments performed on the product may be reported by the manufacturer in appropriate Notes sections, and/or, where applicable, in the Certifications section.

The HPD Open Standard was created and is supported by the Health Product Declaration Collaborative (the HPD Collaborative), a customer-led organization composed of stakeholders throughout the building industry that is committed to the continuous improvement of building products through transparency, openness, and innovation throughout the product supply chain.

The product manufacturer and any applicable independent verifier are solely responsible for the accuracy of statements and claims made in this HPD and for compliance with the HPD standard noted.

Framery Q
by Framery Oy

Health Product Declaration v2.1

created via: HPDC Online Builder

CLASSIFICATION: 12 51 00

PRODUCT DESCRIPTION: Framery Q offers privacy for one-on-one meetings and focus without interruptions in an open plan or activity based office environment. With Framery Q you can design your office in a totally new way. Placing the booths in the middle of the office staff allows you to realize an open-plan office without the common noise problems. Due to great sound insulation the booth can be placed right next to the work stations. Framery Q has a wide range of integrated furniture from workstations to lounge seats and coffee tables. Air ventilation creates fresh and nice working environment. The Product is easy to assemble and relocate when necessary.

Section 1: Summary — Nested Method / Product Threshold

CONTENT INVENTORY

Inventory Reporting Format
- (•) Nested Materials Method
- ( ) Basic Method

Threshold Disclosed Per
- ( ) Material
- (•) Product

Threshold level
- (•) 100 ppm
- ( ) 1,000 ppm
- ( ) Per GHS SDS
- ( ) Per OSHA MSDS
- ( ) Other

Residuals/Impurities

Residuals/Impurities Considered in 34 of 34 Materials

Explanation(s) provided for Residuals/Impurities?
- (•) Yes ( ) No

Are All Substances Above the Threshold Indicated:

Characterized (•) Yes ( ) No
Percent Weight and Role Provided?

Screened (•) Yes ( ) No
Using Priority Hazard Lists with Results Disclosed?

Identified ( ) Yes (•) No
Name and Identifier Provided?

CONTENT IN DESCENDING ORDER OF QUANTITY

Summary of product contents and results from screening individual chemical substances against HPD Priority Hazard Lists and the GreenScreen for Safer Chemicals®. The HPD does not assess whether using or handling this product will expose individuals to its chemical substances or any health risk. Refer to Section 2 for further details.

MATERIAL | SUBSTANCE | *RESIDUAL OR IMPURITY* GREENSCREEN SCORE | HAZARD TYPE

BIRCH PLYWOOD [BIRCH (BIRCH PLYWOOD) NoGS PHENOL FORMALDEHYDE LT-P1 | RES WATER (WATER) NoGS LIMESTONE; CALCIUM CARBONATE LT-UNK CELLULOSE, MICROCRYSTALLINE (CELLULOSE) NoGS SODIUM CARBONATE LT-P1 | EYE AMMONIUM CHLORIDE LT-P1 | EYE | END] LAMINATED GLASS [SOLID / PLATE GLASS (FLOAT GLASS) LT-UNK] STAINLESS STEEL [304 STAINLESS STEEL (STAINLESS STEEL) NoGS] POLYURETHANE [POLYURETHANE FOAMS LT-UNK] ACOUSTIC PANELS [POLYETHYLENE TEREPHTHALATE (PET) LT-UNK] FELT SHEET [POLYETHYLENE TEREPHTHALATE (PET) LT-UNK] FORMPRESSED BIRCH PLYWOOD [BIRCH (BIRCH PLYWOOD) NoGS UREA FORMALDEHYDE LT-P1 | RES WATER (WATER) NoGS KAOLIN NoGS FORMIC ACID BM-2 | SKI RESORCINOL LT-P1 | END | AQU | SKI | EYE] STEEL [STEEL NoGS] PVB [POLYVINYL BUTYRAL (PVB) LT-UNK] NYLON 66 [NYLON 6,6 LT-UNK] GALVANIZED STEEL [STEEL NoGS ZINC LT-P1 | AQU | END | MUL | PHY] FORMICA LAMINATE [KRAFT PAPER NoGS PHENOL FORMALDEHYDE LT-P1 | RES MELAMINE FORMALDEHYDE NoGS] MAGNET [STEEL NoGS NEODYMIUM-IRON-BORON ALLOY NoGS | PHY | SKI | EYE |] POWDER PAINT [POLYESTER NoGS UNDISCLOSED NoGS | TITANIUM DIOXIDE LT-1 | CAN | END CARBON BLACK LT-1 | CAN] ALUMINUM [ALUMINUM LT-P1 | RES | END | PHY] SEAL [ETHYLENE/PROPYLENE/DIENE TERPOLYMER (EPDM) LT-UNK CARBON BLACK LT-1 | CAN HYDROTREATED HEAVY PARAFFINIC PETROLEUM DISTILLATES (MINERAL OIL) (PARAFFINIC PROCESS OIL) LT-1 | CAN | MUL BENZENE, ETHENYL-, POLYMER WITH 1,3-BUTADIENE, HYDROGENATED LT-UNK] WOOL [SHEEPS WOOL NoGS] PMMA [POLYMETHYL METHACRYLATE (PMMA) LT-P1 | RES] POLYETHER SULFONE [POLYETHER SULFONE NoGS] PBT GF30 [PBT GF30 NoGS] ABS [ACRYLONITRILE-BUTADIENE-STYRENE COPOLYMER LT-UNK] CARDBOARD [KRAFT PAPER NoGS

Number of Greenscreen BM-4/BM3 contents ... 0

Contents highest concern GreenScreen Benchmark or List translator Score ... LT-1

Nanomaterial ... No

INVENTORY AND SCREENING NOTES:

The Material "Electronics" is regarded as Special Condition Material by the HPD Collaborative and thus isn't fully screened. All of the Electronics in Framery Q are RoHS compliant.

POLYVINYL ACETATE (PVA) LT-UNK] POLYCARBONATE [POLYCARBONATE LT-UNK] PVC [POLYVINYL CHLORIDE (PVC) LT-P1 | RES] SILICONE SEALANT [SILOXANES AND SILICONES, DI-ME, HYDROXY-TERMINATED BM-2 POLYDIMETHYLSILOXANES LT-P1 | PBT SILICA, AMORPHOUS LT-P1 | CAN DISTILLATES (PETROLEUM), HYDROTREATED MIDDLE LT-1 | CAN | MUL] ELECTRONICS [PRINTED CIRCUIT BOARD (PCB) NoGS | RES | END | PHY] BRASS [BRASS NoGS |] CHROMED STAINLESS STEEL [STAINLESS STEEL NoGS CHROMIUM LT-P1 | RES | END | SKI] WOOD GLUE [POLYVINYL ACETATE (PVA) LT-UNK] TINNED COPPER [COPPER LT-UNK TIN LT-UNK] PET [POLYETHYLENE TEREPHTHALATE (PET) LT-UNK] PDMS [POLYDIMETHYLSILOXANES LT-P1 | PBT] WOOD [WOOD NoGS] ZINC [ZINC LT-P1 | AQU | END | MUL | PHY]

VOLATILE ORGANIC COMPOUND (VOC) CONTENT

CERTIFICATIONS AND COMPLIANCE *See Section 3 for additional listings.*

VOC emissions: Emissions testing according to ISO 16000-6
Other: IEC CB Scheme
Multi-attribute: CE marking
Other: SGS NA NRTL

CONSISTENCY WITH OTHER PROGRAMS

Pre-checked for LEED v4 Material Ingredients, Option 1

Third Party Verified?
- ○ Yes
- ◉ No

PREPARER: Self-Prepared
VERIFIER:
VERIFICATION #:

SCREENING DATE: 2018-08-23
PUBLISHED DATE: 2018-09-03
EXPIRY DATE: 2021-08-23

Section 2: Content in Descending Order of Quantity

This section lists contents in a product based on specific threshold(s) and reports detailed health information including hazards. This HPD uses the inventory method indicated above, which is one of three possible methods:

- *Basic Inventory method with Product-level threshold.*
- *Nested Material Inventory method with Product-level threshold*
- *Nested Material Inventory method with individual Material-level thresholds*

Definitions and requirements for the three inventory methods and requirements for each data field can be found in the HPD Open Standard version 2.1, available on the HPDC website at: www.hpd-collaborative.org/hpd-2-1-standard

BIRCH PLYWOOD

%: 33.9387 - 38.3545 **HPD URL: N/A**

PRODUCT THRESHOLD: 100 ppm RESIDUALS AND IMPURITIES CONSIDERED: Yes

RESIDUALS AND IMPURITIES NOTES: No residuals or impurities are known or expected to be present at or above the Content Inventory Threshold indicated that have a GS score of BM-1, LT-1, LT-P1 or NoGS as predicted by process chemistry (Pharos CML).

