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Survey and risk assessment of chemical substances in chemical products used for "do-it-yourself" projects in the home – follow-up project

Survey of chemical substances in consumer products

Survey of chemical substances in consumer products No. 180

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Preface

This report covers the survey and risk assessment of selected do-it-yourself (DIY) products conducted from April 2019 to November 2019. The project was carried out by the Danish Technological Institut with DHI as subcontractor on exposure scenarios and risk assessment.

The project was a follow-up study to “Survey and risk assessment of chemical substances in chemical products
used for "do-it-yourself" projects in the home” Survey of chemical substances in consumer products No. 167, which in the current project is referred to as the “pre-project”.

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Summary and conclusion

Summary
The purpose of this project is to expand the existing knowledge obtained through mapping and analysis in the pre-project Survey and risk assessment of chemical substances in chemical products used for "do-it-yourself" projects in the home.

The project contains three parts: 1) Mapping of products and establishment of exposure scenarios, 2) Analysis of volatile chemical substances 3) Risk assessment.

The mapping is performed as a supplementary study to the pre-project, and new products relative to this have therefore been identified and chosen for analysis. A total of 86 new products are found, of which 20 are 2-component products, a product type than in general was deemed especially problematic in the pre-project.

The identified products are divided into the following categories: 1) Fillers 2) Primers/membranes 3) Adhesives 4) Paints and lacquers 5) Sealer products 6) Floor wax, polish and care products.

20 products have been chosen based on the mapping and these have been sampled by The Chemical Inspection Service. The analysis of volatile chemical substances in these products has been conducted by emissions testing in climate chambers after 5 hours, 3 days, and 28 days, respectively after application. The analysed products have been chosen based on their chemical content as well as their hazard classification, with the aim that all the aforementioned product categories are represented.

In the category of paints and lacquers eight products have been tested, which all emit high concentrations of volatile chemical substances. Six of these products have been selected for risk analysis, which shows that after 5 hours of degassing all samples exceeded the permitted risk characterization ratio for one or more chemicals (including chronically neurotoxic hydrocarbons, as well as multiple mucosal irritants including butanone oxime), and therefore have unacceptable exposure levels for the user. After 3 days none of the 2-component paints and laquers exceed the tolerable exposure level, while this still is the case for 1-component paints and laquers, for a range of eye and respiratory irritants (compounds that are strong irritants to eyes and upper respiratory system). For the latter product group, three out of four products displayed unacceptably high emissions of 2-ethylhexanoic acid, which is deemed to potentially be harmful to the unborn child.

Of the four tested fillers three products emit high concentrations of volatile chemical substances, which is also the case for the only sealer product that is tested regarding emissions. Only one filler is chosen for risk analysis, where degassing after 5 hours and 3 days, respectively is deemed unacceptably high for hydrocarbons especially, while this has reached an acceptable level after 28 days.

In the primers/membranes product group only one product is selected for testing. This product emits phenol, formaldehyde, and acetaldehyde, however it is chosen for risk assessment, as the concentration of emitted volatile compounds is relatively low and are therefore considered to not pose a significant exposure risk. In the category adhesives two products were tested that primarily also emitted phenol, formaldehyde, and acetaldehyde. Of these products only one adhesive product intended for wet room purposes was chosen for risk analysis. After 5

hours and 3 days, respectively this adhesive exhibits an exposure level above the tolerable for the mucosal irritant and preservative chemical 5-chloro-2-methyl-3(2H)-isothiazolone (CMIT).

Four products from the product group floor wax, polish and care products have been tested and two of these have further been selected for risk assessment. One oil-based product intended for wooden tables (product ID 72) exceeds acceptable tolerance levels after 5 hours for hydrocarbons (among others), but acceptable levels are achieved after 3 days. Product ID 85, which is a linseed oil-based product for wood care, exhibits limited emissions after 3 days, however after 28 days a range of aldehydes and organic acids are found, which are not previously observed for this product.

The recommendation of the project is to ensure thorough ventilation during and after all do-it-yourself projects in the home as well as taking the precaution of not using the room/rooms in question directly after renovation.

Conclusion

Mapping of products and establishment of exposure scenarios

Within the mapping of products, emphasis was on targeting sales locations and specific products that were not included in the pre-project. 31 companies selling products for private use were identified in total, where 12 of these have not previously been examined. Furthermore, the survey showed that consumers can buy do-it-yourself products in large retail stores, however, as these are usually promotional items and not part of the standard assortment, they were not examined further. It was not possible to get specific sales numbers for the products sold to private consumers, as this information is partially confidential and partially not known exactly. This is due to the fact that all identified sales locations sell to both private and professionals. However, it was assessed that the supply of products in the physical stores largely reflects the sales of these products, as the stores primarily have products on stock that are considered to have a high turnover. For all product groups it was possible to find eco-labelled products (M1, EU Ecolabel, the Swan etc.), making it possible for the consumer to choose an alternative to the traditionally used items. In the majority of DIY stores it was possible to get information from an employee, however it was not in all cases possible to get sufficiently qualified guidance. Safety Data Sheets (SDS) were only available in a few cases without actually purchasing a given item. It can therefore be concluded that it can be quite challenging for a consumer without previous knowledge within the area, to be sufficiently informed regarding safety, before purchasing a DIY product.

Analysis of volatile chemical substances

The products found through the mapping of the products, were analysed based on the available information. Based on this, 20 products were selected for further analysis according to the following criteria: 1) Hazard label on product 2) Ingredients with hazard classification 3) Each product group should be represented. The analysed products are shown below:

Fillers	4 products (ID 14, 26, 36, 71)
Primers/membranes	1 product (ID 56)
Adhesives	2 products (ID 60, 65)
Paints and lacquers	8 products consisting of 4 products 1-component (ID 4, 11, 29, 32) and 4 products 2-component (ID 2, 5, 20, 30)
Sealants	1 product (ID 88)
Floor wax, polish and care products	4 products (ID 72, 80, 83, 85)

Measurement of the volatile chemical substances from the products was performed by the same procedure as in the pre-project. The products were applied on glass plates in the recommended dosage according to the manufacturer's instructions. Emissions measurements was performed in small climate chambers of 113 litres at 23 °C and 50 % RH with an air change rate of 0.5 h^{-1} corresponding to testing according to EN 16516: 2017. Three measurements

were performed for each sample, in order to assess the exposure during and right after application of the product (5 hours) after a short period (3 days) and after a longer period (28 days). The sampling of volatile organic compounds (VOC) was performed on Tenax and subsequently the substances were analysed by TDS-GC/MS. For the analysis a library of 67 reference substances was utilized. These chemicals were chosen based on the volatile substances found in the mapping of the products in addition to previous experience from analysis of similar construction products. Volatile aldehydes were collected on DNPH and analysed by HPLC for formaldehyde, acetaldehyde, propanal, acrolein and butanal.

2-ethylhexanoic acid was found in the emissions for three out of four 1-component paint products (product ID 4, 11 and 32). This substance is formed during drying and is derived from calcium bis (2-ethylhexanoate)[1], which is added to the paint to contribute to the deep drying of especially alkyd-based products. For all 1-component paints alkanes in the form of naphta or other substances were found.

In all the 2-component paints volatile substances were found in the emissions in high concentrations including 2-butoxy ethanol, 1-methoxy propan-2-ol, naphta, benzyl alcohol and a range of esters. In two products (product ID 2 and 5) CMIT was found, although CMIT was not declared in the SDS for product ID 5.

The tested sealer product (Product ID 88) emitted styrene in smaller quantities as well as 2-propenoic acid, 2-methyl-1,2 ethanediyl ester in very high concentrations. The filler products all emitted either styrene or phenol, while product ID 14 emitted naphta in very large quantities.

A single membrane product intended for wet room use (product ID 56) from product group primers/membranes was tested. Phenol, formaldehyde and acetaldehyde were found in the emissions of this product.

Two adhesive products were tested, which both mainly emitted phenol, formaldehyde and acetaldehyde, while one (product ID 60) also emitted CMIT, which was not declared in the SDS[2].

After 5 hours, four products from the product group floor wax, polish and care products (ID 72, 80, 83, 85) all emitted naphta, while 2-butanone oxime emitted in low concentration from product ID 85. Furthermore, various aldehydes and carboxylic acids were observed in the emissions for product ID 85 (raw linseed oil) after 28 days, although these were not detected after 5 hours nor 3 days.

CMIT and / or methyl isothiazolinone (MIT) emitted from six different products (Product ID 2, 5, 60, 65, 80 and 83). MIT was identified in the emissions from a floor polish (ID 83) for which no SDS was available.

For all the tested products the highest emissions were generally measured immediately after application i.e. after 5 hours. This is to be expected, as the products must cure after application, which happens through evaporation of solvent and/or by evaporation of new volatile chemical compounds, which are formed during the curing process. For some products, new

[1] New information became available during the final project phase via the complete list of ingredients acquired by the Chemical Inspection Service. Products with IDs 4 and 11 contain 2-ethyl hexanoic acid, however in concentrations below the limit of declaration.

[2] This substance was not mentioned on the SDS by the time analysis were performed. The manufacturer informed later on that the SDS was updated with information about the content of the substance.

emissions profiles (i.e. combination of volatile substances) were detected after 3 days and once again after 28 days, where the product finally had cured. The components subject to declaration in the SDS were known in advance for 13 of the 20 investigated products and overall there was a good correlation between the declared ingredients and the volatile chemical substances identified by analysis.

Risk assessment

Based on the results from the analysis of volatile compounds ten products were selected for risk assessment, as shown below:

Fillers	1 product (ID 14)
Adhesives	1 product (ID 60)
Paints and lacquers	6 products consisting of 4 products 1-component (ID 4, 11, 29, 32) and 2 products 2-component (ID 5, 30)
Floor wax, polish and care products	2 products (ID 72, 85)

Thus, risk assessment was not performed for the product groups primers/membranes or sealants. The selection of products for the risk assessment focused on the products that continued to emit dangerous substances after 3 and 28 days. There was a clear overrepresentation of paints and lacquers among the chosen products, as six of the ten selected products belong to this group.

The emissions of the products were evaluated in relation to the tolerable exposure values, the so-called DNEL-values (Derived No Effect Level). These values are either found within the literature or from expert assessments, while a few cases they are calculated from toxicological data.

The emission values, which can be directly related to exposure, are compared with the DNEL value and a Risk Characterization Ratio (RCR) is calculated:

RCR (X) = Measured exposure (Substance X) / DNEL (Substance X)

When the exposure exceeds the DNEL-value the RCR-value is over 1, which indicates increased risk in relation to safety defined by the DNEL-value.

In the event that several of the emitted substances have the same type of effect, e.g., mucous membrane irritation or neurotoxic effects, it is considered relevant to add the RCR values for these substances. Hereby, each of the single-acting substances is believed to contribute to the same type of effect. Thus, many small RCR values together may result in an overall risk that is unacceptable (i.e. a total RCR value above 1), although the values for the individual substances are below the tolerable exposure level.

The risk assessments are based on the use of one DIY product at a time. In the event that multiple products are utilized simultaneously, the accumulated emissions will be larger and thereby lead to increased risk potential.

All products from each product groups exceeded the acceptable exposure level (RCR> 1) for one or more substances in the emissions after 5 hours. Particularly 1- and 2-component paints and lacquers exhibited high emission levels. This is considered to be most critical for a number of eye and respiratory irritants, such as 2-butanone oxime and triethylamine. None of the 2-component paints and lacquers exceeded the RCR-values of 1 after 3 days, while this continued to be the case for some eye and respiratory irritants in 1-component paints and lacquers. Furthermore, it should be noted that for the 3-day measurement for three out of six products, unacceptably high emissions of 2-ethylhenxanoic acid was detected, which is considered to potentially be harmful to the unborn child.

The tested adhesive for wet rooms (product ID 60) showed RCR-values of 18 and 21 after 5 hours and 3 days, respectively, for the mucosal irritant preservative CMIT. This had, however, dropped to an acceptable exposure level (RCR = 0.08) after 28 days.

Emissions after 5 hours and 3 days, respectively, are unacceptably high for the tested filler (product ID 14), especially with regards to hydrocarbons (RCR ≥ 238), while after 28 days it has reached an acceptable level.

Two products from the product group floor wax, polish and care products have been selected for risk assessment. DNEL-values for product ID 72 (oil for wooden tabletops) exceed acceptable tolerance levels after 5 hours for 2-(2-ethoxyethoxyethanol) and C7-C13 hydrocarbons by a factor of 11 and 147, respectively, while acceptable levels are achieved after 3 days.
For product ID 85 (linseed oil for wood care) emissions of 2-butanone oxime and C7-C13 hydrocarbons exceeded DNEL-values by a factor of 6 and 3, respectively. This product exhibited limited emissions after 5 hours and 3 days, however, after 28 days a range of aldehydes and organic acids occur, indicating that these are degradation products from the linseed oil.

After 28 days emissions have generally dropped to much lower levels for all products, however for some substances tolerable exposure levels are still exceeded. This applies, for example, to the substance 2-ethylhenxanoic acid from 1-component paints and lacquers, which is considered critical, as the substance is potentially harmful to unborn children. Furthermore, an unacceptably high emission of the mucosal irritant preservative CMIT was found for a 2-component paint after 28 days, which was not measured after neither 5 hours nor 3 days.

1. Introduction

1.1 Background for the survey

In “Survey and risk assessment of chemical substances in chemical products used for "do-it-yourself" projects in the home” henceforth referred to as the “pre-project ”, it was shown that there can be a health risk when working with a number of products for minor home improvement renovations, if the consumer does not use proper personal protective equipment. For some products, there is a risk in the case of direct skin contact, while for others the evaporation of respiratory irritants and carcinogenic substances occurs for up to 28 days after application.

The use of do-it-yourself products are not subject to the same stringent requirements as products for professional use, for example it is not required to submit information to the Product Register for products used by private consumers. Therefore, there is a risk that retailers unknowingly sell goods to consumers, which do not comply with current legislation for professional use. It is not mandatory to provide safety data sheets (SDS) for products intended for private use.

In the pre-project, the following product types were identified as posing a risk by emission: “Chemical wood” (two component), floor lacquer (acid-curing), solvent-based floor paint, water-based epoxy floor paint (two component), water based wet room paint, PU-sealing foam, white spirit (mineral turpentine) and floor waxes. These types of products are typically applied in liquid form and then cured. During the curing process, a chemical reaction occurs, whereby volatile organic compounds can be formed and emit.

1.2 Objective

The objective of this project is to:

- Expand the existing knowledge obtained through mapping and analysis in the pre-project
- Mapping the prevalence of previously studied product types including the amounts used by the average consumer
- Determine whether suitable alternatives are found for existing products
- Gain more knowledge about the origin of the volatile organic compounds that emit; Are they initially present in the products or are they formed during curing
- Analyse the emission of volatile organic compounds from several products within the previously investigated product groups

1.3 Delimitation

In this project products that have previously been investigated in "Survey and risk assessment of chemical substances in chemical products used for "do-it-yourself" projects in the home" will not be registered. Products that have eco-labels, with criteria regarding emissions of volatile compounds are not considered. This includes EU Ecolabel, the Nordic Swan Ecolabel, Blue Angel (Germany), M1 (Finland) and the French emission label. Additionally, products which are clearly labelled for outdoor use will not be included, while products that are intended for regular cleaning such as care products such as care oils/waxes for furniture and floors are likewise not included.

Furthermore, there will be only limited focus on grocery stores in this study, as they to some extent supply chemical products to the do-it-yourself market, especially cleaning products, but to some extent also paints and lacquers. These points of sale are mentioned in the project but have not been further investigated.