OTHER MATERIAL NOTES: Range is given since the weight of the plywood parts vary due to humidity. If any residuals or impurities would be present, those residuals or impurities would be noticed during the quality inspection of the plywood parts and so there aren't expected to be any impurities above the Content Inventory Threshold.

BIRCH (BIRCH PLYWOOD)

ID: Not registered

%: 83.6000 - 91.0000 GS: NoGS RC: UNK NANO: No ROLE: Wood used in plywood.

HAZARDS:	AGENCY(IES) WITH WARNINGS:
None Found	No warnings found on HPD Priority lists

SUBSTANCE NOTES: Range is given from supplier provided information.

PHENOL FORMALDEHYDE

ID: 9003-35-4

%: 6.9000 - 7.5000 GS: LT-P1 RC: UNK NANO: No ROLE: Resin

HAZARDS:	AGENCY(IES) WITH WARNINGS:	
RESPIRATORY	AOEC - Asthmagens	Asthmagen (Rs) - sensitizer-induced

SUBSTANCE NOTES: Range is given from supplier provided information. Added during the plywood manufacturing process and forms plywood with hardener and birch wood veneers.

WATER (WATER)

ID: 558440-22-5

%: 5.0000 - 8.0000 GS: NoGS RC: None NANO: No ROLE: Moisture in the wood

HAZARDS:	AGENCY(IES) WITH WARNINGS:
None Found	No warnings found on HPD Priority lists

SUBSTANCE NOTES: Range is given because plywood moisture content depends on humidity. Other CAS RN: 7732-18-5

LIMESTONE; CALCIUM CARBONATE

ID: 1317-65-3

%: 0.3800 - 1.2000 GS: LT-UNK RC: UNK NANO: No ROLE: Part of hardener

HAZARDS:	AGENCY(IES) WITH WARNINGS:
None Found	No warnings found on HPD Priority lists

SUBSTANCE NOTES: Range is given from supplier provided information. Hardener is added during the plywood manufacturing process.

CELLULOSE, MICROCRYSTALLINE (CELLULOSE)

ID: 9004-34-6

%: 0.1500 - 0.6000 GS: NoGS RC: UNK NANO: No ROLE: Part of hardener

HAZARDS:	AGENCY(IES) WITH WARNINGS:
None Found	No warnings found on HPD Priority lists

SUBSTANCE NOTES: Range is given from supplier provided information. Hardener is added during the plywood manufacturing process.

SODIUM CARBONATE

ID: 497-19-8

%: 0.0800 - 0.2400 GS: LT-P1 RC: UNK NANO: No ROLE: Part of hardener

HAZARDS:	AGENCY(IES) WITH WARNINGS:	
EYE IRRITATION	EU - GHS (H-Statements)	H319 - Causes serious eye irritation

SUBSTANCE NOTES: Range is given from supplier provided information. Hardener is added during the plywood manufacturing process.

AMMONIUM CHLORIDE

ID: 12125-02-9

%: 0.0500 - 0.1200 GS: LT-P1 RC: UNK NANO: No ROLE: Part of hardener

HAZARDS:	AGENCY(IES) WITH WARNINGS:	
EYE IRRITATION	EU - GHS (H-Statements)	H319 - Causes serious eye irritation
ENDOCRINE	TEDX - Potential Endocrine Disruptors	Potential Endocrine Disruptor

SUBSTANCE NOTES: Range is given from supplier provided information. Hardener is added during the plywood manufacturing process.

LAMINATED GLASS

%: 29.1300 HPD URL: N/A

PRODUCT THRESHOLD: 100 ppm RESIDUALS AND IMPURITIES CONSIDERED: Yes

RESIDUALS AND IMPURITIES NOTES: No residuals or impurities are known or expected to be present at or above the Content Inventory Threshold indicated that have a GS score of BM-1, LT-1, LT-P1 or NoGS as predicted by process chemistry (Pharos CML).

OTHER MATERIAL NOTES: If any residuals or impurities would be present, those residuals or impurities would be noticed during the quality inspection of the glasses and so there aren't expected to be any impurities above the Content Inventory Threshold.

SOLID / PLATE GLASS (FLOAT GLASS) ID: 65997-17-3

%: 100.0000 GS: LT-UNK RC: UNK NANO: No ROLE: Glass

HAZARDS:	AGENCY(IES) WITH WARNINGS:
None Found	No warnings found on HPD Priority lists

SUBSTANCE NOTES: The material consists fully of this substance.

STAINLESS STEEL %: 19.3390 HPD URL: N/A

PRODUCT THRESHOLD: 100 ppm RESIDUALS AND IMPURITIES CONSIDERED: Yes

RESIDUALS AND IMPURITIES NOTES: No residuals or impurities are known or expected to be present at or above the Content Inventory Threshold indicated that have a GS score of BM-1, LT-1, LT-P1 or NoGS as predicted by process chemistry (Pharos CML).

OTHER MATERIAL NOTES: If any residuals or impurities would be present, those residuals or impurities would be noticed during the quality inspection of the stainless steel parts and so there aren't expected to be any impurities above the Content Inventory Threshold.

304 STAINLESS STEEL (STAINLESS STEEL) ID: 12597-68-1

%: 100.0000 GS: NoGS RC: UNK NANO: No ROLE: Stainless steel

HAZARDS:	AGENCY(IES) WITH WARNINGS:
None Found	No warnings found on HPD Priority lists

SUBSTANCE NOTES: The material consists fully of this substance.

POLYURETHANE %: 3.2540 HPD URL: N/A

PRODUCT THRESHOLD: 100 ppm RESIDUALS AND IMPURITIES CONSIDERED: Yes

RESIDUALS AND IMPURITIES NOTES: No residuals or impurities are known or expected to be present at or above the Content Inventory Threshold indicated that have a GS score of BM-1, LT-1, LT-P1 or NoGS as predicted by process chemistry (Pharos CML).

OTHER MATERIAL NOTES: Material consists fully of this substance. If any residuals or impurities would be present, those residuals or impurities would be noticed during the quality inspection of the polyurethane parts and so there aren't expected to be any impurities above the Content Inventory Threshold.

POLYURETHANE FOAMS ID: 9009-54-5

%: 100.0000 GS: LT-UNK RC: UNK NANO: No ROLE: Foam

HAZARDS:	AGENCY(IES) WITH WARNINGS:
None Found	No warnings found on HPD Priority lists

SUBSTANCE NOTES: The material consists fully of this substance.

ACOUSTIC PANELS %: 2.4160 HPD URL: N/A

PRODUCT THRESHOLD: 100 ppm RESIDUALS AND IMPURITIES CONSIDERED: Yes

RESIDUALS AND IMPURITIES NOTES: No residuals or impurities are known or expected to be present at or above the Content Inventory Threshold indicated that have a GS score of BM-1, LT-1, LT-P1 or NoGS as predicted by process chemistry (Pharos CML).

OTHER MATERIAL NOTES: If any residuals or impurities would be present, those residuals or impurities would be noticed during the quality inspection of the acoustic panel parts and so there aren't expected to be any impurities above the Content Inventory Threshold.

POLYETHYLENE TEREPHTHALATE (PET) ID: 25038-59-9

%: 100.0000 GS: LT-UNK RC: PostC NANO: No ROLE: PET

HAZARDS:	AGENCY(IES) WITH WARNINGS:
None Found	No warnings found on HPD Priority lists

SUBSTANCE NOTES: The material consists fully of this substance. Supplier has stated that part of the PET is recycled.

FELT SHEET %: 2.2974 HPD URL: N/A

PRODUCT THRESHOLD: 100 ppm RESIDUALS AND IMPURITIES CONSIDERED: Yes

RESIDUALS AND IMPURITIES NOTES: No residuals or impurities are known or expected to be present at or above the Content Inventory Threshold indicated that have a GS score of BM-1, LT-1, LT-P1 or NoGS as predicted by process chemistry (Pharos CML).

OTHER MATERIAL NOTES: If any residuals or impurities would be present, those residuals or impurities would be noticed during the quality inspection of the felt parts and so there aren't expected to be any impurities above the Content Inventory Threshold.

POLYETHYLENE TEREPHTHALATE (PET) ID: 25038-59-9

%: 100.0000 GS: LT-UNK RC: PostC NANO: No ROLE: PET

HAZARDS:	AGENCY(IES) WITH WARNINGS:
None Found	No warnings found on HPD Priority lists

SUBSTANCE NOTES: The material consists fully of this substance. Supplier has stated that "30% of our felt material is made from recycled material".

FORMPRESSED BIRCH PLYWOOD

%: 1.8848 - 2.1174 HPD URL: N/A

PRODUCT THRESHOLD: 100 ppm RESIDUALS AND IMPURITIES CONSIDERED: Yes

RESIDUALS AND IMPURITIES NOTES: No residuals or impurities are known or expected to be present at or above the Content Inventory Threshold indicated that have a GS score of BM-1, LT-1, LT-P1 or NoGS as predicted by process chemistry (Pharos CML).

OTHER MATERIAL NOTES: Range is given since the weight of the plywood parts vary due to humidity. If any residuals or impurities would be present, those residuals or impurities would be noticed during the quality inspection of the formpressed plywood parts and so there aren't expected to be any impurities above the Content Inventory Threshold.

BIRCH (BIRCH PLYWOOD)

ID: Not registered

%: 83.6000 - 91.0000 GS: NoGS RC: UNK NANO: No ROLE: Wood used in plywood.

HAZARDS:	AGENCY(IES) WITH WARNINGS:
None Found	No warnings found on HPD Priority lists

SUBSTANCE NOTES: Range is given from supplier provided information.

UREA FORMALDEHYDE

ID: 9011-05-6

%: 7.5000 GS: LT-P1 RC: UNK NANO: No ROLE: Resin

HAZARDS:	AGENCY(IES) WITH WARNINGS:	
RESPIRATORY	AOEC - Asthmagens	Asthmagen (Rs) - sensitizer-induced

SUBSTANCE NOTES: Adhesive substance in formpressed plywood

WATER (WATER)

ID: 558440-22-5

%: 5.0000 - 8.0000 GS: NoGS RC: None NANO: No ROLE: Moisture in the wood

HAZARDS:	AGENCY(IES) WITH WARNINGS:
None Found	No warnings found on HPD Priority lists

SUBSTANCE NOTES: Range is given because plywood moisture content depends on humidity. Other CAS RN: 7732-18-5

KAOLIN

ID: 12198-85-5

%: 0.1000 - 0.6000 GS: NoGS RC: UNK NANO: No ROLE: Part of hardener

HAZARDS:	AGENCY(IES) WITH WARNINGS:
None Found	No warnings found on HPD Priority lists

SUBSTANCE NOTES: Range is given to protect intellectual property of the hardener manufacturer.

FORMIC ACID ID: 64-18-6

%: 0.1000 - 0.6000 GS: BM-2 RC: UNK NANO: No ROLE: Part of hardener

HAZARDS:	AGENCY(IES) WITH WARNINGS:	
SKIN IRRITATION	EU - GHS (H-Statements)	H314 - Causes severe skin burns and eye damage

SUBSTANCE NOTES: Range is given to protect intellectual property of the hardener manufacturer.

RESORCINOL ID: 108-46-3

%: 0.0100 - 0.9000 GS: LT-P1 RC: UNK NANO: No ROLE: Part of hardener

HAZARDS:	AGENCY(IES) WITH WARNINGS:	
ENDOCRINE	EU - Priority Endocrine Disruptors	Category 1 - In vivo evidence of Endocrine Disruption Activity
ACUTE AQUATIC	EU - GHS (H-Statements)	H400 - Very toxic to aquatic life
SKIN IRRITATION	EU - GHS (H-Statements)	H315 - Causes skin irritation
EYE IRRITATION	EU - GHS (H-Statements)	H319 - Causes serious eye irritation
ENDOCRINE	ChemSec - SIN List	Endocrine Disruption
ENDOCRINE	TEDX - Potential Endocrine Disruptors	Potential Endocrine Disruptor
SKIN SENSITIZE	MAK	Sensitizing Substance Sh - Danger of skin sensitization

SUBSTANCE NOTES: Range is given to protect intellectual property of the hardener manufacturer.

STEEL %: 1.5300 HPD URL: N/A

PRODUCT THRESHOLD: 100 ppm RESIDUALS AND IMPURITIES CONSIDERED: Yes

RESIDUALS AND IMPURITIES NOTES: No residuals or impurities are known or expected to be present at or above the Content Inventory Threshold indicated that have a GS score of BM-1, LT-1, LT-P1 or NoGS as predicted by process chemistry (Pharos CML).

OTHER MATERIAL NOTES: If any residuals or impurities would be present, those residuals or impurities would be noticed during the installation of steel parts and so there aren't expected to be any impurities above the Content Inventory Threshold.

STEEL ID: 12597-69-2

%: **100.0000** GS: **NoGS** RC: **UNK** NANO: **No** ROLE: **Steel**

HAZARDS:	AGENCY(IES) WITH WARNINGS:
None Found	No warnings found on HPD Priority lists

SUBSTANCE NOTES: The material consists fully of this substance.

PVB

%: 0.9310 **HPD URL: N/A**

PRODUCT THRESHOLD: 100 ppm RESIDUALS AND IMPURITIES CONSIDERED: Yes

RESIDUALS AND IMPURITIES NOTES: No residuals or impurities are known or expected to be present at or above the Content Inventory Threshold indicated that have a GS score of BM-1, LT-1, LT-P1 or NoGS as predicted by process chemistry (Pharos CML).

OTHER MATERIAL NOTES: If any residuals or impurities would be present in PVB, those residuals or impurities would be noticed during the quality inspection of the glasses and so there aren't expected to be any impurities above the Content Inventory Threshold.

POLYVINYL BUTYRAL (PVB)

ID: **63148-65-2**

%: **100.0000** GS: **LT-UNK** RC: **UNK** NANO: **No** ROLE: **Acoustical material**

HAZARDS:	AGENCY(IES) WITH WARNINGS:
None Found	No warnings found on HPD Priority lists

SUBSTANCE NOTES: The material consists fully of this substance.

NYLON 66

%: 0.6550 **HPD URL: N/A**

PRODUCT THRESHOLD: 100 ppm RESIDUALS AND IMPURITIES CONSIDERED: Yes

RESIDUALS AND IMPURITIES NOTES: No residuals or impurities are known or expected to be present at or above the Content Inventory Threshold indicated that have a GS score of BM-1, LT-1, LT-P1 or NoGS as predicted by process chemistry (Pharos CML).

OTHER MATERIAL NOTES: If there would be any residuals or impurities above the Content Inventory Threshold level, those residuals or impurities would be noticed since amount of the material in the end product is low.

NYLON 6,6

ID: **32131-17-2**

%: **100.0000** GS: **LT-UNK** RC: **UNK** NANO: **No** ROLE: **Nylon 66**

HAZARDS:	AGENCY(IES) WITH WARNINGS:
None Found	No warnings found on HPD Priority lists

SUBSTANCE NOTES: The material consists fully of this substance.

GALVANIZED STEEL %: 0.6346 HPD URL: N/A

PRODUCT THRESHOLD: 100 ppm RESIDUALS AND IMPURITIES CONSIDERED: Yes

RESIDUALS AND IMPURITIES NOTES: No residuals or impurities are known or expected to be present at or above the Content Inventory Threshold indicated that have a GS score of BM-1, LT-1, LT-P1 or NoGS as predicted by process chemistry (Pharos CML).

OTHER MATERIAL NOTES: If any residuals or impurities would be present, those residuals or impurities would be noticed when the galvanized steel parts are handled and so there aren't expected to be any impurities above the Content Inventory Threshold.

STEEL ID: 12597-69-2

%: 98.5000 - 99.9000 GS: NoGS RC: UNK NANO: No ROLE: Steel part of galvanized steel

HAZARDS:	AGENCY(IES) WITH WARNINGS:
None Found	No warnings found on HPD Priority lists

SUBSTANCE NOTES: Range is given since the galvanizing varies depending on the galvanized steel component.

ZINC ID: 7440-66-6

%: 0.1000 - 1.5000 GS: LT-P1 RC: UNK NANO: No ROLE: Zinc part of galvanized steel

HAZARDS:	AGENCY(IES) WITH WARNINGS:	
ACUTE AQUATIC	EU - GHS (H-Statements)	H400 - Very toxic to aquatic life
CHRON AQUATIC	EU - GHS (H-Statements)	H410 - Very toxic to aquatic life with long lasting effects
ENDOCRINE	TEDX - Potential Endocrine Disruptors	Potential Endocrine Disruptor
MULTIPLE	German FEA - Substances Hazardous to Waters	Class 2 - Hazard to Waters
PHYSICAL HAZARD (REACTIVE)	EU - GHS (H-Statements)	H250 - Catches fire spontaneously if exposed to air
PHYSICAL HAZARD (REACTIVE)	EU - GHS (H-Statements)	H260 - In contact with water releases flammable gases which may ignite spontaneously

SUBSTANCE NOTES: Range is given since the galvanizing varies depending on the galvanized steel component.

FORMICA LAMINATE %: 0.4500 HPD URL: N/A

PRODUCT THRESHOLD: 100 ppm RESIDUALS AND IMPURITIES CONSIDERED: Yes

RESIDUALS AND IMPURITIES NOTES: No residuals or impurities are known or expected to be present at or above the Content Inventory Threshold indicated that have a GS score of BM-1, LT-1, LT-P1 or NoGS as predicted by process chemistry (Pharos CML).

OTHER MATERIAL NOTES: If there would be any residuals or impurities above the Content Inventory Threshold level, those residuals or impurities would be noticed since amount of the material in the end product is low.