2. Mapping of products and establishment of exposure scenarios

2.1 Objective

This project seeks to:

- Map the prevalence of the above product types including the use of the general consumer
- Clarify whether there are suitable alternatives to the existing products and what their advantages and disadvantages are
- Gain more knowledge about the origin of the volatiles that emit gases; Are they present in the products or are they formed during curing
- Analyse the emissions of volatile substances from several products within the previously investigated product groups (e.g. epoxy products)

2.2 Mapping

The mapping is based on the pre-project and the methods below have been used.

- The products offered for private use have been investigated on the Internet
- Products available in physical stores have been detected during visits to the following retailers: Silvan, Bauhaus, jem & fix, Biltema, Beck & Jørgensen, Stark, Harald Nyborg and XL-byg. Product choices and options have also been discussed with the staff in the stores in the cases when it has been possible to obtain advice from competent employees.
- The store main offices have been contacted by telephone and through e-mail correspondences to obtain information on quantities of sold products. In addition, companies have been contacted to provide SDS, if these were not available online
- Contact has been made to the Confederation of Danish Industry and the Danish Chamber of Commerce, who do not have information on products sold exclusively for private use
- In the survey, special attention was paid to investigating 2-component products, as these were found to be particularly problematic in the pre-project and the application in professional use requires mandatory specialized training.
- In relation to identifying replacement products for 2-component acid curing varnishes, some 1-component acrylic, polyurethane and acrylic/polyurethane lacquers are found on the market, which claim: "The floor surface can be compared with the old 2-component floor surfaces"[3]. Typically, these products do not exhibit quite the same durable properties as the 2-component systems[4], however they are included in the mapping of products on the market.

2.3 Scenarios

When assessing the use of do-it-yourself products, the specific project for which the product will be used must be defined. Do-it-yourself projects in the home relevant to this survey fall in to one of the following three categories.

1. General maintenance, where the primary purpose is to improve or maintain the appearance of a surface by washing and subsequent soap treatment, oiling or coating

[3] Quote concerning the product from webpage of Maling.dk ” FAXE GOLAK - EKSTREM STÆRK MAT”

[4] Communication with professional painters

2. Extensive maintenance, where surfaces are cleaned thoroughly by removing wallpaper, paint or lacquer, and subsequently rebuilding the surface by spackling, glass flies/fabric setting, priming and finishing
3. New build or complete renovation where the surface is built from the beginning, which may be brick walls, concrete walls or light walls (plaster, wood or similar)

2.4 Do-it-yourself projects

2.4.1 Project for the scenario ”Normal maintenance”

The primary goal is to improve or maintain the appearance of the surface.

Here the typical project operation will be:

- Cleaning
- Refinishing with soap, wood oil or paint

2.4.2 Project for the scenario "Extensive maintenance"

The project where the surfaces are cleaned thoroughly before rebuilding.

Here the typical project operation will be:

2.4.2.1 Renovation of walls

- Removal of wallpaper, paint or lacquer
- Spackling
- Grinding[5]
- Priming
- Mounting of fiberglass fabric or wallpaper with adhesives.
- Priming of fiberglass fabric
- Application of paint

2.4.2.2 Renovation of concrete floors

- Removal of paint or lacquer
- Spackling of holes and gaps with concrete filler
- Priming with acrylic/epoxy or floor levelling with epoxy filler
- Application of paint/lacquer

2.4.2.3 Renovation of woodwork

- Removal of paint or lacquer
- Spackling
- Grinding
- Priming
- Application of paint/lacquer

2.4.3 Project for the scenario ” New build or complete renovation”

The project where everything is done from scratch.

Here the typical project operation will be:

- Spackling
- Grinding
- Priming
- Setting of tiles, glass flies/fabric or wallpaper with adhesives
- Priming of glass flies/fabric – grouting of tiles

[5] Grinding is specifically mentioned, because harmful substances as well as dust may be released during this process and these may be inhaled by the user.

- Application of paint/lacquer
- Gluing of architraves, lists and panels
- Painting of architraves, lists and panels

2.5 Identified product types for do-it-yourself projects

The products for the projects can be divided into the following categories:

TABLE 1. Product types including descriptions

Product type	Description
Fillers	These products are available as either dry powder, which must be mixed with water, or as ready-to-use products. These products are available as 1 and 2 component products. These products are always used early on in a project, to level holes, gaps and other unevenness of the surface. These products are either porous like putties for walls or solid like wood fillers. These products are used as spot repair or as a whole surface pre-treatment for example on a full wall.
Primers/membranes	These products are available as ready-made liquid products and are used as pre-treatment. These products are mostly used on larger areas, like whole walls and floors, and are pre-treatment for gluing, painting and as moisture controlling treatment.
Adhesives (glues)	These products are available as either dry powder, which must be mixed with water or as ready-to-use products. These products are available as 1 and 2 component products. These products are used for setting of tiles, glass flies/fabric or wallpaper and gluing of architraves, lists and panels. The products are mainly used on large areas.
Paints and lacquers	These products are available as ready-made liquid products. These products are used as the aesthetic finishing of a project These products are mainly used on large areas
Sealants	These products are available as ready-made liquid products. These products are used for filling gaps and maintain the building envelope. The products are mainly used on smaller areas.
Floor wax, polish and care products	These products are available as ready-made liquid products. These products are used as the aesthetic finishing of projects on wood-based surfaces. These products are mainly used on large areas

2.6 Summary of survey results

The survey has identified a total of 31 companies selling products for private use, of which there are 12 new ones that were not covered by the pre-project, cf. Appendix 1.

In this project, the focus is primarily on products that were not covered by the pre-project. A total of 86 new products have been found, of which 20 are 2-component, cf. Appendix 2.
The products are categorised in the following groups:

- Fillers
- Primers/membranes
- Adhesives (glues)
- Paints and/or lacquers

- Sealer products
- Floor wax, polish and care products (including oils and waxes)

Based on the information found in the survey, it must be concluded that as a consumer it can in some cases be a challenge to get qualified advice in the shops regarding do-it-yourself products. This advice will depend on several factors, including the merchant's knowledge of the application area of the product and the seller's expectations of what the customer requires (ecolabelling, durability, price, etc.). These expectations are probably influenced by the customer's age, gender and appearance. The range of products will also depend on the geographical location in the country and whether the customer group for the current store is primarily rural or urban.

An online service called "Malerfagligt behandlingskatalog" (MBK)[6] is used by Danish professionals and recommends appropriate procedures for a given project. It was observed that staff in the DYI stores can provide guidance on procedures in a similar way to MBK's guidance. An example of an MBK instruction for floor paint is given in Appendix 3 (only available in Danish).

Acrylic-based paints/lacquers can largely replace epoxy-based products but are generally not considered as strong as these. The acrylic based products are far less hazardous in relation to emissions than the epoxy products and often have the same properties. It was observed that the use of 2-component floor paints / lacquers (which includes epoxy-based products) is not directly recommended in the construction markets for floors in general, but they are recommended for floors needing high wear resistance, for example workshops and garages. In two construction markets, a curing agent for a floor lacquer (product ID 29 cf. appendix 2.1) could not be purchased, even though the packaging stated that this component must be added before use. The construction market stated that the product can be used without the addition of a curing agent and this was confirmed by telephone to the technical support department of the manufacturer. Curing agents are added in cases where the lacquered surfaces must be extremely durable, but the product dries within the same time as if the hardener is added.

The survey found 15 1-component fillers, which can be alternatives to the 9 found 2-component fillers. In most cases, 1-component products are easier to work with for the consumer, as the product is ready to use and therefore does not need to be prepared before use. However, if a corresponding 2-component product is significantly cheaper, this may also affect the consumer's choice. In all product categories, products with an eco-label (The Blue Label, EU Ecolabel, The Nordic Swan etc.) were identified, giving the consumer an option to avoid problematic substances. Eco-labelled products are not included in the survey, as it is expected that these products will comply with their respective labelling requirements, which in most cases also include the emissions of problematic substances. In some cases, the durability and/or performance of these alternatives may be inferior to the traditional products, but a closer qualitative study of this would be very elaborate and was therefore not included in the project.

The products selected in the survey are available at the visited stores, which indicates that they are used by private customers. The DIY stores have no interest in having items on the shelves that will not be sold, as there is a limited shelf life of the products, which means that expired items must be discarded without profit. The distribution of the products in the stores thus reflects to some extent the demand from the consumers. This has been verified by physical visits to selected stores. A large assortment of a given product in several retail chains may indicate that this product is also used in large quantities by consumers. It has not been possi-

[6] https://www.teknologisk.dk/mbk

ble to find exact figures for the sale of the different types of products, partly because most construction markets sell both to private and professional, and partly because this information is confidential.

2.7 Exposure scenarios

2.7.1 Background for exposure scenarios

The pre-project demonstrated a risk for the operator during application/use of all products except the water-based floor paint, if appropriate precautions (thorough ventilation) or personal protective equipment (respiratory protection and/or protective gloves) were not used. This risk was verified through measurements of the vapours in the inhalation zone, while working with the products. This was a general finding for all products containing organic solvents. It is unlikely that new measurements and assessments will contribute with new knowledge in relation to this compared to the pre-project. Therefore, it is also not expected that there will be changes in the recommendations for working with the specific products, as the user can protect himself/herself by using the proper protective equipment.

In the pre-project problematic substances were shown to emit to the indoor climate over a longer time period, which can be problematic. Therefore, this project focuses on measuring emissions in small climate chambers and the emissions of the chemical products for up to 28 days after use.

Furthermore, the exposure assessment and risk assessment in this project do not focus on skin contact with the products, but only on the emissions and inhalation of the vapours after the products are used.

2.7.2 Description of exposure scenarios

The do-it-yourself exposure scenarios focus on exposure to the emissions for the users of a renovated room in the first weeks after the renovation.

Relevant unit of measurement

Measurements are given in the concentration unit µg/m^3, since the concentration in the room can thus be directly compared with a tolerable exposure level stated in µg/m^3 (Derived No Effect LeveL, DNEL, see chapter 4 regarding exposure and risk assessment).

Target group and time of occupancy

The measurements from small climate chambers are used in the same way as in the pre-project to assess the exposure in a renovated room. The users of the room can include all age groups from infants to elderly/old people, and the exposure time can be set as a worst-case scenario to 24 hours per day in case the person is bedridden. However, for exposure in a bathroom, the daily exposure time of 1 hour is considered more appropriate.

Room size

Based on the measurements in the climate chamber, the exposure is assessed in a reference room, which is a room with a floor area of 12 m^2 with a volume of 30 m^3, cf. the European standard EN 16516 for measuring the emission of VOC from construction products to the indoor environment. Thus, the area of the treated surfaces of the test pieces can be scaled down relative to the size of the test chamber so that the results can be used directly as exposure levels for user occupancy in a standard room of 30 m^3.

The emission rate and the measured concentration in the climate chamber will also depend on the following factors:

Amount of used product and applied area:
As in the pre-project, climate chamber test specimens will be prepared according to current test standards and recommendations for the current product type. The surface area and film thickness of liquid products such as coatings and fillers are important for the measured concentration.

As mentioned above, the area of the treated surfaces of the test specimens is scaled down to the size of the test chamber at 113 L, so that the results can be used directly as exposure levels for user occupancy in a standard room of 30 m^3.

Measuring Time:
As in the pre-project, the concentration of emissions is measured after 5 hours, 3 days, and 28 days in order to assess the emissions during the first weeks after the renovation work and to assess any changes in the emissions from the product.

Air exchange:
Air exchange in the chamber in relation to the material load is adjusted to correspond to an air exchange of 0.5 times per hour in the reference room, since this is the building regulations minimum ventilation requirement in housing (BR18).

In connection with risk assessment of the listed products in Table 5, it is not considered necessary to change the assumptions in relation to the corresponding risk assessments carried out in the pre-project.

3. Analysis of volatile chemical compounds

3.1 Objective

The objective is to determine the emissions of volatile chemical compounds from selected do-it-yourself (DIY) products. These results will form the basis of the subsequent health and risk assessments.

3.2 Selection of products for analysis

From the list of products found in the survey, 20 products were selected for analysis based on the following criteria:

- Hazard labelling of the product (CLP), if available
- Ingredient substances with hazard classification, if SDS is available[7]
- The 6 different product types must be represented

Products for testing have been obtained by the Chemical Inspection Service of the Danish Environmental Protection Agency, which in addition to participation on this project, inspects the CLP marking of the products. The list of products selected for laboratory analysis is highlighted with green in the product overview in appendix 2.1.

Based on available information from the SDS of the products, a list of declared ingredient substances with hazard classification has been prepared as shown in Appendix 4.1. Not all products from the survey (Appendix 2.1) are included in this list, as some of the found products were subsequently considered to be outside the scope of the defined DIY scenarios.

3.3 Analysis programme

There are numerous methods for measuring the emission of volatiles from building materials and liquid products. Since emissions from liquid products such as adhesives and coatings (lacquers, paints etc.) are very high in the initial period after application, most product test methods use a curing time of 3 days under controlled climatic conditions before the sample is introduced into the climate chamber with air samples taken after 3 and 28 days, respectively (GEV-Testing method, EN 16402). This means that the first emissions are in fact measured 6 days after application of the product. The measurements in the current project focus on exposure immediately during and just after application (5 hours), after a short time (3 days) and long-term (28 days).

Although it is a technical challenge to measure the initial high concentrations of volatiles, it was decided to use the same methodology as in the pre-project. It was considered to introduce a smaller material surface in the climate chambers than the standard room to reduce the concentration of VOC in the gas phase, thus avoiding over-saturation of sampling media and subsequent analyses. Emission of volatiles from material surfaces is an equilibrium between gas phase and substrate in a so-called boundary layer (Salthammer and Uhde, 2009). If the amount of material is reduced and thereby the VOC in the chamber, the equilibrium will shift towards the gas phase and thus not give a correct emission profile. It was therefore assessed that measurements performed under the same test conditions as in the pre-project, would give the most accurate results.

[7] As it is only a required that SDS must be provided for products intended for professional use, it has not been possible to obtain SDS for all purchased products.

Measurements of volatile chemical substances from the products were therefore carried out similarly to the pre-project in small climate chambers of 113 litres at 23°C and 50% RH at an air change of 0.5 h^{-1} according to EN 16516: 2017. EN 16516: 2017 is a specification of the ISO 16000 standard test methods for emission testing of dangerous substances from construction products to the indoor environment. Thus, the test conditions reflect a typical indoor climate in dwellings, where a standard room has been defined with loading factors for different types of construction products i.e. floors, walls, ceilings, sealants etc.

3.3.1 Preparation of samples for chamber testing

Products were applied in the recommended amount according to the product-specific instructions. Representative sampling is performed after thorough mixing of the product. The product coverage (m^2/L) and density as stated by the manufacturer are used for calculation of application amounts, cf. Appendix 2.1. The product is applied in an even layer with a brush or roller according to the manufacturer's instructions on to a clean glass plate with an area corresponding to the loading factor for chamber test cf. EN 16516. For some of the products, including sealants and oils, a recommended amount is not specified, so instructions given in ISO 16000-11 and GEV-Testing method was followed. Fillers and sealants were applied to a 3 mm deep mould and smoothed with a trowel. An overview of the tested products is shown in Table 2.