KRAFT PAPER ID: Not registered

%: 60.0000 - 77.0000 GS: NoGS RC: UNK NANO: No ROLE: Kraft paper

HAZARDS:	AGENCY(IES) WITH WARNINGS:
None Found	No warnings found on HPD Priority lists

SUBSTANCE NOTES: Range is given from supplier provided information.

PHENOL FORMALDEHYDE ID: 9003-35-4

%: 20.0000 - 25.0000 GS: LT-P1 RC: UNK NANO: No ROLE: Resin

HAZARDS:	AGENCY(IES) WITH WARNINGS:	
RESPIRATORY	AOEC - Asthmagens	Asthmagen (Rs) - sensitizer-induced

SUBSTANCE NOTES: Range is given from supplier provided information.

MELAMINE FORMALDEHYDE ID: 94645-56-4

%: 5.0000 - 12.0000 GS: NoGS RC: UNK NANO: No ROLE: Resin

HAZARDS:	AGENCY(IES) WITH WARNINGS:
None Found	No warnings found on HPD Priority lists

SUBSTANCE NOTES: Range is given from supplier provided information.

MAGNET %: 0.3370 HPD URL: N/A

PRODUCT THRESHOLD: 100 ppm RESIDUALS AND IMPURITIES CONSIDERED: Yes

RESIDUALS AND IMPURITIES NOTES: No residuals or impurities are known or expected to be present at or above the Content Inventory Threshold indicated that have a GS score of BM-1, LT-1, LT-P1 or NoGS as predicted by process chemistry (Pharos CML).

OTHER MATERIAL NOTES: If there would be any residuals or impurities above the Content Inventory Threshold level, those residuals or impurities would be noticed since amount of the material in the end product is low.

STEEL ID: 12597-69-2

%: 58.5000 - 59.5000 GS: NoGS RC: UNK NANO: No ROLE: Steel part of magnets

HAZARDS:	AGENCY(IES) WITH WARNINGS:
None Found	No warnings found on HPD Priority lists

SUBSTANCE NOTES: Amount of steel depends on the size of the magnet.

NEODYMIUM-IRON-BORON ALLOY

ID: 918106-59-9

%: 38.5000 - 39.5000 GS: NoGS RC: UNK NANO: No ROLE: Magnetic alloy

HAZARDS:	AGENCY(IES) WITH WARNINGS:	
PHYSICAL HAZARD (REACTIVE)	EU - GHS (H-Statements)	H228 - Flammable solid
PHYSICAL HAZARD (REACTIVE)	EU - GHS (H-Statements)	H250 - Catches fire spontaneously if exposed to air
SKIN IRRITATION	EU - GHS (H-Statements)	H315 - Causes skin irritation
EYE IRRITATION	EU - GHS (H-Statements)	H319 - Causes serious eye irritation
ORGAN TOXICANT	EU - GHS (H-Statements)	H335 - May cause respiratory irritation
ACUTE AQUATIC	EU - Manufacturer REACH hazard submissions	H402 - Aquatic Acute 3 - Harmful to aquatic life (unverified)
CHRON AQUATIC	EU - GHS (H-Statements)	H412 - Harmful to aquatic life with long lasting effects

SUBSTANCE NOTES: Amount of neodymium-iron-boron alloy depends on the size of the magnet.

POWDER PAINT

%: 0.2550 HPD URL: N/A

PRODUCT THRESHOLD: 100 ppm RESIDUALS AND IMPURITIES CONSIDERED: Yes

RESIDUALS AND IMPURITIES NOTES: No residuals or impurities are known or expected to be present at or above the Content Inventory Threshold indicated that have a GS score of BM-1, LT-1, LT-P1 or NoGS as predicted by process chemistry (Pharos CML).

OTHER MATERIAL NOTES: Colours are black and white, because these colours are used in the standard models. If there would be any residuals or impurities above the Content Inventory Threshold level, those residuals or impurities would be noticed since amount of the material in the end product is low.

POLYESTER

ID: 113669-95-7

%: 50.0000 - 70.0000 GS: NoGS RC: UNK NANO: No ROLE: Adhesive

HAZARDS:	AGENCY(IES) WITH WARNINGS:
None Found	No warnings found on HPD Priority lists

SUBSTANCE NOTES: Range is given to protect powder coat manufacturer intellectual property.

UNDISCLOSED

ID: Not Registered

%: 5.0000 - 50.0000 GS: NoGS RC: UNK NANO: No ROLE: Filler and auxiliary agents

HAZARDS: AGENCY(IES) WITH WARNINGS:

CHRON AQUATIC	EU - GHS (H-Statements)	H412 - Harmful to aquatic life with long lasting effects

SUBSTANCE NOTES: Range is given since the amount of fillers and auxiliary agents depend on the colour. Powder paint supplier identifies that as the powder paint is applied to the metallic parts of the product, the chemistry of the powder paint filler and auxiliary agents is changed and thus a specific CAS number listing is incredibly difficult. HPDC recognises these reaction products as Special Condition in Version SC-1.0. Hazards have been identified from the supplier provided SDS.

TITANIUM DIOXIDE

ID: 13463-67-7

%: **0.0000 - 30.0000** GS: **LT-1** RC: **UNK** NANO: **No** ROLE: **Pigment**

HAZARDS:	AGENCY(IES) WITH WARNINGS:	
CANCER	US CDC - Occupational Carcinogens	Occupational Carcinogen
CANCER	CA EPA - Prop 65	Carcinogen - specific to chemical form or exposure route
CANCER	IARC	Group 2B - Possibly carcinogenic to humans - inhaled from occupational sources
ENDOCRINE	TEDX - Potential Endocrine Disruptors	Potential Endocrine Disruptor
CANCER	MAK	Carcinogen Group 3A - Evidence of carcinogenic effects but not sufficient to establish MAK/BAT value
CANCER	MAK	Carcinogen Group 4 - Non-genotoxic carcinogen with low risk under MAK/BAT levels

SUBSTANCE NOTES: Range is given to protect powder coat manufacturer intellectual property and because the pigment depends on the colour.

CARBON BLACK

ID: 1333-86-4

%: **0.0000 - 1.0000** GS: **LT-1** RC: **UNK** NANO: **No** ROLE: **Pigment**

HAZARDS:	AGENCY(IES) WITH WARNINGS:	
CANCER	US CDC - Occupational Carcinogens	Occupational Carcinogen
CANCER	CA EPA - Prop 65	Carcinogen - specific to chemical form or exposure route
CANCER	IARC	Group 2B - Possibly carcinogenic to humans - inhaled from occupational sources
CANCER	MAK	Carcinogen Group 3B - Evidence of carcinogenic effects but not sufficient for classification

SUBSTANCE NOTES: Range is given to protect powder coat manufacturer intellectual property and because the pigment depends on the colour.

ALUMINUM

%: 0.2361 **HPD URL: N/A**

PRODUCT THRESHOLD: 100 ppm RESIDUALS AND IMPURITIES CONSIDERED: Yes

RESIDUALS AND IMPURITIES NOTES: No residuals or impurities are known or expected to be present at or above the Content Inventory Threshold indicated that have a GS score of BM-1, LT-1, LT-P1 or NoGS as predicted by process chemistry (Pharos CML).

OTHER MATERIAL NOTES: Residuals or impurities above the Content Inventory Threshold level would make over 4% of the weight of the material and so residuals and impurities above the Content Inventory Threshold level aren't expected to be present in the material.

ALUMINUM ID: 91728-14-2

%: 100.0000 GS: LT-P1 RC: UNK NANO: No ROLE: Aluminum

HAZARDS:	AGENCY(IES) WITH WARNINGS:	
RESPIRATORY	AOEC - Asthmagens	Asthmagen (ARs) - sensitizer-induced - inhalable forms only
ENDOCRINE	TEDX - Potential Endocrine Disruptors	Potential Endocrine Disruptor
PHYSICAL HAZARD (REACTIVE)	EU - GHS (H-Statements)	H228 - Flammable solid
PHYSICAL HAZARD (REACTIVE)	EU - GHS (H-Statements)	H250 - Catches fire spontaneously if exposed to air
PHYSICAL HAZARD (REACTIVE)	EU - GHS (H-Statements)	H261 - In contact with water releases flammable gases

SUBSTANCE NOTES: Material consists fully of this substance. Hazards identified concern aluminum in powder or fumigated state. Aluminum parts used in Framery products are machined or extruded solid aluminum parts and thus the hazards identified do not concern the parts used in Framery's products.

SEAL %: 0.1784 HPD URL: N/A

PRODUCT THRESHOLD: 100 ppm RESIDUALS AND IMPURITIES CONSIDERED: Yes

RESIDUALS AND IMPURITIES NOTES: No residuals or impurities are known or expected to be present at or above the Content Inventory Threshold indicated that have a GS score of BM-1, LT-1, LT-P1 or NoGS as predicted by process chemistry (Pharos CML).

OTHER MATERIAL NOTES: Residuals or impurities above the Content Inventory Threshold level would make over 5% of the weight of the material and so residuals and impurities above the Content Inventory Threshold level aren't expected to be present in the material.

ETHYLENE/PROPYLENE/DIENE TERPOLYMER (EPDM) ID: 25038-36-2

%: 20.0000 - 60.0000 GS: LT-UNK RC: UNK NANO: No ROLE: Seal

HAZARDS:	AGENCY(IES) WITH WARNINGS:
None Found	No warnings found on HPD Priority lists

SUBSTANCE NOTES: Range is given from the supplier provided information. Range is also given since the seal substances are dependent on the seal.

CARBON BLACK

ID: 1333-86-4

%: 20.0000 - 60.0000 GS: LT-1 RC: UNK NANO: No ROLE: Pigment

HAZARDS:	AGENCY(IES) WITH WARNINGS:	
CANCER	US CDC - Occupational Carcinogens	Occupational Carcinogen
CANCER	CA EPA - Prop 65	Carcinogen - specific to chemical form or exposure route
CANCER	IARC	Group 2B - Possibly carcinogenic to humans - inhaled from occupational sources
CANCER	MAK	Carcinogen Group 3B - Evidence of carcinogenic effects but not sufficient for classification

SUBSTANCE NOTES: Range is given from the supplier provided information. Range is also given since the seal substances are dependent on the seal.

HYDROTREATED HEAVY PARAFFINIC PETROLEUM DISTILLATES (MINERAL OIL) (PARAFFINIC PROCESS OIL)

ID: 64742-54-7

%: 15.0000 - 50.0000 GS: LT-1 RC: UNK NANO: No ROLE: Softener

HAZARDS:	AGENCY(IES) WITH WARNINGS:	
CANCER	EU - GHS (H-Statements)	H350 - May cause cancer
CANCER	EU - REACH Annex XVII CMRs	Carcinogen Category 2 - Substances which should be regarded as if they are Carcinogenic to man
MULTIPLE	ChemSec - SIN List	CMR - Carcinogen, Mutagen &/or Reproductive Toxicant
CANCER	EU - Annex VI CMRs	Carcinogen Category 1B - Presumed Carcinogen based on animal evidence
CANCER	Australia - GHS	H350 - May cause cancer

SUBSTANCE NOTES: Range is given from the supplier provided information. Range is also given since the seal substances are dependent on the seal.

BENZENE, ETHENYL-, POLYMER WITH 1,3-BUTADIENE, HYDROGENATED

ID: 66070-58-4

%: 0.0000 - 100.0000 GS: LT-UNK RC: UNK NANO: No ROLE: Seal

HAZARDS:	AGENCY(IES) WITH WARNINGS:
None Found	No warnings found on HPD Priority lists

SUBSTANCE NOTES: Range is given from the supplier provided information. Range is also given since the seal substances are dependent on the seal.

WOOL

%: 0.1727 HPD URL: N/A

PRODUCT THRESHOLD: 100 ppm RESIDUALS AND IMPURITIES CONSIDERED: Yes

RESIDUALS AND IMPURITIES NOTES: No residuals or impurities are known or expected to be present at or above the Content Inventory Threshold indicated that have a GS score of BM-1, LT-1, LT-P1 or NoGS as predicted by process chemistry (Pharos CML).

OTHER MATERIAL NOTES: Residuals or impurities above the Content Inventory Threshold level would make over 5% of the weight of the material and so residuals and impurities above the Content Inventory Threshold level aren't expected to be present in the material.

SHEEPS WOOL ID: Not registered

%: 100.0000 GS: NoGS RC: UNK NANO: No ROLE: Wool

HAZARDS:	AGENCY(IES) WITH WARNINGS:
None Found	No warnings found on HPD Priority lists

SUBSTANCE NOTES: The material consists fully of this substance.

PMMA %: 0.1454 HPD URL: N/A

PRODUCT THRESHOLD: 100 ppm RESIDUALS AND IMPURITIES CONSIDERED: Yes

RESIDUALS AND IMPURITIES NOTES: No residuals or impurities are known or expected to be present at or above the Content Inventory Threshold indicated that have a GS score of BM-1, LT-1, LT-P1 or NoGS as predicted by process chemistry (Pharos CML).

OTHER MATERIAL NOTES: Residuals or impurities above the Content Inventory Threshold level would make over 5% of the weight of the material and so residuals and impurities above the Content Inventory Threshold level aren't expected to be present in the material.

POLYMETHYL METHACRYLATE (PMMA) ID: 9011-14-7

%: 100.0000 GS: LT-P1 RC: UNK NANO: No ROLE: PMMA

HAZARDS:	AGENCY(IES) WITH WARNINGS:	
RESPIRATORY	AOEC - Asthmagens	Asthmagen (Rs) - sensitizer-induced

SUBSTANCE NOTES: Material consists fully of this substance.

POLYETHER SULFONE %: 0.1103 HPD URL: N/A

PRODUCT THRESHOLD: 100 ppm RESIDUALS AND IMPURITIES CONSIDERED: Yes

RESIDUALS AND IMPURITIES NOTES: No residuals or impurities are known or expected to be present at or above the Content Inventory Threshold indicated that have a GS score of BM-1, LT-1, LT-P1 or NoGS as predicted by process chemistry (Pharos CML).

OTHER MATERIAL NOTES: Residuals or impurities above the Content Inventory Threshold level would make over 5% of the

weight of the material and so residuals and impurities above the Content Inventory Threshold level aren't expected to be present in the material.

POLYETHER SULFONE ID: 25667-42-9

%: 100.0000 GS: NoGS RC: UNK NANO: No ROLE: Polyether sulfone

HAZARDS:	AGENCY(IES) WITH WARNINGS:
None Found	No warnings found on HPD Priority lists

SUBSTANCE NOTES: The material consists fully of this substance.

PBT GF30 %: 0.1083 HPD URL: N/A

PRODUCT THRESHOLD: 100 ppm RESIDUALS AND IMPURITIES CONSIDERED: Yes

RESIDUALS AND IMPURITIES NOTES: No residuals or impurities are known or expected to be present at or above the Content Inventory Threshold indicated that have a GS score of BM-1, LT-1, LT-P1 or NoGS as predicted by process chemistry (Pharos CML).

OTHER MATERIAL NOTES: Residuals or impurities above the Content Inventory Threshold level would make over 5% of the weight of the material and so residuals and impurities above the Content Inventory Threshold level aren't expected to be present in the material.

PBT GF30 ID: Not registered

%: 100.0000 GS: NoGS RC: UNK NANO: No ROLE: PBT GF30

HAZARDS:	AGENCY(IES) WITH WARNINGS:
None Found	No warnings found on HPD Priority lists

SUBSTANCE NOTES: The material consists fully of this substance.

ABS %: 0.0809 HPD URL: N/A

PRODUCT THRESHOLD: 100 ppm RESIDUALS AND IMPURITIES CONSIDERED: Yes

RESIDUALS AND IMPURITIES NOTES: No residuals or impurities are known or expected to be present at or above the Content Inventory Threshold indicated that have a GS score of BM-1, LT-1, LT-P1 or NoGS as predicted by process chemistry (Pharos CML).

OTHER MATERIAL NOTES: Residuals or impurities above the Content Inventory Threshold level would make over 10% of the weight of the material and so residuals and impurities above the Content Inventory Threshold level aren't expected to be present in the material.

ACRYLONITRILE-BUTADIENE-STYRENE COPOLYMER ID: 9003-56-9

%: 100.0000 GS: LT-UNK RC: UNK NANO: No ROLE: ABS plastic

HAZARDS:	AGENCY(IES) WITH WARNINGS:

None Found	No warnings found on HPD Priority lists

SUBSTANCE NOTES: The material consists fully of this substance.

CARDBOARD

%: 0.0769 HPD URL: N/A

PRODUCT THRESHOLD: 100 ppm RESIDUALS AND IMPURITIES CONSIDERED: Yes

RESIDUALS AND IMPURITIES NOTES: No residuals or impurities are known or expected to be present at or above the Content Inventory Threshold indicated that have a GS score of BM-1, LT-1, LT-P1 or NoGS as predicted by process chemistry (Pharos CML).

OTHER MATERIAL NOTES: Residuals or impurities above the Content Inventory Threshold level would make over 10% of the weight of the material and so residuals and impurities above the Content Inventory Threshold level aren't expected to be present in the material.

KRAFT PAPER

ID: Not registered

%: 85.0000 - 95.0000 GS: NoGS RC: PostC NANO: No ROLE: Kraft paper

HAZARDS:	AGENCY(IES) WITH WARNINGS:
None Found	No warnings found on HPD Priority lists

SUBSTANCE NOTES: Range is given from supplier provided information. Supplier has informed that the kraft paper used is recycled.