TABLE 2. Tested do-it-yourself products (c = number of components)

ID	Product type	C	Application/scenario	Surface	Load (m^2/m^3)	Amount (g/m^2)
60	Adhesive	1C	Mounting of fiberglass fabric	Ceiling + Wall	1.4	222
65	Adhesive	1C	Mounting of fiberglass fabric	Ceiling + Wall	1.4	254
2	Paint & lacquer	2C	Painting of floor	Floor	0.4	108
4	Paint & lacquer	1C	Painting of ceiling and walls	Ceiling + Wall	1.4	274
5	Paint & lacquer	2C	Painting of floor	Floor	0.4	253
11	Paint & lacquer	1C	Painting of wall	Wall	1.0	110
20	Paint & lacquer	2C	Painting of floor	Floor	0.4	301
29	Paint & lacquer	1C	Lacquering of floor	Floor	0.4	109
30	Paint & lacquer	2C	Painting of floor	Floor	0.4	152
32	Paint & lacquer	1C	Painting of floor	Floor	0.4	146
56	Membrane	1C	Bathroom waterproof coating membrane	Floor + Wall	1.4	997
72	Floor wax, polish & care product	1C	Oil for polish & care of wood	Tabletop	0.1	66
80	Floor wax, polish & care product	1C	Oil for polish & care of wood and stone floors	Floor	0.4	50

83	Floor wax, polish & care product	1C	Oil for polish & care of wood and stone floors	Floor	0.4	50
85	Floor wax, polish & care product	1C	Linseed oil for polish of wood floors	Floor	0.4	60
14	Filler	1C	Wood surface repair and levelling	Very small surfaces	0.007	-
26	Filler	2C	Wood surface repair and levelling	Very small surfaces	0.007	-
36	Filler	1C	Wood surface repair and levelling	Very small surfaces	0.007	-
71	Filler	1C	Wood surface repair and levelling	Very small surfaces	0.007	-
88	Sealant	2C	Repair of concrete/cracked concrete	Very small surfaces	0.007	-

3.3.2 Chemical analyses of the air samples

Air samples of volatile compounds were collected on suitable sampling media; VOCs on Tenax and VVOC C1-C4 aldehydes on DNPH, according to the pre-project set-up shown in Table 3 using the calibration list of the chemical substances given in Appendix 5. Detection limits for measured concentrations depend on the amount of air collected on the media.

TABLE 3. Sampled air volumes from climate chamber

Air sampling media	Method	5 hours	3 days	28 days
Tenax (VOC)	ISO 16000-6	0.05 L – 2 L	1 L, 3 L	3 L, 5 L
DNPH (C1-C4 aldehydes)	ISO 16000-3	30 L	30 L	30 L*

*Air sampling after 28 days was carried out if aldehydes > 10 µg/m^3 after 3 days

Determination of VOCs in air by TDS-GC / MS

The collected VOCs on Tenax were thermally desorbed, separated by gas chromatography (GC) and detected by mass spectrometry (MS) on a Gerstel-Agilent system with a 60 m DB-5 column mounted with a 10 m precolumn (DB-5ms) according to ISO 16000-6. The identity of each VOC was verified by searching on Wiley W9N11 with a minimum match of the MS spectrum of 80%. The retention times were verified by pure reference substances according to availability. VOCs were quantified by calibration with pure reference substances, and otherwise as toluene equivalents cf. EN 16516 at concentrations 5 µg/m^3 and above. The analysis included VOC reference substances usually found construction products emissions (including DIY products) and purchased reference substances for the identified volatiles found in the survey. The calibrated linear range for 67 substances is shown in Appendix 5.1, where the measuring range of air concentrations is calculated for the smallest volume of air (0.05 L) and the largest volume of air (5 L). The measurement uncertainty is not determined for all individual substances. The expanded analytical measurement uncertainty of the validated method is 30%.

Determination of carbonyls in air (VVOC C1-C4 aldehydes) by HPLC-UV

The aldehydes were collected on 2,4-dinitrophenylhydrazine (DNPH) filter by derivatization. The collected carbonyls are eluted with acetonitrile and analysed by HPLC, identified by retention time and UV spectrum, and quantified using calibrated reference substances: Formaldehyde, acetaldehyde, propanal, butanal and acrolein. The results are reported with one decimal

place down to 1.0 µg/m^3 which is lower than the EN 16516 reporting limit of 5 µg/m^3. Expanded analytical measurement accuracy is 15%. The limit of detection is given in appendix 5.2.

3.4 Results

The results for all the measured volatiles in the 20 products are given in appendix 6.

Since the emission of VOC is very high at the beginning of the chamber test, the capacity of the sampling medium (Tenax) has been exceeded for several samples upon sampling after 5 hours. In the GC-MS analysis, some values are so high that the concentrations are outside the calibrated range. It cannot be ruled out that the air samples, in addition to the identified substances, also contain other substances at low concentrations which are "overshadowed" by the very high background concentrations. Thus, the measured concentrations may be underestimated and subject to greater analytical uncertainty than usual.

Substance names are in English and the chemical nomenclature is variable depending on the library search on MS spectra for VOC analyses. However, in all cases the substances can be identified by their unique CAS no.

The hydrocarbons listed in SDS for some of the products are of technical grade with different chain lengths and degree of branching depending on the composition, cracking process and distillation of the crude oil. It is therefore difficult to determine the exact hydrocarbon composition of the individual raw materials with the GC/MS VOC analysis used.

An overview of identified volatiles that have a hazard classification according to the risk of inhalation and skin contact, cf. the pre-project[8] is given in the following tables (4-8). Substances that are expected to be present in the product and mentioned in SDS are marked in gray. When the substance is not detected within the linear range, “ND” is indicated for the given measurement. Where a substance or group of substances is measured in concentrations that exceed the linear range, a greater than sign "≥" is added to the concentration.

The lower limit for reporting measured concentration in air is 5 µg/m^3 with two significant digits according to EN 16516, but C1-C4 aldehydes and carcinogenic VOC including CMIT are reported down to 1 µg/m^3 air. Only aldehydes are reported with one decimal place and "N" indicates cases where C1-C4 aldehydes have not been measured after 28 days.

TABLE 4. Volatiles measured in 1-component paints and lacquers

Substance	CAS	5 hours (µg/m^3)	3 days (µg/m^3)	28 days (µg/m^3)
ID 4: 1C Paint – painting of ceiling and wall:				
Formaldehyde	50-00-0	ND	22	7.8
Acetaldehyde	75-07-0	ND	230	18
Acrolein	107-02-8	ND	39	ND
Acetic acid	64-19-7	ND	230	38
Propanoic acid	79-09-4	ND	200	37
Butanoic acid	107-92-6	ND	97	31
Hexanal	66-25-1	ND	ND	230
2-Butanone, oxime	96-29-7	≥220000	ND	1

[8] Acute tox 1+2+3, Skin Corr 1A+1B+1C, Skin sens 1A+1B, Resp sens 1A+1B, STOT RE 1+2, STOT SE 1+2, Carc 1A+1B+2, Repr 1A+1B, Muta 1A+1B

Substance	CAS	5 hours ($\mu g/m^3$)	3 days ($\mu g/m^3$)	28 days ($\mu g/m^3$)
Hexanoic acid	142-62-1	ND	3200	600
2-Ethylhexanoic acid	149-57-5	ND	3200	410
Alkaner, iso-, < 2% aromater C7-C13	927-285-2	≥1100000	≥110000	ND
ID 11: 1C Paint - painting of ceiling and wall:				
Formaldehyde	50-00-0	ND	16	6.5
Acetaldehyde	75-07-0	ND	111	20
Acrolein	107-02-8	ND	22	ND
Acetic acid	64-19-7	ND	250	21
Propanoic acid	79-09-4	ND	250	34
2-Butanone, oxime	96-29-7	≥58000	ND	ND
Butanoic acid	107-92-6	ND	55	ND
Phenol	108-95-2	ND	49	3
Hexanoic acid	142-62-1	ND	3400	340
Di(propylene glycol) methyl ether, mixture of isomers (A)	34590-94-8	≥3900	76	ND
2-Ethylhexanoic acid	149-57-5	ND	3500	200
Naphtha C7-C13	64742-82-1/64742-48-9	>2600000	4200	81
ID 29: 1C Lacquer – lacquering of floors:				
Formaldehyde	50-00-0	ND	ND	2.0
Acetaldehyde	75-07-0	16	2.2	1.6
Diethylamine	109-97-7	2300	ND	ND
Triethylamine	121-44-8	≥19000	140	9
Oxiraner	68609-97-2	<100	430	ND
Propylene glycol butyl ether	5131-66-8	300	ND	ND
Di(propylene glycol) methyl ether, mixture of isomers (A)	34590-94-8	≥190000	100	<5
1-Ethyl-2-pyrrolidinone	2687-91-4	ND	ND	1
Naphtha C7-C13	64742-82-1/64742-48-9	370	780	ND
ID 32: 1C Paint – painting of floors:				
Formaldehyde	50-00-0	2.6	7.1	2.9
Acetaldehyde	75-07-0	2.0	30	5.4
Acetic acid	64-19-7	ND	36	ND
1-Methoxypropan-2-ol	107-98-2	650	ND	ND
Propanoic acid	79-09-4	ND	77	ND
Butanoic acid	107-92-6	ND	31	22
2-Butanone, oxime	96-29-7	≥60000	ND	ND
Hexanal	66-25-1	ND	600	44
Phenol	108-95-2	ND	16	3
Hexanoic acid	142-62-1	ND	790	240
Di(propylene glycol) methyl ether, mixture of isomers (A)	34590-94-8	ND	16	ND
2-Ethylhexanoic acid	149-57-5	ND	600	50

Substance	CAS	5 hours (µg/m³)	3 days (µg/m³)	28 days (µg/m³)
Naphtha C7-C13	64742-82-1/64742-48-9	≥1600000	1900	84

TABLE 5. Volatiles measured in 2-component paints and lacquers

Substance	CAS	5 hours (µg/m³)	3 days (µg/m³)	28 days (µg/m³)
ID 2: 2C Paint – painting of floors:				
Formaldehyde	50-00-0	10	24	4.9
Acetaldehyde	75-07-0	3.6	1.8	6.6
1-Methoxypropan-2-ol	107-98-2	160	ND	ND
Triethylamine	121-44-8	44	ND	ND
1,2-Ethanediol #	107-21-1	2300	45	ND
Butanoic acid	107-92-6	ND	ND	21
Oxiranes (Dodecyl and tetradecyl glycidyl ethers) #	68609-97-2	200	290	<5
2-Butoxy ethanol	111-76-2	6300	7	ND
Hexanoic acid	142-62-1	ND	ND	13
Di(propylene glycol) methyl ether, mixture of isomers (A)	34590-94-8	5600	ND	ND
Benzyl alcohol	100-51-6	220	29	ND
2-Ethylhexanoic acid	149-57-5	ND	ND	6
5-Chloro-2-methyl-1,2-thiazol-3(2H)-on (CMIT)	26172-55-4	17	16	ND
Naphtha C7-C13 #	64742-82-1/64742-48-9	420	6	<5
ID 5: 2C Paint – painting of floors:				
Formaldehyde	50-00-0	ND	2.4	N
Acetaldehyde	75-07-0	11	2.6	N
2-Propanol	67-63-0	360	<5	ND
1-Methoxypropan-2-ol	107-98-2	130	ND	ND
1,4-Dioxane	123-91-1	460	ND	ND
Ethylbenzene	100-41-4	7	ND	ND
Styrene	100-42-5	2	ND	ND
2-Butoxy ethanol	111-76-2	≥23000	230	12
Hexanoic acid	142-62-1	ND	ND	14
Phenol	108-95-2	ND	1	ND
Benzyl alcohol	100-51-6	67	10	<5
2-Ethylhexanoic acid	149-57-5	ND	ND	7
5-Chloro-2-methyl-3(2H)-isothiazolone (CMIT)	26172-55-4	ND	ND	7
ID 20: 2C Paint – painting of floors:				
Formaldehyde	50-00-0	ND	1.1	N
Acetaldehyde	75-07-0	22	1.6	N
1-Methoxypropan-2-ol	107-98-2	7100	ND	ND
Acetone oxime	127-06-0	170	ND	ND
1,4-Dioxane	123-91-1	7	ND	ND

Substance	CAS	5 hours (µg/m³)	3 days (µg/m³)	28 days (µg/m³)
Toluene	108-88-3	4	ND	ND
2-Butoxy ethanol	111-76-2	12	ND	ND
Benzyl alcohol	100-51-6	610	18	ND
Naphtha C7-C13 (3) #	64742-82-1/64742-48-9	1100	<5	<5
ID 30: 2C Paint - painting of floors:				
Formaldehyde	50-00-0	ND	1.0	N
Acetaldehyde	75-07-0	13	1.4	N
Hexane	110-54-3	210	ND	ND
Acetic acid	64-19-7	4100	ND	ND
Benzene	71-43-2	180	ND	ND
1-Methoxypropan-2-ol	107-98-2	≥42000	49	8
Propanoic acid	79-09-4	900	ND	ND
1,4-Dioxane	123-91-1	320	ND	ND
Toluene	108-88-3	130	ND	ND
2-Butanone, oxime	96-29-7	9700	ND	ND
Ethylbenzene	100-41-4	230	ND	ND
Phenol	108-95-2	110	ND	ND
Benzyl alcohol	100-51-6	≥14000	200	29
2-Ethylhexanoic acid	149-57-5	100	ND	ND
Butyldiglycol	112-34-5	430	17	ND
Dibutyl phthalate #	84-74-2	200	ND	ND

TABLE 6. Volatiles measured in fillers and sealants

Substance	CAS	5 hours (µg/m³)	3 days (µg/m³)	28 days (µg/m³)
ID 14: 1C Filler –Wood surface repair & level-ling				
Formaldehyde	50-00-0	1.5	2.0	N
Acetaldehyde	75-07-0	35	18	N
Propanoic acid	79-09-4	ND	ND	20
Butanoic acid	107-92-6	ND	ND	22
Hexanal	66-25-1	ND	53	18
Hexanoic acid	142-62-1	ND	ND	33
Phenol	108-95-2	160	15	3
2-Ethylhexanoic acid	149-57-5	ND	110	18
Naphtha C7-C13	64742-82-1/64742-48-9	>340000	12000	220
ID 26: 2C Filler –Wood surface repair & level-ling				
Formaldehyde	50-00-0	4.2	1.1	N
Acetaldehyde	75-07-0	4.9	1.5	N
Styrene	100-42-5	380	6	ND
2-Butoxy ethanol	111-76-2	32	5	ND

Substance	CAS	5 hours (µg/m³)	3 days (µg/m³)	28 days (µg/m³)
Hexanoic acid	142-62-1	ND	ND	22
Phenol	108-95-2	ND	5	ND
Styrene oxid	96-09-3	16	ND	ND
2-Ethylhexanoic acid	149-57-5	ND	ND	10
1-Ethyl-2-pyrrolidinone	2687-91-4	12	2	ND
Naphtha C7-C13	64742-82-1/64742-48-9	32	ND	ND
ID 36: 1C Filler –Wood surface repair & levelling				
Formaldehyde	50-00-0	1.7	1.2	N
Acetaldehyde	75-07-0	1.6	1.2	N
Styrene	100-42-5	4	4	ND
2-Butoxy ethanol	111-76-2	8	ND	ND
Benzyl alcohol	100-51-6	<5	ND	ND
ID 71: 1C Filler –Wood surface repair & levelling				
Formaldehyde	50-00-0	7.2	2.1	N
Acetaldehyde	75-07-0	2.9	1.8	N
Hexanoic acid	142-62-1	ND	ND	23
Phenol	108-95-2	110	12	3
2-Ethylhexanoic acid	149-57-5	ND	ND	10
Naphtha C7-C13	64742-82-1/64742-48-9	670	19	ND
ID 88: 2C Sealant – Repair of concrete				
Formaldehyde	50-00-0	9.2	1.7	N
Acetaldehyde	75-07-0	28	2.4	N
1,2-Ethanediol	107-21-1	64	ND	ND
Styrene	100-42-5	7	2	ND
2-Butoxy ethanol	111-76-2	10	ND	ND
2-Propanoic acid, 2-methyl-, 1,2-ethanediyl ester #	97-90-5	5800	360	<5