POLYVINYL ACETATE (PVA)

ID: 9003-20-7

%: 5.0000 - 15.0000 GS: LT-UNK RC: UNK NANO: No ROLE: PVAc

HAZARDS:	AGENCY(IES) WITH WARNINGS:
None Found	No warnings found on HPD Priority lists

SUBSTANCE NOTES: Range is given from supplier provided information.

POLYCARBONATE

%: 0.0688 HPD URL: N/A

PRODUCT THRESHOLD: 100 ppm RESIDUALS AND IMPURITIES CONSIDERED: Yes

RESIDUALS AND IMPURITIES NOTES: No residuals or impurities are known or expected to be present at or above the Content Inventory Threshold indicated that have a GS score of BM-1, LT-1, LT-P1 or NoGS as predicted by process chemistry (Pharos CML).

OTHER MATERIAL NOTES: Residuals or impurities above the Content Inventory Threshold level would make over 10 % of the weight of the material and so residuals and impurities above the Content Inventory Threshold level aren't expected to be present in the material.

POLYCARBONATE

ID: 25037-45-0

%: 100.0000 GS: LT-UNK RC: UNK NANO: No ROLE: Polycarbonate

HAZARDS:	AGENCY(IES) WITH WARNINGS:
None Found	No warnings found on HPD Priority lists

SUBSTANCE NOTES: The material consists fully of this substance.

PVC

%: 0.0540 **HPD URL: N/A**

PRODUCT THRESHOLD: 100 ppm RESIDUALS AND IMPURITIES CONSIDERED: Yes

RESIDUALS AND IMPURITIES NOTES: No residuals or impurities are known or expected to be present at or above the Content Inventory Threshold indicated that have a GS score of BM-1, LT-1, LT-P1 or NoGS as predicted by process chemistry (Pharos CML).

OTHER MATERIAL NOTES: Residuals or impurities above the Content Inventory Threshold level would make over 5% of the weight of the material and so residuals and impurities above the Content Inventory Threshold level aren't expected to be present in the material.

POLYVINYL CHLORIDE (PVC)

ID: 9002-86-2

%: 100.0000 GS: LT-P1 RC: UNK NANO: No ROLE: PVC

HAZARDS:	AGENCY(IES) WITH WARNINGS:	
RESPIRATORY	AOEC - Asthmagens	Asthmagen (Rs) - sensitizer-induced

SUBSTANCE NOTES: The material consists fully of this substance.

SILICONE SEALANT

%: 0.0417 **HPD URL: N/A**

PRODUCT THRESHOLD: 100 ppm RESIDUALS AND IMPURITIES CONSIDERED: Yes

RESIDUALS AND IMPURITIES NOTES: No residuals or impurities are known or expected to be present at or above the Content Inventory Threshold indicated that have a GS score of BM-1, LT-1, LT-P1 or NoGS as predicted by process chemistry (Pharos CML).

OTHER MATERIAL NOTES: Residuals or impurities above the Content Inventory Threshold level would make over 5% of the weight of the material and so residuals and impurities above the Content Inventory Threshold level aren't expected to be present in the material.

SILOXANES AND SILICONES, DI-ME, HYDROXY-TERMINATED

ID: 70131-67-8

%: 50.0000 - 60.0000 GS: BM-2 RC: UNK NANO: No ROLE: Adhesive

HAZARDS:	AGENCY(IES) WITH WARNINGS:
None Found	No warnings found on HPD Priority lists

SUBSTANCE NOTES: Range is given from supplier provided information.

POLYDIMETHYLSILOXANES

ID: 63148-62-9

%: 15.0000 - 20.0000 GS: LT-P1 RC: UNK NANO: No ROLE: Adhesive

HAZARDS:	AGENCY(IES) WITH WARNINGS:	
PBT	EC - CEPA DSL	Persistent, Bioaccumulative and inherently Toxic (PBiTH) to humans

SUBSTANCE NOTES: Range is given from supplier provided information.

SILICA, AMORPHOUS

ID: 7631-86-9

%: 5.0000 - 10.0000 GS: LT-P1 RC: UNK NANO: No ROLE: Adhesive

HAZARDS:	AGENCY(IES) WITH WARNINGS:	
CANCER	Japan - GHS	Carcinogenicity - Category 1A
CANCER	Australia - GHS	H350i - May cause cancer by inhalation

SUBSTANCE NOTES: Range is given from supplier provided information.

DISTILLATES (PETROLEUM), HYDROTREATED MIDDLE

ID: 64742-46-7

%: 1.0000 - 10.0000 GS: LT-1 RC: UNK NANO: No ROLE: Adhesive

HAZARDS:	AGENCY(IES) WITH WARNINGS:	
CANCER	EU - GHS (H-Statements)	H350 - May cause cancer
CANCER	EU - REACH Annex XVII CMRs	Carcinogen Category 2 - Substances which should be regarded as if they are Carcinogenic to man
MULTIPLE	ChemSec - SIN List	CMR - Carcinogen, Mutagen &/or Reproductive Toxicant
MULTIPLE	German FEA - Substances Hazardous to Waters	Class 2 - Hazard to Waters
CANCER	EU - Annex VI CMRs	Carcinogen Category 1B - Presumed Carcinogen based on animal evidence
CANCER	Australia - GHS	H350 - May cause cancer

SUBSTANCE NOTES: Range is given from supplier provided information.

ELECTRONICS

%: 0.0378 HPD URL: N/A

PRODUCT THRESHOLD: 100 ppm RESIDUALS AND IMPURITIES CONSIDERED: Yes

RESIDUALS AND IMPURITIES NOTES: No residuals or impurities are known or expected to be present at or above the Content Inventory Threshold indicated that have a GS score of BM-1, LT-1, LT-P1 or NoGS as predicted by process chemistry (Pharos CML).

OTHER MATERIAL NOTES: Special Condition Applied: Electronics

PRINTED CIRCUIT BOARD (PCB) ID: **Not Registered**

%: **100.0000** GS: **NoGS** RC: **UNK** NANO: **No** ROLE: **Printed Circuit Board**

HAZARDS:	AGENCY(IES) WITH WARNINGS:	
RESPIRATORY	AOEC - Asthmagens	Asthmagen (ARs) - sensitizer-induced - inhalable forms only
ENDOCRINE	TEDX - Potential Endocrine Disruptors	Potential Endocrine Disruptor
PHYSICAL HAZARD (REACTIVE)	EU - GHS (H-Statements)	H228 - Flammable solid
PHYSICAL HAZARD (REACTIVE)	EU - GHS (H-Statements)	H250 - Catches fire spontaneously if exposed to air
PHYSICAL HAZARD (REACTIVE)	EU - GHS (H-Statements)	H261 - In contact with water releases flammable gases

SUBSTANCE NOTES: Version = SCElec/2018-02-23. Electronics used to control the electrical sockets, lights and fans in the product. All electronics in Framery O are RoHS compliant. As a take-back program Framery is member of Elker: http://www.elker.fi/en/producers/producer-responsibility/producer-responsibility. Hazards have been identified from the aluminum contained in the electronics. Aluminum used in electronics is in solid state form and thus the hazards don't concern the electronics (Check further information from the "Aluminum" material).

BRASS **%: 0.0327** **HPD URL: N/A**

PRODUCT THRESHOLD: 100 ppm RESIDUALS AND IMPURITIES CONSIDERED: Yes

RESIDUALS AND IMPURITIES NOTES: No residuals or impurities are known or expected to be present at or above the Content Inventory Threshold indicated that have a GS score of BM-1, LT-1, LT-P1 or NoGS as predicted by process chemistry (Pharos CML).

OTHER MATERIAL NOTES: Residuals or impurities above the Content Inventory Threshold level would make over 30% of the weight of the material and so residuals and impurities above the Content Inventory Threshold level aren't expected to be present in the material.

BRASS ID: **63338-02-3**

%: **100.0000** GS: **NoGS** RC: **UNK** NANO: **No** ROLE: **Brass alloy**

HAZARDS:	AGENCY(IES) WITH WARNINGS:	
ACUTE AQUATIC	Australia - GHS	H400 - Very toxic to aquatic life M = 10

SUBSTANCE NOTES: The material consists fully of this substance. Substance hazards have been identified from a SDS about Brass.

CHROMED STAINLESS STEEL %: 0.0268 HPD URL: N/A

PRODUCT THRESHOLD: 100 ppm RESIDUALS AND IMPURITIES CONSIDERED: Yes

RESIDUALS AND IMPURITIES NOTES: No residuals or impurities are known or expected to be present at or above the Content Inventory Threshold indicated that have a GS score of BM-1, LT-1, LT-P1 or NoGS as predicted by process chemistry (Pharos CML).

OTHER MATERIAL NOTES: Residuals or impurities above the Content Inventory Threshold level would make over 30% of the weight of the material and so residuals and impurities above the Content Inventory Threshold level aren't expected to be present in the material.