TABLE 7. Volatiles in floor wax, polish and care products

Substance	CAS	5 hours (µg/m³)	3 days (µg/m³)	28 days (µg/m³)
ID 72: Floor wax, polish & care product – Oil for polish and care of wood				
Formaldehyde	50-00-0	2.8	6.6	N
Acetaldehyde	75-07-0	15	6.9	N
Butanoic acid	107-92-6	ND	ND	21
Hexanoic acid	142-62-1	ND	360	25
Phenol	108-95-2	53	11	3
Di(propylene glycol) methyl ether, mixture of isomers (A)	34590-94-8	290	9	ND
Ethanol, 2-(2-ethoxyethoxy)- #	111-90-0	3700	ND	ND

Substance	CAS	5 hours (µg/m^3)	3 days (µg/m^3)	28 days (µg/m^3)
2-Ethylhexanoic acid	149-57-5	ND	55	10
Naphtha C7-C13	64742-82-1/ 64742-48-9	≥210000	310	ND
ID 80: Floor wax, polish & care product – Oil for polish & care of wood and stone floors				
Formaldehyde	50-00-0	ND	1.8	N
Acetaldehyde	75-07-0	4.8	1.3	N
1,4-Dioxane	123-91-1	70	ND	ND
1,2-Ethanediol	107-21-1	19	ND	ND
2-Butoxy ethanol	111-76-2	1900	<5	ND
Phenol	108-95-2	ND	<5	4
2-Methyl-isothiazolin-3-one (MIT)	2682-20-4	16	ND	ND
Butyldiglycol	112-34-5	310	9	ND
Naphtha C7-C13	64742-82-1/64742-48-9	330	23	<5
ID 83: Floor wax, polish & care product – Oil for polish & care of wood and stone floors				
Formaldehyde	50-00-0	ND	1.9	N
Acetaldehyde	75-07-0	2.5	1.4	N
1,4-Dioxane	123-91-1	68	ND	ND
2-Butoxy ethanol	111-76-2	460	ND	ND
Benzyl alcohol	100-51-6	830	6	ND
2-Methyl-isothiazolin-3-one (MIT)	2682-20-4	ND	10	ND
Naphtha C7-C13	64742-82-1/64742-48-9	450	93	<5
ID 85: Floor wax, polish & care product – Linseed-oil for polish of wood floors				
Formaldehyde	50-00-0	ND	1.9	12
Acetaldehyde	75-07-0	ND	1.6	30
Propanal	123-38-6	5.9	2.0	257
Acetic acid	64-19-7	ND	ND	120
Propanoic acid	79-09-4	ND	ND	420
Hexanal	66-25-1	<5	ND	670
Hexanoic acid	142-62-1	ND	ND	260
2-Butanone, oxime	96-29-7	92	ND	ND
Naphtha C7-C13	64742-82-1/64742-48-9	4500	48	<5

TABLE 8. Volatile chemicals measured in adhesives (for walls) and membranes (water-based)

Substance	CAS	5 hours ($\mu g/m^3$)	3 days ($\mu g/m^3$)	28 days ($\mu g/m^3$)
ID 56: Membrane - Bathroom waterproof coating membrane				
Formaldehyde	50-00-0	70	5.7	N
Acetaldehyde	75-07-0	10	1.6	N
Phenol	108-95-2	110	11	2
ID 60: Adhesive - Mounting of fiberglass fabric				
Formaldehyde	50-00-0	120	1.4	N
Acetaldehyde	75-07-0	11	1.3	N
Acetic acid	64-19-7	ND	1000	31
Propanoic acid	79-09-4	ND	22	ND
Butanoic acid	107-92-6	ND	15	13
Phenol	108-95-2	100	5	3
2-Methyl-1,2-thiazol-3(2H)-on (MIT)	2682-20-4	ND	9	<5
5-Chloro-2-methyl-3(2H)-isothiazolone (CMIT)	26172-55-4	18	21	<5
ID 65: Adhesive - Mounting of fiberglass fabric				
Formaldehyde	50-00-0	15	5.0	N
Acetaldehyde	75-07-0	107	1.5	N
Acetic acid	64-19-7	ND	64	43
Propanoic acid	79-09-4	ND	ND	20
Butanoic acid	107-92-6	ND	ND	13
Styrene	100-42-5	ND	ND	1
Phenol	108-95-2	10	8	2
2-Methyl-isothiazolin-3-one (MIT)	2682-20-4	ND	<5	14
5-Chloro-2-methyl-1,2-thiazol-3(2H)-on (CMIT)	26172-55-4	ND	13	ND

3.5 Discussion of the results

Information on the ingredients was available for 13 of the 20 tested products. In general, there was a good correlation between the declared ingredients and the results of the performed analyses.

More volatiles have been found in the emissions from the tested products than those listed in the corresponding SDS. There are several reasons for this:

- Cf. CLP rules ingredient substances are declared only when above a certain concentration depending on CLP hazard classification, i.e. a substance measured in the emissions may well be derived from the product, however it is present at such low concentrations that it need not be declared as an ingredient
- The identified substances are formed during curing of the product by chemical reactions in the liquid phase, including polymerisation
- Gas phase reactions occur between the volatiles, including rearrangement and cleavage into smaller molecules
- Gas phase reactions occur with oxygen, whereby radicals are formed and cleavage into smaller molecules happens

In general, it is observed that the concentrations of declared ingredients concentration are very high immediately after application of the product and decrease over time. After 5 hours, the

identified volatiles are primarily solvents and other volatile constituents in the products, while semi-volatile substances and the degradation products formed are identified in the emissions after 3 and 28 days.

Solvents are applied to dissolve typical ingredients such as pigments, polymers, reactive monomers and other additives that are included in the production of liquid DIY products. It is expected and necessary that solvents evaporate during curing to form the final product.

Substances that are not initially present are presumed to be formed during the curing process and in gas-phase reactions in the chamber. As a rule, these substances are not present in the products and therefore cannot be expected to be declared as product ingredients.

3.5.1 Paints and lacquers 1-component

The organic acid 2-Ethylhexanoic acid is present in 3 of 4 of the products after 3 days of testing, however it is not observed after 5 hours in any of the products. It is released during the curing process and is derived from the salt Calcium bis (2-ethylhexanoate) which is a declared ingredient in product ID 11. Calcium bis (2-ethylhexanoate) is a so-called siccative, which is a catalyst for the deep drying of alkyd-based products. Similarly, in the same 3 products there are findings of "2-butanone oxime", which is also a declared ingredient. 2-Butanone oxime is only measured after 5 hours, as it is a volatile constituent intended to prevent skin formation of the product during in-can storage.

Naphta is found in 3 paints and in high concentrations in 2 paints (above the upper quantification limit). In the fourth product, high concentrations of alkanes (above upper quantification limit) were found, however these were declared ingredients.

3.5.2 Paints and lacquers 2-component

All 4 products emit high amounts of volatiles such as 2-butoxy ethanol, 1-methoxy propane-2-ol and several ethers. There were also findings of naphta, benzyl alcohol, acetic acid, etc. In 2 products (product ID 2 and 5) CMIT was found, and in the SDS for product ID 5 CMIT was not declared. In SDS for Product ID 2, CMIT and MIT are declared in a 3:1 ratio, i.e. content of CMIT is 3 times higher than MIT, so it is possible that MIT has been present in the emissions below the analytical detection limit.

3.5.3 Fillers and sealants

Styrene is found in a high concentration in product ID 26 (380 µg/m^3) and in a lower concentration in product ID 36 and 88 (4 µg/m^3 and 7 µg/m^3, respectively). Naptha was found in very high concentration in product ID 14 (340,000 µg/m^3), however this was declared in SDS. Phenol was found in the emissions from 3 of the products ID 14, 26, and 71.

3.5.4 Floor wax, polish and care products

Naphta was found in all 4 products (ID 72, 80, 83, 85). 2-Butoxyethanol was found in 2 products (ID 83, 80). Benzyl alcohol was found in one product (ID 83). After 5 hours, a low concentration of 2-butanone oxime is emitted from product ID 85. Many carboxylic acids (acetic acid, propanoic acid, hexanoic acid) and aldehydes (pentanal, hexanal, heptanal, octanal) are measured after 28 days from product ID 85, although they could not be detected after 5 hours and 3 days. Thus, an atypical emission profile is seen for product ID 85 compared to the other tested products. This is due to the fact that product ID 85 is based on crude linseed oil, which is degraded over time by oxidation of double bonds in the unsaturated fatty acids, thereby forming aldehydes and acids, which have also been identified in previous studies of linseed oil (Clausen et al., 2008).

3.5.5 Adhesives and membranes

Phenol, formaldehyde and acetaldehyde emit from all 3 products (ID 56, 60, 65). Phenol reacts with aldehydes (typically formaldehyde) in conventional adhesive systems, which is consistent with the observations of the tested products.

4. Risk assessment

4.1 Objective

Based on the results from the emissions analysis a selection of relevant products will be made for further risk assessment. The subsequent risk assessment will then be carried out in the same way as in the pre-project for the assessment of VOC emissions after 5 hours, 3 days and 28 days.

4.2 Selection of products for risk assessment

When reviewing the analysis results, it was considered most appropriate to focus the risk assessment on the products that continued to emit over 3 and 28 days. For these products, there is potentially the worst risk of exposure to persons/family members who subsequently reside in the renovated room/rooms.

In collaboration with the Danish Environmental Protection Agency, the project group selected 10 products for detailed risk assessment (see Table 9), as these products all emitted volatiles for up to 28 days. Products were selected which as broadly as possible represented the 20 tested products. The selection also included a wide range of different degassing volatiles.

TABLE 9. Products selected for risk assessment

Fillers	1 product (ID 14)
Adhesives	1 product (ID 60)
Paints and lacquers	6 products consisting of 4 products 1-component (ID 4, 11, 29, 32) and 2 products 2-component (ID 5, 30)
Floor wax, polish and care products	2 products (ID 72, 85)

4.3 Risk assessment of substances in the emissions, tolerable exposure levels

In the pre-project a risk assessment has been carried out for a number of the substances also found in this project. Therefore, the hazard assessments and tolerable exposure levels from the pre-project are used in this project. The tolerable exposure levels are specified as DNEL (Derived No Effect Level) values, as this is the terminology used in the REACH chemical control (REACH 2006). The DNEL values given in this project are aimed at the general population, i.e. consumers in general.
For substances, where no DNEL values are specified in the pre-project, a so-called Lowest Concentration of Interest (LCI) values are being utilized to protect consumers from emissions from building materials. These values (which were also widely used in the pre-project) are derived according to the same principles as DNEL values under REACH. Thus, the EU Commission has prepared a report describing how LCI values are derived based on the same assessment methods used in REACH in connection with the derivation of DNEL values to the general population i.e. consumers (ECA 2013).

Table 10 lists the relevant DNEL values that will be utilised for risk assessment in this project based on values from the previous do-it-yourself project (the pre-project) as well as reviewing the last updated EU list of LCI values (Agreed EU-LCI values, 2018).

In Table 10 the chemical substances measured by emission from the selected products are listed with corresponding DNEL values. The hazard classification of the substances regarding human health hazards is also indicated here. For the hazard classification the EU harmonized classification is indicated. If this is not available, the hazard classification of the substance

used in its REACH registration is used. The column "Critical effect" indicates the effect of the substance that is considered to occur at the lowest exposure level and which thus is considered as the basis for the protective DNEL value.

TABLE 10. Volatile substances with hazard classification and DNEL values in air

Substance	CAS	Classification health	DNEL (air)	Critical effect
Hydrocarbons			mg/m^3	
Benzene	071-43-2	Carc. 1A Muta. 1B Asp. Tox. 1 STOT RE 1 Skin Irrit. 2 Eye Irrit. 2	0.600[a] 0.019[b]	Neurotoxic Carcinogenic
Hexane	110-54-3	Repr. 2 Asp. Tox. 1 STOT SE 3 STOT RE 2 Skin Irrit. 2	0.700[a]	Neurotoxic
Ethylbenzene	100-41-4	Acute Tox. 4 Asp. Tox. 1 STOT RE 2	0.200[a]	Neurotoxic
Styrene	100-42-5	Repr. 2 Acute Tox. 4 STOT RE 1 Skin Irrit. 2 Eye Irrit. 2	0.175[a]	Neurotoxic
Toluene	108-88-3	Repr. 2 Asp. Tox. 1 STOT SE 3 STOT RE 2 Skin Irrit. 2	0.725[a]	Neurotoxic
Alkanes, iso-, < 2% aromatics C7-C13	927-285-2	Asp Tox. 1	1.425[a]	Neurotoxic
Naphtha C7-C13	64742-82-1/ 64742-48-9	Asp. Tox. 1	1.425[a]	Neurotoxic
Aldehydes				
Acetaldehyde	75-07-0	Carc. 2 STOT SE 3 Eye Irrit. 2	1.200[c]	Eye and respiratory tract irritation
Acrolein	107-02-8	Acute Tox. 1 Acute Tox. 2 Acute Tox. 3 Skin Corr. 1B	0.007[d]	Mucous membrane irritation
Formaldehyde	50-00-0	Carc. 1B Muta. 2 Acute Tox. 3 Skin Corr. 1B Skin Sens. 1		Eye and respiratory tract irritation

Substance	CAS	Classification health	DNEL (air)	Critical effect
Hexanal	66-25-1	Skin Irrit. 2 Eye Irrit. 2	0.900[c]	Mucous membrane irritation
Organic acids				
2-Ethylhexanoic acid	149-57-5	Repr. 2	0.150[c]	Effects on fetal development
Acetic acid	064-19-7	Skin Corr. 1A	1.200[c]	Mucous membrane irritation
Butanoic acid	107-92-6	Skin Corr. 1B	1.800[c]	Mucous membrane irritation
Hexanoic acid	142-62-1	Skin Corr. 1B	2.100[c]	Mucous membrane irritation
Propanoic acid	79-09-4	Skin Corr. 1B	1.500[c]	Mucous membrane irritation
Alcohols/ ethers /epoxides/ esters				
1-Methoxypropan-2-ol	107-98-2	STOT SE 3	7.900[c]	No value available
1,4-Dioxane	123-91-1	Carc. 2, STOT SE 3 Eye Irrit. 2	0.400[c]	Mucous membrane irritation
2-Butoxy ethanol	111-76-2	Acute tox. 4 Skin Irrit. 2 Eye Irrit. 2	1.600[c]	Effects on liver and blood
2-Propanol	67-63-0	Eye Irrit. 2 STOT SE 3	26 000[b]	Neurotoxic
Benzyl alcohol	100-51-6	Acute Tox. 4	0.440 [c]	No value available
Butyldiglycol	112-34-5	Eye Irrit. 2	0.670[c]	No value available
Di(propylene glycol) methyl ether, mixture of isomers (A) Dipropylene glycol monomethyl ether	34590-94-8	No classification	3.100[c]	No value available
Dibutyl phthalate	84-74-2	Repr. 1B	0.023[b]	Effects on fetal development
Ethanol, 2-(2-ethoxyethoxy)-	111-90-0	Ingen klass.	0.350[c]	Most likely mucous membrane irritation
Oxiranes	68609-97-2	Skin Irrit. 2 Skin Sens. 1	0.020[e]	Mucous membrane irritation (value for allylglycidylether, CAS 106-92-3)
Phenol	108-95-2	Muta. 2, Acute Tox. 3 STOT RE 2 Skin Corr. 1B	0.070[c]	Respiratory effects
Propylene glycol butyl ether	5131-66-8	Skin Irrit. 2 Eye Irrit. 2	0.900[b]	Effects on eyes

Substance	CAS	Classification health	DNEL (air)	Critical effect
Nitrogen-containing substances				
1-Ethyl-2-pyrrolidinone	2687-91-4	Repr. 1B, Eye Dam.1	0.400[c]	Mucous membrane irritation
2-Butanone, oxime	96-29-7	Carc. 2 Acute Tox. 4 Eye Dam. 1 Skin Sens. 1 (Carc. 1B Acute Tox. 4 Acute Tox. 3 STOT SE 3 STOT SE 1 STOT RE 2 Skin Irrit. 2 Eye Dam. 1 Skin Sens. 1)[f]	0.015[c]	Irritation of upper respiratory tract
2-Methyl-isothiazolin-3-one	2682-20-4	Acute Tox. 3 Skin Corr. 1B Skin Sens. 1A Eye Dam. 1 STOT SE 3	0.100[c]	Most likely mucous membrane irritation
5-Chloro-2-methyl-3(2H)-isothiazolone (CMIT)	26172-55-4	Acute Tox. 3 Skin Corr. 1B Skin Sens. 1 Eye Dam. 1 STOT SE 3	0.001[c]	Mucous membrane irritation
Diethylamine	109-97-7	Acute Tox. 4 Skin Corr. 1A	As triethylamine 0.060[c]	Eye and respiratory tract irritation
Triethylamine	121-44-8	Acute Tox. 4 Skin Corr. 1A	0.060[c]	Eye and respiratory tract irritation

a) Environmental Protection Agency (2016a). Survey and risk assessment of toluene and other neurotoxic substances in children's rooms. Survey of Chemical Substances in Consumer Products # 145. These values pay particular attention to children's increased sensitivity to the influence of the central nervous system.