STAINLESS STEEL ID: 12597-68-1

%: 95.0000 GS: NoGS RC: UNK NANO: No ROLE: Stainless steel core of chromed stainless steel

HAZARDS:	AGENCY(IES) WITH WARNINGS:
None Found	No warnings found on HPD Priority lists

SUBSTANCE NOTES: Works as a structural substance.

CHROMIUM ID: 7440-47-3

%: 5.0000 GS: LT-P1 RC: UNK NANO: No ROLE: Chrome coating in chromed stainless steel

HAZARDS:	AGENCY(IES) WITH WARNINGS:	
RESPIRATORY	AOEC - Asthmagens	Asthmagen (ARs) - sensitizer-induced - inhalable forms only
ENDOCRINE	TEDX - Potential Endocrine Disruptors	Potential Endocrine Disruptor
SKIN SENSITIZE	MAK	Sensitizing Substance Sh - Danger of skin sensitization

SUBSTANCE NOTES: Works as the surface material.

WOOD GLUE %: 0.0268 HPD URL: N/A

PRODUCT THRESHOLD: 100 ppm RESIDUALS AND IMPURITIES CONSIDERED: Yes

RESIDUALS AND IMPURITIES NOTES: No residuals or impurities are known or expected to be present at or above the Content Inventory Threshold indicated that have a GS score of BM-1, LT-1, LT-P1 or NoGS as predicted by process chemistry (Pharos CML).

OTHER MATERIAL NOTES: Residuals or impurities above the Content Inventory Threshold level would make over 30% of the weight of the material and so residuals and impurities above the Content Inventory Threshold level aren't expected to be present in the material.

POLYVINYL ACETATE (PVA) ID: 9003-20-7

%: 99.0000 - 99.5000 GS: LT-UNK RC: UNK NANO: No ROLE: Adhesive

HAZARDS:	AGENCY(IES) WITH WARNINGS:
None Found	No warnings found on HPD Priority lists

SUBSTANCE NOTES: Range is given from supplier provided information.

TINNED COPPER %: 0.0253 HPD URL: N/A

PRODUCT THRESHOLD: 100 ppm RESIDUALS AND IMPURITIES CONSIDERED: Yes

RESIDUALS AND IMPURITIES NOTES: No residuals or impurities are known or expected to be present at or above the Content Inventory Threshold indicated that have a GS score of BM-1, LT-1, LT-P1 or NoGS as predicted by process chemistry (Pharos CML).

OTHER MATERIAL NOTES: Residuals or impurities above the Content Inventory Threshold level would make over 30% of the weight of the material and so residuals and impurities above the Content Inventory Threshold level aren't expected to be present in the material.

COPPER ID: 7440-50-8

%: 97.8000 - 99.5000 GS: LT-UNK RC: UNK NANO: No ROLE: Copper part of tinned copper

HAZARDS:	AGENCY(IES) WITH WARNINGS:
None Found	No warnings found on HPD Priority lists

SUBSTANCE NOTES: Range is given since the tin layer varies depending on the tinned copper component.

TIN ID: 7440-31-5

%: 0.5000 - 2.2000 GS: LT-UNK RC: UNK NANO: No ROLE: Tin part of tinned copper

HAZARDS:	AGENCY(IES) WITH WARNINGS:
None Found	No warnings found on HPD Priority lists

SUBSTANCE NOTES: Range is given since the tin layer varies depending on the tinned copper component.

PET %: 0.0194 HPD URL: N/A

PRODUCT THRESHOLD: 100 ppm RESIDUALS AND IMPURITIES CONSIDERED: Yes

RESIDUALS AND IMPURITIES NOTES: No residuals or impurities are known or expected to be present at or above the Content Inventory Threshold indicated that have a GS score of BM-1, LT-1, LT-P1 or NoGS as predicted by process chemistry (Pharos CML).

OTHER MATERIAL NOTES: Residuals or impurities above the Content Inventory Threshold level would make over 30% of the weight of the material and so residuals and impurities above the Content Inventory Threshold level aren't expected to be present in the material.

POLYETHYLENE TEREPHTHALATE (PET) ID: 25038-59-9

%: 100.0000 GS: LT-UNK RC: UNK NANO: No ROLE: PET

HAZARDS:	AGENCY(IES) WITH WARNINGS:
None Found	No warnings found on HPD Priority lists

SUBSTANCE NOTES: Material consists fully of this substance.

PDMS %: 0.0164 HPD URL: N/A

PRODUCT THRESHOLD: 100 ppm RESIDUALS AND IMPURITIES CONSIDERED: Yes

RESIDUALS AND IMPURITIES NOTES: No residuals or impurities are known or expected to be present at or above the Content Inventory Threshold indicated that have a GS score of BM-1, LT-1, LT-P1 or NoGS as predicted by process chemistry (Pharos CML).

OTHER MATERIAL NOTES: Residuals or impurities above the Content Inventory Threshold level would make over 50% of the weight of the material and so residuals and impurities above the Content Inventory Threshold level aren't expected to be present in the material.

POLYDIMETHYLSILOXANES ID: 63148-62-9

%: 100.0000 GS: LT-P1 RC: UNK NANO: No ROLE: PDMS

HAZARDS:	AGENCY(IES) WITH WARNINGS:	
PBT	EC - CEPA DSL	Persistent, Bioaccumulative and inherently Toxic (PBiTH) to humans

SUBSTANCE NOTES: The material consists fully of this substance.

WOOD %: 0.0138 HPD URL: N/A

PRODUCT THRESHOLD: 100 ppm RESIDUALS AND IMPURITIES CONSIDERED: Yes

RESIDUALS AND IMPURITIES NOTES: No residuals or impurities are known or expected to be present at or above the Content Inventory Threshold indicated that have a GS score of BM-1, LT-1, LT-P1 or NoGS as predicted by process chemistry (Pharos CML).

OTHER MATERIAL NOTES: Residuals or impurities above the Content Inventory Threshold level would make over 50% of the weight of the material and so residuals and impurities above the Content Inventory Threshold level aren't expected to be present in the material.

WOOD ID: Not registered

%: 100.0000 GS: NoGS RC: UNK NANO: No ROLE: Wood

HAZARDS:	AGENCY(IES) WITH WARNINGS:
None Found	No warnings found on HPD Priority lists

SUBSTANCE NOTES: Material consists fully of this substance. The wood is Ash wood.

ZINC **%: 0.0122** **HPD URL: N/A**

PRODUCT THRESHOLD: 100 ppm RESIDUALS AND IMPURITIES CONSIDERED: Yes

RESIDUALS AND IMPURITIES NOTES: No residuals or impurities are known or expected to be present at or above the Content Inventory Threshold indicated that have a GS score of BM-1, LT-1, LT-P1 or NoGS as predicted by process chemistry (Pharos CML).

OTHER MATERIAL NOTES: Residuals or impurities above the Content Inventory Threshold level would make over 50% of the weight of the material and so residuals and impurities above the Content Inventory Threshold level aren't expected to be present in the material.

ZINC ID: 7440-66-6

%: **100.0000** GS: **LT-P1** RC: **UNK** NANO: **No** ROLE: **Zinc**

HAZARDS:	AGENCY(IES) WITH WARNINGS:	
ACUTE AQUATIC	EU - GHS (H-Statements)	H400 - Very toxic to aquatic life
CHRON AQUATIC	EU - GHS (H-Statements)	H410 - Very toxic to aquatic life with long lasting effects
ENDOCRINE	TEDX - Potential Endocrine Disruptors	Potential Endocrine Disruptor
MULTIPLE	German FEA - Substances Hazardous to Waters	Class 2 - Hazard to Waters
PHYSICAL HAZARD (REACTIVE)	EU - GHS (H-Statements)	H250 - Catches fire spontaneously if exposed to air
PHYSICAL HAZARD (REACTIVE)	EU - GHS (H-Statements)	H260 - In contact with water releases flammable gases which may ignite spontaneously

SUBSTANCE NOTES: The material consists fully of this substance.

Section 3: Certifications and Compliance

This section lists applicable certification and standards compliance information for VOC emissions and VOC content. Other types of health or environmental performance testing or certifications completed for the product may be provided.

VOC EMISSIONS — **Emissions testing according to ISO 16000-6**

CERTIFYING PARTY: Third Party
APPLICABLE FACILITIES: All
CERTIFICATE URL:
ISSUE DATE: 2018-01-29
EXPIRY DATE:
CERTIFIER OR LAB: VTT Technical Research Centre of Finland

CERTIFICATION AND COMPLIANCE NOTES: Analysis method used for TVOC emissions was EN ISO 16000-6 and for formaldehyde EN 717-1. The laboratory has stated the following: "The total VOC concentration TVOC measured inside the pod 1-2 days after the air exchange has been continuously on correspond to a normal level measured in Finnish offices (<100 µg/m 3). The amount and composition of the VOC compounds are normal for offices, except for acetic acid and decamethyl-cyclopentasiloxane, which were at 10-20 µg/m 3(as toluene equivalents) higher than normally measured". This means that the exposure to decamethyl-cyclopentasiloxane is about 0.0007 to 0.0013 ppm and to acetic acid about 0.004 to 0.009 ppm.

OTHER — **IEC CB Scheme**

CERTIFYING PARTY: Third Party
APPLICABLE FACILITIES: All
CERTIFICATE URL: https://www.sgs.com/en/certified-clients-and-products/electrical-products/modal-electrical-certificate-view?certno=FI+9050+M2%7cProcert
ISSUE DATE: 2018-04-25
EXPIRY DATE:
CERTIFIER OR LAB: SGS Fimko Ltd.

CERTIFICATION AND COMPLIANCE NOTES: Safety of electrical and electronic components. The electrical safety of our products is tested and found to meet CB requirements by an accredited testing laboratory, SGS Finland, as indicated by the CB test certificate. Furthermore, our products are NRTL certified in the USA and Canada.

MULTI-ATTRIBUTE — **CE marking**

CERTIFYING PARTY: Self-declared
APPLICABLE FACILITIES: All
CERTIFICATE URL:
ISSUE DATE: 2018-02-01
EXPIRY DATE:
CERTIFIER OR LAB: None

CERTIFICATION AND COMPLIANCE NOTES: Framery's products are CE marked. EC directives relevant to Framery's CE marking are: Low Voltage Directive (LVD) 2006/95/EC, Electromagnetic Compatibility Directive (EMC) 2004/108/EC, Restriction of Hazardous Substances (RoHS) Directive 2011/65/EU and Ecodesign Directive 2009/125/EC

OTHER — **SGS NA NRTL**

CERTIFYING PARTY: Third Party
APPLICABLE FACILITIES: All
CERTIFICATE URL: https://www.sgs.com/en/certified-clients-and-products/electrical-products/modal-electrical-certificate-view?certno=SGSNA%2f17%2fSUW%2f00038%7cProcert
ISSUE DATE: 2018-05-15
EXPIRY DATE:
CERTIFIER OR LAB: SGS North America Inc.

CERTIFICATION AND COMPLIANCE NOTES: Safety of electrical and electronic components.

SUSTAINABLE FORESTRY — **PEFC International Sustainability Benchmark - from sustainably managed forests Chain of custody**

CERTIFYING PARTY: Third Party
APPLICABLE FACILITIES: All
CERTIFICATE URL: https://www.koskisen.com/file/pefc-certificate/?download

ISSUE DATE: 2018-01-23
EXPIRY DATE: 2019-06-30
CERTIFIER OR LAB: DNV CERTIFICATION OY/AB

CERTIFICATION AND COMPLIANCE NOTES: Applies to all of the plywood parts.

SUSTAINABLE FORESTRY — **FSC Certification - Chain of Custody (COC)**

CERTIFYING PARTY: Third Party
APPLICABLE FACILITIES: All
CERTIFICATE URL: https://www.koskisen.com/file/fsc-certificate/?download

ISSUE DATE: 2013-05-17
EXPIRY DATE: 2023-05-16
CERTIFIER OR LAB: DNV GL

CERTIFICATION AND COMPLIANCE NOTES: Applies to all of the plywood parts.

OTHER — **EU Ecolabel - Textiles**

CERTIFYING PARTY: Third Party
APPLICABLE FACILITIES: All
CERTIFICATE URL: https://static.kvadrat.dk/assets/pdf/collection/environment/a4/e-1221-seu-ecolabel-certificate.pdf

ISSUE DATE: 2017-11-01
EXPIRY DATE: 2020-12-05
CERTIFIER OR LAB: Ecolabeling Denmark

CERTIFICATION AND COMPLIANCE NOTES: Applies to the fabrics used in the sofas.

Section 4: Accessories

This section lists related products or materials that the manufacturer requires or recommends for installation (such as adhesives or fasteners), maintenance, cleaning, or operations. For information relating to the contents of these related products, refer to their applicable Health Product Declarations, if available.

No accessories are required for this product.

Section 5: General Notes

Other possible MasterFormat classifications: 13 22 00 (Office Shelters and Booths), 13 20 00 (Special Purpose Rooms), 13 21 48 (Sound-Conditioned Rooms). This HPD has been compiled according to the standard model of Framery Q, which is the Meeting Maggie version. This HPD applies also to the Working with PAL 90, Working with PAL 110, Betty's Café, MeTime and NapQ models and their variants since the weight difference isn't over 10% between the models and they function is similarly.

Section 6: References

MANUFACTURER INFORMATION

MANUFACTURER: **Framery Oy**
ADDRESS: **Patamäenkatu 7**
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KEY

OSHA MSDS Occupational Safety and Health Administration Material Safety Data Sheet
GHS SDS Globally Harmonized System of Classification and Labeling of Chemicals Safety Data Sheet

Hazard Types

AQU Aquatic toxicity
CAN Cancer
DEV Developmental toxicity
END Endocrine activity
EYE Eye irritation/corrosivity
GEN Gene mutation
GLO Global warming
MAM Mammalian/systemic/organ toxicity
MUL Multiple hazards
NEU Neurotoxicity
OZO Ozone depletion
PBT Persistent Bioaccumulative Toxic
PHY Physical Hazard (reactive)
REP Reproductive toxicity
RES Respiratory sensitization
SKI Skin sensitization/irritation/corrosivity
LAN Land Toxicity
NF Not found on Priority Hazard Lists

GreenScreen (GS)

BM-4 Benchmark 4 (prefer-safer chemical)
BM-3 Benchmark 3 (use but still opportunity for improvement)
BM-2 Benchmark 2 (use but search for safer substitutes)
BM-1 Benchmark 1 (avoid - chemical of high concern)
BM-U Benchmark Unspecified (insuficient data to benchmark)
LT-P1 List Translator Possible Benchmark 1
LT-1 List Translator Likely Benchmark 1
LT-UNK List Translator Benchmark Unknown (insufficient information from List Translator lists to benchmark)
NoGS Unknown (no data on List Translator Lists)

Recycled Types

PreC Preconsumer (Post-Industrial)
PostC Postconsumer
Both Both Preconsumer and Postconsumer
Unk Inclusion of recycled content is unknown
None Does not include recycled content

Other Terms
Inventory Methods:

Nested Method / Material Threshold Substances listed within each material per threshold indicated per material
Nested Method / Product Threshold Substances listed within each material per threshold indicated per product
Basic Method / Product Threshold Substances listed individually per threshold indicated per product

Nano Composed of nano scale particles or nanotechnology
Third Party Verified Verification by independent certifier approved by HPDC
Preparer Third party preparer, if not self-prepared by manufacturer
Applicable facilities Manufacturing sites to which testing applies

The Health Product Declaration (HPD) Open Standard provides for the disclosure of product contents and potential associated human and environmental health hazards. Hazard associations are based on the HPD Priority Hazard Lists, the GreenScreen List Translator™, and when available, full GreenScreen® assessments. The HPD Open Standard v2.1 is not:

- *a method for the assessment of exposure or risk associated with product handling or use,*
- *a method for assessing potential health impacts of: (i) substances used or created during the manufacturing process or (ii) substances created after the product is delivered for end use.*

Information about life cycle, exposure and/or risk assessments performed on the product may be reported by the manufacturer in appropriate Notes sections, and/or, where applicable, in the Certifications section.

The HPD Open Standard was created and is supported by the Health Product Declaration Collaborative (the HPD Collaborative), a customer-led organization composed of stakeholders throughout the building industry that is committed to the continuous improvement of building products through transparency, openness, and innovation throughout the product supply chain.

The product manufacturer and any applicable independent verifier are solely responsible for the accuracy of statements and claims made in this HPD and for compliance with the HPD standard noted.

Interview base for the product designers about alternative materials for the hazardous materials:

- Onko olemassa jotain erityistä syytä miksi koppien vanerikomponenteissa ollaan käytetty juuri vaneria? (Translation: Is there some specific reason for using plywood in the plywood components?)

- Mitä ominaisuuksia vanerikomponenteilta vaaditaan? (Translation: What are the properties that are required from the plywood components?)

- Onko olemassa tai ollaanko mietitty mitään vaihtoehtoja vanerille? (Translation: Is there or has there been any discussion about alternatives for plywood?)

- Onko olemassa jotain erityistä syytä miksi PX4 tiivisteissä ollaan käytetty juuri siinä käytettyä tiivistemateriaalia? (Translation: Is there some specific reason for using the PX4 seal?)

- Mitä ominaisuuksia PX4 tiivisteeltä vaaditaan? (Translation: What are the properties that are required from the PX4 seal?)

- Onko olemassa tai ollaanko mietitty mitään vaihtoehtoja PX4 tiivisteen materiaalille? (Translation: Is there or has there been any discussion about alternatives for PX4 seal?)