(b) Derived from this report, see Appendix 7

c) EU-LCI Values. Agreed EU-LCI values (July 2018) https://ec.europa.eu/growth/sectors/construction/eu-lci/values_en

d) Danish Environmental Protection Agency (2016b) Survey and risk assessment of chemical substances in rugs for children. Survey of Chemical Substances in Consumer Products No. 147.

e) Environmental Protection Agency (2018). Survey and risk assessment of chemical substances in chemical products used for "do-it-yourself" projects in the home. Survey of Chemical Substances in Consumer Products No. 167.

f) New harmonized classification under discussion in the European Chemicals Agency (personal information from the Environmental Protection Agency, November 2019).

For the substances that are reported to cause mucosal irritation and effects on the eyes and respiratory tract, the values will typically target acute damage/irritation due to the direct irritant effects of the substances, where even short-term exposure to many of these substances may cause acute irritation. Next, in the context of a risk assessment, it will be relevant to add the

contributions of these substances, since the substances can be considered to have similar and thus additive effects.

For the substances listed as neurotoxic, the values, on the other hand, are aimed at protecting from long-term exposure and protection from chronic damage to the central nervous system, and here short-term exceeding of the values is less critical, as the acute toxicity level is significantly higher than the values protecting against chronic effects. For substances that affect the central nervous system, it is also considered relevant to add the contributions in connection with the risk assessment.

With regards to carcinogens, short-term exceeding of the DNEL value, as for the chronic neurotoxic substances, is considered less critical, as it is the overall long-term exposure that is important for increased risk of cancer.

For substances harmful to the unborn child (developmental toxicants), on the other hand, short-term exceeding of the DNEL value must also be considered critical, since the effects on fetal development can be manifested by even short-term exposure in particularly sensitive periods during pregnancy.

4.4 Exposure Assessment

In this project, the focus has been solely on inhalation of the emitting chemical substances. Thus, skin exposure to the substances will not be assessed in terms of direct skin contact with the treated surfaces. As stated in section 2.7, the emission tests in the climate chambers are carried out so that the measured values represent the concentrations that would have been obtained if the product had been used in a standard room in a home. Therefore, the measured values can be used directly as exposure values in connection with a risk assessment.

Continuous exposure of 24 hours/day is used as a realistic worst-case exposure scenario, since such a scenario may be relevant for bedridden individuals or people who spend most of the day in the room. However, a modified scenario is used for one product intended for wet room purposes (Section 4.6.5.1.), where the exposure time is set to 1 hour per day.

4.5 Risk assessment

4.5.1 Method

The chosen methodology for risk assessment corresponds to the method used in the pre-project. The risk assessment covers all age groups, which should therefore be taken into account since some age groups e.g. very young children can be more sensitive than adults. This applies, for example, to effects on the central nervous system, where the DNEL values for the chronic neurotoxic substances are reduced 4 times compared to DNEL values for adults (see Danish Environmental Protection Agency 2016b).

4.5.1.1 Calculation of risk characterization ratio (RCR)

The risk assessment in this project is based on the guidelines used in connection with the REACH chemical regulation (ECHA, 2012).
Risk assessment is done by comparing the exposure of a given substance to the substance's DNEL value and calculating the risk characterization ratio (RCR) of the substance, where RCR is calculated as:

RCR (X) = Calculated or measured exposure (Substance X) / DNEL (Substance X)

If the calculated or measured exposure to a given substance exceeds the DNEL value and the RCR thus becomes greater than 1, the exposure in that scenario is considered to present an unacceptable risk.

When exposed to multiple similar-acting substances in the exposure scenario, it may be relevant to assess the overall risk of a given effect. This can be done by summing the individual RCR values for the similar-acting substances:

$$RCR\ (sum) = RCR\ (1) + RCR\ (2) + \ldots\ RCR\ (n)$$

This approach may be particularly relevant in this project for those substances that are considered to affect the central nervous system or those substances that cause irritation of mucous membranes (eye and respiratory tract irritation). If the RCR (sum) exceeds 1, the total exposure of the substances with similar effect is considered to result in an unacceptable risk

4.6 Risk assessment for selected products

In the following, a risk assessment is carried out for each product. Subsequently, a more general assessment of the overall results is made and a discussion of which substances, if any. can be considered particularly critical.

4.6.1 1-component paints and lacquers

4.6.1.1 Assessment of product 4

The emissions from product 4 (see Table 11) is largely dominated by the substances 2-butanone oxime and C7-C13 hydrocarbons (white spirit with low aromatic content), which are the two substances listed as ingredients in the product (see Appendix 4).

After 5 hours, exposure levels above 14667 times the DNEL for 2-butanone oxime and almost 800 times above the DNEL for hydrocarbons are observed. Thus, it is believed that there will be considerable discomfort in the form of mucosal irritation from butanone oxime at this level. However, for hydrocarbons, the exposure level is still considered to be below acute toxic levels regarding central nervous system effects.

After 3 days, emissions of 2-butanone oxime are no longer seen, but emission of acrolein, which is a potent respiratory and eye irritant, is seen. The level of acrolein is 5.6 times the DNEL value. Similarly, emissions of 2-ethylhexanoic acid is now seen, where the level is 21 times above the DNEL value protecting against developmental toxicity. For C7-C13 hydrocarbons, the level has dropped to 1/10 compared to the 5-hour measurement, but the level is still significantly above the DNEL value (77 times) protecting against chronic neurotoxicity in relation to long term exposure to the substance. The relatively delayed/ slow emission of the hydrocarbons is probably due to the fact that it is a low aromatic white spirit with a high content of C12-13 in the product.

After 28 days, the levels of 2-butanoxime and C7-C13 hydrocarbons are below the DNEL, while the level of 2-ethylhexanoic acid remains almost a factor of 3 above the DNEL.

As stated in the preliminary project, it is expected that high exposure levels of volatiles may occur during the first hours and days at levels exceeding the DNEL if no specific precautions such as additional ventilation are taken in the first days after use. It is worth noting that there is a delayed emission of 2-ethylhexanoic acid and that an unacceptably high emission level may be maintained by this substance for more than 28 days.

TABLE 11. Risk assessment of product 4 (1-component paint)

Product 4									
		Room concentration			DNEL	RCR			
Substance	CAS no	5 hours ($\mu g/m^3$)	3 days ($\mu g/m^3$)	28 days ($\mu g/m^3$)	($\mu g/m^3$)	5 hours	3 days	28 days	Critical effect
Formaldehyde	50-00-0	ND	22	7.8	100	-	0.22	0.08	Mucous membrane irritation
Acetaldehyde	75-07-0	ND	230	18	1200	-	0.20	0.02	Mucous membrane irritation
Acrolein	107-02-8	ND	39	ND	7	-	**5.6**	-	Mucous membrane irritation
Hexanal	66-25-1	ND	ND	230	900	-	-	0.26	Mucous membrane irritation
Acetic acid	64-19-7	ND	230	38	1200	-	0.20	0.03	Mucous membrane irritation
Propanoic acid	79-09-4	ND	200	37	1500	-	0.13	0.02	Mucous membrane irritation
Butanoic acid	107-92-6	ND	97	31	1800	-	0.05	0.02	Mucous membrane irritation
Hexanoic acid	142-62-1	ND	3200	600	2100	-	**1.5**	0.29	Mucous membrane irritation
2-Butanone, oxime	96-29-7	≥220000	ND	1	15	**≥14667**	-	0.01	Mucous membrane irritation
Cumulated RCR for mucous membrane irritation						**≥14667**	**8.0**	0.73	Mucous membrane irritation
2-Ethylhexanoic acid	149-57-5	ND	3200	410	150	-	**21**	**2.7**	Effects on fetal development
Alkaner, iso-, < 2% aromatics C7-C13	927-285-2	≥1100000	110000	ND	1425	**≥772**	**77**	-	Neurotoxic

4.6.1.2 Assessment of product 11

For product 11 emission after 5 hours is dominated by 2-butanone oxime and C7-C8 hydrocarbons (SDS ingredients, see Appendix 4), with the levels of these substances exceeding their respective DNELs by 3867 and 1825 times, respectively (see Table 12). Thus, it is assumed that there is considerable mucosal irritation from butanone oxime at this level. For hydrocarbons, exposure levels are estimated to be close to acute toxic levels with an impact on the central nervous system. Furthermore, di (propylene glycol) methyl ether is emitting at a concentration exceeding 1.3 times the DNEL value.

After 3 days emission of 2-butanone oxime no longer occurs and C7-C8 hydrocarbons have reached a level that merely exceeds the DNEL by a factor of 2.9. However, emission of acrolein and 2-ethylhexanoic acid is now seen, and the levels here exceed the DNEL values by a factor of 2.3 and 23, respectively, giving a calculated, cumulative RCR value of 6.1 for mucosal irritation.

After 28 days only the emission of 2-ethylhexanoic acid exceeds the DNEL value, hereby reaching an RCR value of 1.3. It is worth noting that there is a delayed emission of 2-ethylhexanoic acid and that an unacceptably high emission level may be maintained by this substance for more than 28 days. Emission of 2-ethylhexanoic acid probably derives from the compound calcium bis (2-ethylhexanoate) in the product, which according to the safety data sheet is present in up to 1%. (see Appendix 4).

TABLE 12. Risk assessment of product 11 (1-component paint)

Product 11									
		Room concentration			DNEL	RCR			
Substance	CAS no	5 hours ($\mu g/m^3$)	3 days ($\mu g/m^3$)	28 days ($\mu g/m^3$)	($\mu g/m^3$)	5 hours	3 days	28 days	Critical effect
Formaldehyde	50-00-0	ND	16	6.5	100	-	0.16	0.07	Mucous membrane irritation
Acetaldehyde	75-07-0	ND	111	20	1200	-	0.09	0.02	Mucous membrane irritation
Acrolein	107-02-8	ND	22	ND	7	-	**3.1**	-	Mucous membrane irritation
Acetic acid	64-19-7	ND	250	21	1200	-	0.21	0.02	Mucous membrane irritation
Propanoic acid	79-09-4	ND	250	34	1500	-	0.17	0.02	Mucous membrane irritation
Butanoic acid	107-92-6	ND	55	ND	1800	-	0.03	-	Mucous membrane irritation
Hexanoic acid	142-62-1	ND	3400	340	2100	-	**1.6**	0.16	Mucous membrane irritation
2-Butanone, oxime	96-29-7	≥58000	ND	ND	15	**≥3867**	-	-	Mucous membrane irritation
Phenol	108-95-2	ND	49	3	70	-	0.7	0.04	Respiratory effects
Cumulated RCR for mucous membrane irritation						**≥3867**	**6.1**	0.33	Mucous membrane irritation
Di(propylene glycol) methyl ether, mixture of isomers (A)	34590-94-8	≥3900	76	ND	3100	**≥1.3**	0.02	-	No value available
2-Ethylhexanoic acid	149-57-5	ND	3500	200	150	**-**	**23**	**1.3**	Effects on fetal development
Naphtha C7-C13	64742-82-1/ 64742-48-9	≥2600000	4200	81	1425	**≥1825**	**2.9**	0.06	Neurotoxic

4.6.1.3 Assessment of product 29

Dipropylene glycol methyl ether is the only declared chemical substance in the product SDS (see Appendix 4). After 5 hours, the emission is dominated by diethylamine, triethylamine and dipropylene glycol methyl ether, for which the DNEL values are exceeded by 38, 317 and 61

times, respectively (see table 13). The amines must be considered to cause both malodour and mucosal irritation. The source of diethylamine and triethylamine is unknown.

After 3 days, the level of amines has dropped significantly, but triethylamine still exceeds the DNEL by a factor of 3. The level of dipropylene glycol methyl ether has dropped to a toxicologically insignificant level. Oxiranes, which are highly mucosal irritants, are now emitting at a level exceeding the DNEL value 22 times. The source of the oxiranes is unknown.

After 28 days, none of the emitted substances exceed the DNEL levels. It is noted that the identified critical substances from this product were not disclosed in SDS (Appendix 4).

TABLE 13. Risk assessment of product 29 (1-component lacquer)

Product 29									
		Room concentration			DNEL	RCR			Critical effect
Substance	CAS no	5 hours ($\mu g/m^3$)	3 days ($\mu g/m^3$)	28 days ($\mu g/m^3$)	($\mu g/m^3$)	5 hours	3 days	28 days	
Formaldehyde	50-00-0	ND	ND	2.0	100	-	-	0.02	Mucous membrane irritation
Acetaldehyde	75-07-0	16	2.2	1.6	1200	0.01	0.002	0.001	Mucous membrane irritation
Diethylamine	109-97-7	2300	ND	ND	60	**38**	**-**	-	Mucous membrane irritation
Triethylamine	121-44-8	≥19000	140	9	60	**≥317**	**2.3**	0.15	Mucous membrane irritation
Oxiranes	68609-97-2	<100	430	ND	20	**<5**	**22**	-	Mucous membrane irritation
1-Ethyl-2-pyrrolidinone	2687-91-4	ND	ND	1	400	**-**	**-**	0.003	Mucous membrane irritation
Propylene glycol butyl ether	5131-66-8	300	ND	ND	900	0.33	**-**	-	Mucous membrane irritation
Cumulated RCR for mucous membrane irritation						**≥360**	**24**	0.17	Mucous membrane irritation
Di(propylene glycol) methyl ether, mixture of isomers (A)	34590-94-8	≥190000	100	<5	3100	**≥61**	0.03	0.002	No value available
Naphtha C7-C13	64742-82-1/ 64742-48-9	370	780	ND	1425	0.26	0.55	-	Neurotoxic

4.6.1.4 Assessment of product 32

After 5 hours, considerable emission of 2-butanone oxime and naphta C7-C13 (white spirit), both of which are indicated, occur (Appendix 4). The DNEL values are exceeded by over 4000 and 1123 times, respectively (see table 14).

After 3 days the emission of 2-butanone oxime has ceased, while naphta C7-C13 is still present, but at a significantly lower level just exceeding the DNEL value. Furthermore, emission of 2-ethylhexanoic acid is now approximately 4 times above the DNEL (probably due to the co-

balt bis (2-ethylhexanoate) content). The cumulative RCR value for mucous membrane irritation is exceeded due to the presence of a number of aldehydes and organic acids, the latter possibly being generated from the decomposition products of fatty acids in the product.

After 28 days, emission has decreased to levels significantly below the DNELs.
In the initial phase, very high emissions of 2-butanone oxime and white spirit is observed, which however decreases rapidly. 2-Ethylhexanoic acid is considered to be the substance that exceeds the DNEL value for most days, although this has reached an acceptable level after 28 days.

TABLE 14. Risk assessment of product 32 (1-component floor paint)

Product 32									
		Room concentration			DNEL	RCR			
Substance	CAS no	5 hours ($\mu g/m^3$)	3 days ($\mu g/m^3$)	28 days ($\mu g/m^3$)	($\mu g/m^3$)	5 hours	3 days	28 days	Critical effect
Formaldehyde	50-00-0	2.6	7.1	2.9	100	0.03	0.07	0.03	Mucous membrane irritation
Acetaldehyde	75-07-0	2.0	30	5.4	1200	0.002	0.03	0.005	Mucous membrane irritation
Acetic acid	64-19-7	ND	36	ND	1200	-	0.03	-	Mucous membrane irritation
Propanoic acid	79-09-4	ND	77	ND	1500	-	0.05	-	Mucous membrane irritation
Butanoic acid	107-92-6	ND	31	22	1800	-	0.02	0.01	Mucous membrane irritation
2-Butanone, oxime	96-29-7	≥60000	ND	ND	15	**≥4000**	-	-	Mucous membrane irritation
Hexanal	66-25-1	ND	600	44	900	-	0.67	0.05	Mucous membrane irritation
Phenol	108-95-2	ND	16	3	70	-	0.23	0.04	Respiratory effects
Hexanoic acid	142-62-1	ND	790	240	2100	-	0.38	0.11	Mucous membrane irritation
Cumulated RCR for mucous membrane irritation						**≥4000**	**1.48**	0.25	Mucous membrane irritation
Di(propylene glycol) methyl ether, mixture of isomers (A)	34590-94-8	ND	16	ND	3100	-	0.005	-	No value available
1-Methoxypropan-2-ol	107-98-2	650	ND	ND	7900	-	0.08	-	No value available
2-Ethylhexanoic acid	149-57-5	ND	600	50	150	-	**4.0**	0.33	Effects on fetal development
Naphtha C7-C13	64742-82-1 /64742-48-9	≥1600000	1900	84	1425	**≥1123**	**1.3**	0.06	Neurotoxic

4.6.2 2-component paints and lacquers

4.6.2.1 Assessment of product 5

After 5 hours, the DNEL values for 1,4-dioxane and 2-butoxyethanol are exceeded by 1.2 and 14 times, respectively (see table 15). 2-butoxyethanol, but not 1,4-dioxane is listed as an ingredient, cf. Appendix 4. After 3 days, none of the emitted substances exceed their respective DNEL values.

On the contrary CMIT, which is a potent mucosal irritant, is found after 28 days and as the DNEL value is very low (1 µg/m^3), it is exceeded by a factor of 7. It is remarkable that the substance appears as a delayed emission after 28 days. The substance is not listed as an ingredient (Appendix 4).

TABLE 15. Risk assessment of product 5 (2-component paint)

Product 5									
		Room concentration			DNEL	RCR			
Substance	CAS no	5 hours (µg/m^3)	3 days (µg/m^3)	28 days (µg/m^3)	(µg/m^3)	5 hours	3 days	28 days	Critical effect
Formaldehyde	50-00-0	ND	2.4	N	100	-	0.02	-	Mucous membrane irritation
Acetaldehyde	75-07-0	11	2.6	N	1200	0.009	0.002	-	Mucous membrane irritation
2-Propanol	67-63-0	360	<5	ND	26000	0.01	-	-	Mucous membrane irritation
Phenol	108-95-2	ND	1	ND	70	-	0.01	-	Respiratory effects
1,4-Dioxane	123-91-1	460	ND	ND	400	**1.2**	-	-	Mucous membrane irritation
Hexanoic acid	142-62-1	ND	ND	14	2100	-	-	0.007	Mucous membrane irritation
5-Chloro-2-methyl-3(2H)-isothiazolone (CMIT)	26172-55-4	ND	ND	7	1	-	-	**7.0**	Mucous membrane irritation
Cumulated RCR for mucous membrane irritation						**1.2**	0.03	**7.0**	Mucous membrane irritation
1-Methoxypropan-2-ol	107-98-2	130	ND	ND	7900	0.02	-	-	No value available
Toluene	108-88-3	ND	ND	ND	725		-	-	Neurotoxic
Ethylbenzene	100-41-4	7	ND	ND	200	0.035	-	-	Neurotoxic
Styrene	100-42-5	2	ND	ND	175	0.01	-	-	Neurotoxic
2-Butoxy ethanol	111-76-2	≥23000	230	12	1600	**≥14**	0.14	0.008	Effects on liver and blood
Benzyl alcohol	100-51-6	67	10	<5	440	0.15	0.02	-	No value available
2-Ethylhexanoic acid	149-57-5	ND	ND	7	150	-	-	0.05	Effects on fetal development

4.6.2.2 Assessment of product 30

This product results in the most complex emission of all the investigated products. After 5 hours, an emission concentration of 2-butanone oxime is seen, exceeding the DNEL value by 647 times (see table 16). Other respiratory irritants such as acetic acid and phenol also exceed their DNEL values with RCR values of 3.4 and 1.6, respectively. The cumulated exposure to neurotoxic hydrocarbons reaches a total RCR value of 2, while benzene as a carcinogen exceeds the DNEL value 9.5 times. In addition, the DNEL value are exceeded for benzyl

alcohol (32 times), 1-methoxypropan-2-ol (5.3 times) and dibutyl phthalate (8.7 times). No information regarding the composition was available for the product.

After 3 days and 28 days, emission is very limited and all levels are significantly below the relevant DNEL values.

TABLE 16. Risk assessment of product 30 (2-component floor paint)

Product 30									
		Room concentration			DNEL	RCR			Critical effect
Substance	CAS no	5 hours ($\mu g/m^3$)	3 days ($\mu g/m^3$)	28 days ($\mu g/m^3$)	($\mu g/m^3$)	5 hours	3 days	28 days	
Formaldehyde	50-00-0	ND	1.0	N	100	-	0.01	-	Mucous membrane irritation
Acetaldehyde	75-07-0	13	1.4	N	1200	0.01	0.001	-	Mucous membrane irritation
Acetic acid	64-19-7	4100	ND	ND	1200	**3.4**	-	-	Mucous membrane irritation
Propanoic acid	79-09-4	900	ND	ND	1500	0.60	-	-	Mucous membrane irritation
1,4-Dioxane	123-91-1	320	ND	ND	400	0.80	-	-	Mucous membrane irritation
2-Butanone, oxime	96-29-7	9700	ND	ND	15	**647**	-	-	Mucous membrane irritation
Phenol	108-95-2	110	ND	ND	70	**1.6**	-	-	Respiratory effects
Cumulated RCR for mucous membrane irritation						**653**	0.01		Mucous membrane irritation
Benzene	71-43-2	180	ND	ND	600	0.30	-	-	Neurotoxic
Hexane	110-54-3	210	ND	ND	700	0.30	-	-	Neurotoxic
Toluene	108-88-3	130	ND	ND	725	0.18	-	-	Neurotoxic
Ethylbenzene	100-41-4	230	ND	ND	200	**1.2**	-	-	Neurotoxic
Cumulated RCR for neurotoksicitet						**2.0**			Neurotoxic
Benzene	71-43-2	180	ND	ND	19	**9.5**	-	-	Carcinogenic
Benzyl alcohol	100-51-6	≥14000	200	29	440	**≥32**	0.45	0.07	No value available
1-Methoxypropan-2-ol	107-98-2	≥42000	49	8	7900	**≥5.3**	0.006	0.001	No value available
Butyldiglycol	112-34-5	430	17	ND	670	0.64	0.03	-	No value available
Dibutyl phtalate	84-74-2	200	ND	ND	23	**8.7**	-	-	Effects on fetal development
2-Ethylhexanoic acid	149-57-5	100	ND	ND	150	0.67	-	-	Effects on fetal development

4.6.3 Fillers

4.6.3.1 Assessment of product 14

After 5 hours, the DNEL value for C7-C13 hydrocarbons (white spirit) is exceeded 238 times (see table 17). Additionally, an excess of the substance phenol (RCR: 2.3) is observed, although this is not declared as a constituent of the product (Appendix 4).

After 3 days, the levels of C7-C13 hydrocarbons are still above the DNEL value (RCR: 8.4), and initial emission of 2-ethylhexanoic acid is observed here probably due to the content of zirconium 2-ethylhexanoate in the product. However, the DNEL value is not exceeded for the substance. No volatiles exceed the DNEL value after 28 days.

TABLE 17. Risk assessment of product 14 (Filler)

Product 14									
		Room concentration			DNEL	RCR			
Substance	CAS no	5 hours	3 days	28 days		5 hours	3 days	28 days	Critical effect
		(µg/m³)	(µg/m³)	(µg/m³)	(µg/m³)				
Formaldehyde	50-00-0	1.5	2.0	N	100	0.02	0.02	-	Mucous membrane irritation
Acetaldehyde	75-07-0	35	18	N	1200	0.03	0.02	-	Mucous membrane irritation
Propanoic acid	79-09-4	ND	ND	20	1500	-	-	0.01	Mucous membrane irritation
Butanoic acid	107-92-6	ND	ND	22	1800	-	-	0.01	Mucous membrane irritation
Hexanal	66-25-1	ND	53	18	900	-	0.06	0.02	Mucous membrane irritation
Hexanoic acid	142-62-1	ND	ND	33	2100	-	-	0.02	Mucous membrane irritation
Phenol	108-95-2	160	15	3	70	**2.3**	0.21	0.04	Respiratory effects
Cumulated RCR for mucous membrane irritation						**2.4**	0.31	0.10	Mucous membrane irritation
2-Ethylhexanoic acid	149-57-5	ND	110	18	150	-	0.73	0.12	Effects on fetal development
Naphtha C7-C13	64742-82-1/ 64742-48-9	≥340000	12000	220	1425	**≥238**	**8.4**	0.15	Neurotoxic

4.6.4 Floor wax, polish and care products

4.6.4.1 Assessment of product 72

After 5 hours, the DNEL value has been exceeded by a factor 11 for 2- (2-ethoxyethoxy-ethanol, while the DNEL value for C7-C14 hydrocarbons has been exceeded by 147 times (see table 18). Emission decreases rapidly and there are no substances exceeding the DNEL value after either 3 or 28 days. There are no data regarding ingredients of the product, cf. Appendix 4.

TABLE 18. Risk assessment of product 72 (Oil for care of tabletops)

Product 72									
		Room concentration			DNEL	RCR			
Substance	CAS no	5 hours ($\mu g/m^3$)	3 days ($\mu g/m^3$)	28 days ($\mu g/m^3$)	($\mu g/m^3$)	5 hours	3 days	28 days	Critical effect
Formaldehyde	50-00-0	2.8	6.6	N	100	0.03	0.07	-	Mucous membrane irritation
Acetaldehyde	75-07-0	15	6.9	N	1200	0.01	0.006	-	Mucous membrane irritation
Butanoic acid	107-92-6	ND	ND	21	1800	-	-	0.01	Mucous membrane irritation
Hexanoic acid	142-62-1	ND	360	25	2100	-	0.17	0.01	Mucous membrane irritation
Phenol	108-95-2	53	11	3	70	0.76	0.16	0.04	Respiratory effects
Ethanol, 2-(2-ethoxyethoxy)-	111-90-0	3700	ND	ND	350	**11**	-	-	Mucous membrane irritation
Cumulated RCR for mucous membrane irritation						**12**	0.41	0.06	Mucous membrane irritation
2-Ethylhexanoic acid	149-57-5	ND	55	10	150	-	0.37	0.07	Effects on fetal development
Naphtha C7-C13	64742-82-1/ 64742-48-9	≥210000	310	ND	1425	**≥147**	0.22	-	Neurotoxic
Di(propylene glycol) methyl ether, mixture of isomers (A)	34590-94-8	290	9	ND	3100	0.09	0.003	-	No value available

TABLE 19. Risk assessment of product 85 (Linseed oil for wood care)

Product 85									
		Room concentration			DNEL	RCR			
Substance	CAS no	5 hours ($\mu g/m^3$)	3 days ($\mu g/m^3$)	28 days ($\mu g/m^3$)	($\mu g/m^3$)	5 hours	3 days	28 days	Critical effect
Formaldehyde	50-00-0	ND	1.9	12	100		0.019	0.12	Mucous membrane irritation
Acetaldehyde	75-07-0	ND	1.6	30	1200		0.001	0.025	Mucous membrane irritation
Acetic acid	64-19-7	ND	ND	120	1200			0.10	Mucous membrane irritation
Propanoic acid	79-09-4	ND	ND	420	1500			0.28	Mucous membrane irritation
Hexanal	66-25-1	<5	ND	670	900			0.74	Mucous membrane irritation
Hexanoic acid	142-62-1	ND	ND	260	2100			0.12	Mucous membrane irritation
2-Butanone, oxime	96-29-7	92	ND	ND	15	**6.1**			Mucous membrane irritation
Cumulated RCR for mucous membrane irritation						**6.1**	0.020	**1.3**	Mucous membrane irritation
Naphtha C7-C13	64742-82-1/ 64742-48-9	4500	48	<5	1425	**3.2**	0.0007		Neurotoxic

4.6.4.2 Assessment of product 85

After 5 hours, emission of 2-butanone oxime exceeds DNEL by a factor of 6.1 and emission of C7-C13 hydrocarbons (white spirit) exceeds the DNEL value by a factor of 3.2 (see table 19). No significant emission is measured after 3 days. After 28 days, a number of aldehydes and organic acids not previously measured are released, suggesting that the degradation products of the linseed oil, which makes up the main content of the product. When the RCR values for these irritants are added up, the tolerable level of mucosal irritants is exceeded after 28 days. It is not known how long the emission of these substances will take place.

TABLE 20. Risk assessment of product 60 (Wet room adhesive)

Product 60									
		Room concentration			DNEL	RCR			
Substance	CAS no	5 hours	3 days	28 days		5 hours	3 days	28 days	Critical effect
		(µg/m³)	(µg/m³)	(µg/m³)	(µg/m³)				
Formaldehyde	50-00-0	120	1.4	N	100	1.2	0.01	-	Mucous membrane irritation
Acetaldehyde	75-07-0	11	1.3	N	1200	0.009	0.001	-	Mucous membrane irritation
Acetic acid	64-19-7	ND	1000	31	1200	-	0.83	0.03	Mucous membrane irritation
Propanoic acid	79-09-4	ND	22	ND	1500	-	0.03	-	Mucous membrane irritation
Butanoic acid	107-92-6	ND	15	13	1800	-	0.008	0.007	Mucous membrane irritation
Phenol	000108-95-2	100	5	3	70	1.4	0.07	0.04	Respiratory effects
2-Methyl-1,2-thiazol-3(2H)-one (MIT)	2682-20-4	ND	9	<5	100	-	0.09	-	Mucous membrane irritation
5-Chloro-2-methyl-3(2H)-isothiazolone (CMIT)	026172-55-4	18	21	<5	1	18	21	-	Mucous membrane irritation
Cumulated RCR for mucous membrane irritation						**20.6**	22	0.08	Mucous membrane irritation

4.6.5 Adhesive for walls and membranes (water-based)

4.6.5.1 Assessment of product 60

After 5 hours, emissions are observed over the DNEL levels of phenol (RCR: 1.4) and CMIT (RCR: 18) (see table 20). The latter is listed as an ingredient in the product.
While the emission of phenol is decreased after 3 days, a slight increase is seen for CMIT resulting in an RCR value of 21. After 28 days, only emissions at very low levels persist and a total RCR of 0.08 can be calculated for the cumulated emission with respect to mucosal irritants.
It should be noted that the exposure duration in a wet room (bathroom or laundry room) is estimated to be significantly shorter (approx. 1 hour) than the exposure time in other rooms (living room or bed room), thus, 1 hour of exposure to phenol (RCR of 1.4) after 5 hours is not considered critical. However, the relatively high RCR values for CMIT of 18 and 21 after 5 hours

and 3 days, respectively, is considered critical due to the risk of irritation during the stay in the wet room.

4.7 Overview of the emission results

4.7.1 Emission patterns over time

Table 21 below lists the chemical gases emitted from the investigated products at levels that exceed the DNEL value for the measurement series.

TABLE 21 Critical substances and emission patterns

1-component paints and lacquers (product 4, 11, 29, 32)						
Substance	**CAS no**	**DNEL**	**5 hours**	**3 days**	**28 days**	**Critical effect**
		(µg/m³)	**RCR**	**RCR**	**RCR**	
Acrolein	107-02-8	7		3.1 – 5.6		Mucous membrane irritation
Hexanoic acid	142-62-1	1800		1.5 – 1.6		Mucous membrane irritation
2-Butanone, oxime	96-29-7	15	≥3867 - ≥14667			Mucous membrane irritation
Diethylamine	109-97-7	60	38			Mucous membrane irritation
Triethylamine	121-44-8	60	317	2.3		Mucous membrane irritation
Oxiranes	68609-97-2	20	<5	22		Mucous membrane irritation
2-Ethylhexanoic acid	149-57-5	150		4-23	1.3 – 2.7	Effects on fetal development
Di(propylene glycol) methyl ether, mixture of isomers (A)	34590-94-8	3100	1.3 - 61			No value available
Naphtha C7-C13 Alkanes, iso-, < 2% aromatics C7-C13	64742-82-1/ 64742-48-9 927-285-2	1425	772-1825	1.3-77		Neurotoxic

2-component paints and lacquers (product 5, 30)						
Acetic acid	64-19-7	1200	3.4			Mucous membrane irritation
1,4-Dioxane	123-91-1	400	1.2			Mucous membrane irritation
2-Butanone, oxime	96-29-7	15	647			Mucous membrane irritation
2-Butoxy ethanol	111-76-2	1600	14			Mucous membrane irritation
5-Chloro-2-methyl-3(2H)-isothiazolone (CMIT)	26172-55-4	1			7.0	Mucous membrane irritation
Phenol	108-95-2	70	1.6			Respiratory effects
Ethylbenzene	100-41-4	230	1.2			Neurotoxic
Benzene	71-43-2	19	9.5			Carcinogenic
Benzyl alcohol	100-51-6	440	32			No value available
1-Methoxypropan-2-ol	107-98-2	7900	5.3			No value available
Dibutyl phtalate	84-74-2	23	8.7			Effects on fetal development

Fillers (product 14)						
Phenol	108-95-2	70	2.3			Respiratory effects
Naphtha C7-C13	64742-82-1/ 64742-48-9	1425	238	8.4		Neurotoxic

Floor wax, polish and care products (product 72, 85)						
Substance	**CAS no**	**DNEL**	**5 hours**	**3 days**	**28 days**	**Critical effects**
		(µg/m³)	**RCR**	**RCR**	**RCR**	
Ethanol, 2-(2-ethoxyethoxy)-	111-90-0	350	11			Mucous membrane irritation
Naphtha C7-C13	64742-82-1/ 64742-48-9	1425	3.2 - 147			Neurotoxic
2-Butanone, oxime	96-29-7	15	6.1			Mucous membrane irritation

Adhesive (product 60)					
Formaldehyde	50-00-0	100	1.2		Mucous membrane irritation
Phenol	108-95-2	70	1.4		Respiratory effects
5-Chloro-2-methyl-3(2H)-isothiazolone (CMIT)	026172-55-4	1	18	21	Mucous membrane irritation

4.7.1.1 Emission after 5 hours

After 5 hours, 23 substances have been measured that exceed the DNEL value. This is most pronounced for 2-butanone oxime from 1-component paints and varnishes exceeding the DNEL by more than 14667 times. As the substance is a potent mucosal irritant, pronounced irritation of eyes and respiratory tract is expected for people are staying in the room in question. Similarly, C7-C13 hydrocarbons (white spirit) from 1-component paints and varnishes and from filler and sealant exceed DNEL up to 1825 times. As this DNEL value is based on the development of chronic neurotoxicity after many years of exposure, this temporary exceedance is considered to be less critical than for 2-butanone oxime, where the effect is acute.

To avoid irritation from these very high concentrations of volatiles after 5 hours, persons should not use the room and instead wait a few days before putting it into service and/or ensuring a very thorough ventilation.
It should be noted that there is increased focus on 2-butanone, as it is currently being discussed in the Risk Assessment Committee of the European Chemicals Agency, whether the substance is proposed to be upgraded from Carc 2 to Carc 1B and further to be subjected to classification as STOT SE 1 and STOT RE 1 due to the harmful effects of the substance on the nasal mucosa in short-term as well as by prolonged/repeated exposure.

4.7.1.2 Emission after 3 days

The total emission has decreased significantly after 3 days, with 7 substances exceeding their DNEL value. A number of these substances are substances that have not been measured after 5 hours e.g. acrolein, hexanoic acid, oxiranes, 2-ethylhexanoic acid. The substances measured after 3 days considered to be most problematic are acrolein, oxiranes and CMIT, all of which are potent respiratory and eye irritants. Furthermore, the emission of 2-ethylhexanoic acid is also considered critical due to the potential effects on fetal development. Thus, when using the rooms after 3 days, very thorough ventilation is necessary to reduce the exposure to acceptable levels.

4.7.1.3 Emission after 28 days

After 28 days, the emissions from most products have dropped to very low values below the critical levels. An exception is one 1-component paint/lacquer, which continues to exceed the DNEL value for 2-ethylhexanoic acid and another exception is a filler, where the emission of CMIT causes the DNEL value to be exceeded. Finally, a linseed oil product, which had no significant emissions at 5 hours, emits irritants such as aldehydes and organic acids after 28 days, which results in a cumulated exposure above the tolerable exposure level.
Furthermore, it is seen that the content of the preservative CMIT can cause long-term emissions at levels that exceed the DNEL value of this substance. Products containing metal salts of 2-ethylhexanoic acid as a desiccant may also give rise to a delayed and prolonged emission, which may cause the DNEL values to be exceeded. Similarly, delayed emission also applies to the linseed oil product, which can emit mucosal irritant conversion products several weeks after application.
However, after 28 days, the exceedances of the DNEL values are relatively limited and critical levels can therefore be countered by undertaking thorough venting.

4.8 Conclusion of risk analysis

Significant emissions, which far exceed the tolerable exposure level after 5 hours have been demonstrated from the investigated products. Emissions of potent eye and upper airways irritants like 2-butanone oxime and triethylamine were evaluated to be the most critical compounds.
After 3 days, significant reductions in the total emissions of volatile substances from products was found. However, the tolerable exposure levels are exceeded for eye and respiratory irritants. These substances with delayed emission may either bedegradation products or less volatile substances than those measured after 5 hours. Furthermore, after 3 days unacceptably high emissions of 2-ethylhenxanoic acid was found, a substance that may be potentially harmful to the developing fetus.
After 28 days, the overall emissions generally decrease to very low levels, however for some substances the tolerable exposure levels are still exceeded. This applies, for example, to the substance 2-ethylhenxanoic acid, which is considered critical since the substance as mentioned before, is considered potentially harmful to the developing fetus. Additionally, after 28 days unacceptably high emissions of the biocidal preservative CMIT, critical for mucous membrane irritation. After 28 days, linseed oil display unacceptably high emissions of aldehydes and organic acids that may cause mucous membrane irritation of the eyes and respiratory tract.

The risk assessments are based on the use of one product at a time. In case of simultaneous use of more products, the total emissions will increase, thus leading to a higher potential risk. It is assumed the general population is aware of the occurrence of high emissions on the day of working with DIY products and therefore users do not stay in the room right after use. Therefore, the delayed evaporation after 3 and 28 days is considered to be more critical, as it is easy to envision that a renovated room will be in use after 1-3 days. However, the results of this project show that for some DIY products, a longer “quarantine” period before use of the room may be relevant or significantly increased ventilation must be provided to avoid harmful levels of volatile compounds.

5. Outlook

In the pre-project, 19 companies selling DIY products were identified, while a total of 57 DIY products were found. In this project, an additional 12 companies and a total of 86 products were identified. The survey showed that DIY products can be purchased many other places than in conventional DIY stores. When purchasing DIY products in a supermarket for example, it is assumed that assistance is minimal and that purchasing is predominantly based on spontaneous decisions. As a consumer it is difficult to know, whether a product is safe to use indoors, when there is a lack of relevant safety information in combination with lack of suitable guidance at the time of purchase.

The emissions analysis in the pre-project was primarily focused on the declared and/or expected ingredients in the products. Experience from the pre-project as well as analysis of other similar materials showed a need for further investigation regarding several other substances. The analyses must be performed using defined reference standards and therefore a limited number of substances can be determined. Therefore, it is not surprising that more dangerous substances have been identified and determined in the current project than in the pre-project. Furthermore, in the present project, increased attention was paid to identifying substances potentially formed during curing of the DIY product, which could therefore not be expected to be found in the list of declared ingredients.

In the pre-project tests for human exposure were performed in a large chamber while applying the products. These analyses did not give new information compared to the measurements after 5 hours in the small chambers. It has therefore been possible to focus in this project on testing a wider range of products within the given financial framework. The analysis program of the project has focused on the volatiles emitting over time to assess the risk related to the products in the short, medium and long term. The measurements performed after 5 hours give an overview of the substances the performing DIY person is exposed to, while the analysis after 3 and 28 days, respectively, give an indication of the exposure levels the rest of the household is subject to in the short and long term, when the renovated room/rooms in question are in taken into use after renovation.

Thorough and regular ventilation of the renovated room/rooms significantly reduces the exposure to harmful volatile substances. This is especially important for humans, who are more vulnerable to dangerous substances such as pregnant women and young children. Thus, it is recommended to ensure thorough ventilation during all DIY projects in the home and as well as taking the precaution of not using the room/rooms directly after renovation. The general recommendation for all product groups is that consumers should choose a product with an indoor climate label, which adhere to established criteria in relation emissions of dangerous volatiles and thus also set limits for exposure to harmful substances. Limit values for emissions are set in several existing labelling schemes such as AgBB, Blue Label, GEV Emicode, Danish Indoor Climate Label, M1 and Blauer Engel.

Liquid products may have different eco-labels with requirements regarding specific ingredients (including carcinogens and allergenic substances) and total VOC content. Under the CLP Regulation Safety Data Sheets are only required to include state hazard labelled ingredients for a product, but this does not take into consideration the formation of reaction products and volatiles during curing of a given product. In general, there are no legal requirements for testing of or criteria for product emissions to the indoor environment, and therefore consumers also have no way of knowing, whether products are safe to apply indoors or whether they are safe to use indoors in the long term. Therefore, the recommendation to consumers is to use products that

have documentation of testing and adhere to recommended limit values for hazardous substances.

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Appendix 1. List of companies

Appendix 1.1 In ” Survey and risk assessment of chemical substances in chemical products used for "do-it-yourself" projects in the home ”* product information was obtained from the following companies with retail stores of DYI products

Company name	Type of company
Alfix	Producer
Bauhaus A/S	DYI store
Beck & Jørgensen A/S	Producer
Beckmann A/S	Paint shop/Producer
Borup Kemi I/S	Producer
Casco - Sika Danmark A/S	Producer
DanaLim A/S	Producer
Deco Farver ApS	Paint shop
Flügger A/S	Paint shop/Producer
Harald Nyborg A/S	DYI store
Jem & Fix A/S	DYI store
Junckers Industrier A/S	Producer
LavprisVVS	DYI store
Malgodt.dk	Paint shop
Sadolin - Akzo Nobel	Producer
Saint-Gobain Weber A/S	Producer
Scandinova A/S	Wholesaler
XL-Byg	DYI store
Æ´Gulvsliver	DYI store (Floor planning)

*” Survey and risk assessment of chemical substances in chemical products used for "do-it-yourself" projects in the home. Survey of Chemical Substances in Consumer Products No. 167, Environmental Protection Agency 2018.

Appendix 1.2 Product information gathered from identified DIY companies, stores and manufacturers of building materials for private use

Company name	Type of company
Bilka (Salling Group A/S)	Retail/groceries
Biltema	Retail/DYI store
Coop Danmark (amba)	Retail/groceries
Damgaard	Retail/DYI store
Davidsen (DAVIDSENS TØMMERHANDEL A/S)	Retail/DYI store, lumber
Esbjerg Farve- & Lakfabrik A/S	Producer
Idé Møbler (IDdesign A/S)	Retail/Furniture
JYSK A/S	Retail/DYI store
Maling.dk	Retail/paints and varnishes
Røverkøb	Retail/paints and varnishes
SILVAN A/S (Aurelius Group)	DYI store
thansen (T. Hansen Gruppen A/S)	Retail/DYI store

Appendix 2. Product overview

Appendix 2.1 Product overview with product ID.

Products selected for testing are indicated with green background

ID	1/2c	Product type (application)	Project	Amount	Drying time	Number of treatments	SDS	Density	MAL-code*	CLP hazard label*	VOC content (g/l)
1		Sealant	Sealing				Yes	1.3 g/cm³ (20°C)	1-5	-	No
2	A	Paint & lacquer	Painting of floor				Yes	~1.050 g/cm³	00-5	Health hazard, Environmental hazard	5
2	B	Paint & lacquer	Painting of floor				Yes	1.290 g/cm³	No	Corrosion	5
3	A	Paint & lacquer	Lacquering of floor				Yes	~1.050 g/cm³	No	-	5
3	B	Paint & lacquer	Lacquering of floor				Yes	~1.050 g/cm³	No	-	55
4		Paint & lacquer	Painting	4-6 m²/liter	4-8 hours	1-2	Yes	No	1-1	-	<350 g/l
5	A	Paint & lacquer	Painting	150-200 g/m²	24-96 hours	3	Yes	1.1 g/cm³	00-1	Corrosion, Health hazard	No
5	B	Paint & lacquer	Painting	150-200 g/m²	24-96 hours	3	Yes	1.52 g/cm³	0-5	Health hazard	No
6		Sealant	Sealing	-	-	-	Yes	≤ 1.3 g/cm³ (PMDI)	3-3	-	No
7		Sealant	Sealing	-	-	-	Yes	≤ 1.3 g/cm³ (PDMI)	3-3	-	No
8		Sealant	Sealing	-	-	-	Yes	1.2 g/cm³	3-3	-	No
9		Sealant	Sealing	-	-	-	Yes	1.2 g/cm³	3-1	-	No

ID	1/2c	Product type (application)	Project	Amount	Drying time	Number of treatments	SDS	Density	MAL-code*	CLP hazard label*	VOC content (g/l)
10		Paint & lacquer	Painting of floor	-	-	2-3	Yes	1.18 g/cm³	2-1	-	<500 g/l
11		Paint & lacquer	Painting	-	-	-	Yes	1.1 g/cm³	2-1	Health hazard, Flammable	<500 g/l
12		Paint & lacquer	Lacquering of floor	-	-	-	Yes	-	2-1	-	<400 g/l
13	A	Filler	Sealing	-	-	-	No	-	-	-	-
13	B	Filler	Sealing				No	-	-	-	-
14		Filler	Sealing	-	2-3 hours	-	Yes	-	-	Serious health hazard, Flammable	-
15		Filler	Sealing	1-2 mm layer	8-10 hours	-	No	-	-	-	-
16		Sealant	Sealing	-	-	-	No	-	-	-	-
17		Filler	Sealing				No	-	-	-	-
18		Filler	Sealing	-	-	-	No	-	-	-	-
19		Filler	Sealing	1 cm layer	2 hours	-	No	-	-	-	-
20	A	Paint & lacquer	Painting	6 m²/liter	9 hours (surface dry)	2	No	-	00-6	Corrosion, Serious health hazard, Health hazard	-
20	B	Paint & lacquer	Painting				No	-	00-5	Health hazard, Environmental hazard	-
21	A	Paint & lacquer	Painting of floor	8 m²/kg	24 hours (surface dry)	2	No	-	-	-	-
21	B	Paint & lacquer	Painting of floor				No	-	-	-	-
22	A	Filler	Sealing	-	15 min	-	No	-	-	-	-
22	B	Filler	Sealing				No	-	-	-	-
23	A	Filler	Sealing	-	15 min	-	No	-	-	-	-
23	B	Filler	Sealing				No	-	-	-	-
24	A	Filler	Sealing	-	15 min	-	No	-	-	-	-

ID	1/2c	Product type (applica-tion)	Project	Amount	Drying time	Number of treatments	SDS	Density	MAL-code*	CLP hazard label*	VOC content (g/l)
24	B	Filler	Sealing				No	-	-	-	-
25		Sealant	Sealing	-	12 min	-	No	<25 kg/kvm	-	-	-
26	A	Filler	Sealing	-	10 min	-	Yes	-	-	Flammable, Serious health hazard, Health hazard	-
26	B	Filler	Sealing				Yes	-	-	Flammable, Health hazard	-
27	A	Filler	Sealing	-	10 min	-	No	-	-	-	-
27	B	Filler	Sealing				No	-	-	-	-
28		Sealant	Sealing	10-30 liter	-	-	No	-	-	-	-
29	A	Paint & lac-quer	Lacquering of floor	-	-	-	Yes	-	-	-	-
29	B	Paint & lac-quer	Lacquering of floor	-	-	-	Yes	-	-	-	-
30	A	Paint & lac-quer	Painting of floor	-	-	-	No	-	-	Health hazard, Cor-rosion	-
30	B	Paint & lac-quer	Painting of floor	-	-	-	No	-	-	Health hazard	-
31		Paint & lac-quer	Painting of floor	8 m²/0.9 l (8.8 m²/l)	-	-	No	-	-	-	-
32		Paint & lac-quer	Painting of floor	-	-	-	No	-	-	Flammable, Health hazard	-
33		Paint & lac-quer	Lacquering of floor	-	2 min	-	No	-	-	-	-
34		Filler	Sealing	-	-	-	No	-	-	-	-
35		Filler	Sealing	-	-	-	No	-	-	-	-
36	A	Filler	Sealing	-	20 min	-	Yes	-	-	-	-
36	B	Filler	Sealing				Yes	-	-	-	-
38		Filler	Sealing	-	10 min	-	No	-	-	-	-
39		Filler	Sealing				No	-	-	-	-

ID	1/2c	Product type (applica-tion)	Project	Amount	Drying time	Number of treatments	SDS	Density	MAL-code*	CLP hazard label*	VOC content (g/l)
40		Filler	Sealing	-	-	-	No	-	-	-	-
41		Filler	Sealing	max 5 mm	1.5 hours	-	No	-	-	-	-
42		Filler	Sealing	-	-	-	No	-	-	-	-
43		Filler	Sealing	-	-		No	-	-	-	-
44		Filler	Sealing	-	-		No	-	-	-	-
45	A	Filler	Sealing	-	10 min	-	Yes	1.79 g/cm³	5-6	-	105 g/l
45	B	Filler	Sealing				Yes	1.1 g/cm³	0-4	-	0 g/l
46		Filler	Sealing	-	-		No	-	-	-	-
47		Tile adhe-sive	Gluing	-	-		No	-	-	-	-
48		Tile adhe-sive	Gluing	-	-		No	-	-	-	-
49		Tile adhe-sive	Gluing	-	-		No	-	-	-	-
50		Tile adhe-sive	Gluing	-	-		No	-	-	-	-
51		Tile adhe-sive	Gluing	-	-		No	-	-	-	-
52		Filler	Sealing	-	-		No	-	-	-	-
53		Tile adhe-sive	Gluing	-	min. 2 hours		No	-	-	-	-
54		Tile adhe-sive	Gluing	-	min. 12 hours		No	-	-	-	-
55		Tile adhe-sive	Gluing	-	24-48 hours		No	-	-	-	-
56		Membrane	Sealing	-	1. layer: 1-2 hours; 2. layer: 12 hours	2-3	Yes	-	-	-	-

ID	1/2c	Product type (applica-tion)	Project	Amount	Drying time	Number of treatments	SDS	Density	MAL-code*	CLP hazard label*	VOC content (g/l)
57		Membrane	Sealing	-	1. layer: 1-2 hours; 2. layer 8-16 hours	2	No	-	00-1	-	-
58	A	Adhesive	Gluing	-	-	-	No	-	-	-	-
58	B	Adhesive	Gluing				No	-	-	-	-
59		Adhesive	Gluing	-	-	-	No	-	-	-	-
60		Adhesive	Gluing	-	-	-	Yes	-	-	-	-
61		Adhesive	Gluing	-	-	-	No	-	-	-	-
62		Adhesive	Gluing	-	-	-	No	-	-	-	-
63		Adhesive	Gluing	-	-	-	No	-	-	-	-
64		Adhesive	Gluing	-	-	-	No	-	-	-	-
65		Adhesive	Gluing	-	-	-	Yes	-	-	-	-
66	A	Adhesive	Gluing	-	-	-	No	-	-	-	-
66	B	Adhesive	Gluing				No	-	-	-	-
67		Adhesive	Gluing	-	-	-	No	-	-	-	-
68		Adhesive	Gluing	-	-	-	No	-	-	-	-
69		Floor wax, polish and care prod-ucts (wax)	Waxing	-	-	-	Yes	0.79 g/cm³	2-1	-	-
70		Sealant	Sealing	-	10-14 min	-	Yes	1.3 g/cm³	1-5	-	-
71		Filler	Sealing	-	-	-	Yes	1.5 ± 0.05 kg/dm³	-	-	-
72		Floor wax, polish and care prod-ucts (oil)	Polish and care of wood	-	-	-	No	-	-	-	-
73		Sealant	Sealing	-	-	-	No	-	-	-	-
74		Floor wax, polish and	Polish and care	-	-	-	No	-	-	-	-

ID	1/2c	Product type (application)	Project	Amount	Drying time	Number of treatments	SDS	Density	MAL-code*	CLP hazard label*	VOC content (g/l)
		care products									
75		Floor wax, polish and care products (wax)	Polish and care	-	-	-	No	-	-	-	-
76		Floor wax, polish and care products	Polish and care	-	-	-	No	-	-	-	-
77		Floor wax, polish and care products (wax)	Polish and care	-	-	-	No	-	-	-	-
78		Floor wax, polish and care products (wax)	Polish and care	-	-	-	No	-	-	-	-
79		Floor wax, polish and care products (wax)	Polish and care	-	-	-	No	-	-	-	-
80		Floor wax, polish and care products (wax)	Polish and care		-	-	No	-	-	-	-
81		Floor wax, polish and care products	Polish and care		-	-	No	-	-	-	-
82		Floor wax, polish and care products	Polish and care		-	-	No	-	-	-	-

ID	1/2c	Product type (applica-tion)	Project	Amount	Drying time	Number of treatments	SDS	Density	MAL-code*	CLP hazard label*	VOC content (g/l)
83		Floor wax, polish and care prod-ucts (wax)	Polish and care		-	-	No	-	00-3	-	-
84		Sealant	Sealing		-	-	No	-	-	-	-
85		Floor wax, polish and care prod-ucts	Polish and care of wooden floors	Apply to sur-face and re-move excess	-	-	No	-	-	-	-
87±		Adhesive	Gluing		-	-	Yes	1.71	-	Health hazard	3.6
88¥		Sealant	Repair and levelling		-	-	Yes	1.52-1.68 g/ml	-	Health hazard	-

Product-ID numbers 37 and 86 were not applied. In order to avoid errors in data, the original ID-numbering has been kept.

*MAL-codes and CLP classification is stated for all products, depending on availability of information. For all the tested products (marked with green background) the MAL-codes and CLP classification was stated on the packaging and therefore added in the table.

±The product was received from the Danish Chemical Inspection due to packaging issues. The product was considered outside the scope of the current project, since it is a specialty product.

¥The product was received from the Danish Chemical Inspection. The product is from a store that is not included in this project.

Appendix 3. **MBK**

MBK is a Danish database for application of coating products and the following instructions are only available in Danish.

Appendix 3.1 Anvisning V 6453C

Malerfagligt Behandlings-Katalog

Gulve > Vedligehold > Træ, brædder/parket

Vedligehold V 6453C

Byggemateriale:	Træ, brædder/parket
Funktionsklasse:	Æstetiske og middel funktionelle krav II
Nuværende behandling:	Plastgulvlak
Tilstand og behov:	C: Almindeligt vedligehold
Forventet udfald:	Ensartet, lukket og glat flade
Slutbehandling:	Plastgulvlak
Kodenummer:	00-1

Behandlingsanvisning

Malebehandling

vask
afrensning af evt. sæberester, plejemidler o.lign.
let slibning
kitning
2 gange plastgulvlak, glans:_____

Vedhæftning: Tapeprøve, kl. 0-1

Forudsætninger

Overfladen er:
stort set intakt (slidt, enkelte små huller/revner),
fastsiddende og bæredygtig,
uden væsentlig afsmitning,
tilsmudset.

C-anvisningen kan give tilfredsstillende funktion/udseende.

Vejl. prøvemetoder: Klima·Afsmitning·Tapeprøve

Egenskaber

Behandling til trægulve i tørre rum med let gangtrafik, fx bolig.
C-behandling anviser det rettidige vedligehold.
Plastgulvlak tørrer op til klar film, blank til halvmat. Har tilfredsstillende slidstyrke, men begrænset ridsefasthed og vandbestandighed. Rengørligheden er god, men skal udføres skånsomt og vandspild skal fjernes straks.
NB: Undersøg forligelighed mellem nuværende beh. og ny lak.

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Appendix 3.2 Anvisning V 6452

Malerfagligt Behandlings-Katalog

Gulve > Nybehandling > Træ, brædder/parket

Nybehandling V 6452

Byggemateriale:	Træ, brædder/parket
Funktionsklasse:	Æstetiske og middel funktionelle krav II
Forventet udfald:	Ensartet, lukket og glat flade
Slutbehandling:	Plastgulvlak
Kodenummer:	00-1

Behandlingsanvisning

Malebehandling

grunding med plastgulvlak
2 gange plastgulvlak, glans:_____

Vedhæftning: Tapeprøve, kl. 0

Forudsætninger

Trægulvet skal være fastgjort fordækt eller med udfyldte huller. Gulvet skal være rent, uden ujævnhed fra overfladeopfugtning og uden misfarvninger som følge af biologisk angreb, samt glatte (uden skader fra maskinbearbejdning og meget synlige kutterslag). Samlinger og stød skal være tætte og i plan, uden slibespor. Barkrings- og rådknaster, knasthuller og harpikslommer må ikke forekomme. Revner max. bredde 0,5 mm og længde max. 10% af emnet. Fugtighed 8 ±2 vægt%.

Vejl. prøvemetoder: Klima·Træfugtighed

Egenskaber

Behandling til trægulve i tørre rum med let gangtrafik, fx bolig.
Plastgulvlak tørrer op til klar film, blank til halvmat. Har tilfredsstillende slidstyrke, men begrænset ridsefasthed og vandbestandighed. Rengørligheden er god, men skal udføres skånsomt og vandspild skal fjernes straks.
Plastgulvlak er let at genbehandle.

Appendix 4. Dangerous substances in do-it-yourself products

Appendix 4.1 Dangerous substances in do-it-yourself products according to their respective safety data sheets (SDS).
Products selected for testing are indicated with green background

ID	C	Product type	Substance	Type	CAS no.	EINECS no.	Classification cf. SDS	Conc.(%)
1		Sealant	Dimethylether	VVOC	115-10-6	204-065-8	H220, H280, Flam. Gas 1, Press. Gas (*),	<10
1		Sealant	Isobutane	VVOC	75-28-5	200-857-2	H220, H280, Flam. Gas 1, Press. Gas (*),	<15
1		Sealant	Butane	VVOC	106-97-8	203-448-7	H220, H280, Flam. Gas 1, Press. Gas (*),	<15
1		Sealant	Dimethylether	VVOC	115-10-6	204-065-8	H220, H280, Flam. Gas 1, Press. Gas (*),	<10
1		Sealant	Chlorinated paraffins C14-17	N	85535-85-9	287-477-0	H362, H400, H410, Aquatic Acute 1, Aquatic Chronic 1, Lact.,	<30
1		Sealant	Diphenylmethandiisocyanate, isomers and homologues	(VOC)	9016-87-9	618-498-9	H315, H317, H319, H332, H334, H335, H351, H373, Acute tox. 4, Carc. 2, Eye Irrit. 2, Resp. Sens. 1, Skin Irrit. 2, Skin Sens. 1, STOT RE 2, STOT SE 3,	20-60
2	A	Paint & lacquer	Alcohols, C8-22, ethoxylated	(VOC)	69013-19-0	-	H302, H315, H318, H400, Acute tox. 4, Aquatic Acute 1, Eye Dam. 1, Skin Irrit. 2,	<0.5
2	A	Paint & lacquer	1,2-ethandiol	VOC	107-21-1	203-473-3	H302, Acute tox. 4,	1
2	A	Paint & lacquer	5-chloro-2-methyl-2H-isothiazol-3-on [EU no. 247-500-7], mixture (3:1) with 2-methyl-2H-isothiazol-3-one [EU no. 220-239-6]	VOC	55965-84-9	247-500-7	H301+H311, H314, H317, H331, H400, H410, Acute tox. 3, Aquatic Acute 1, Aquatic Chronic 1, Skin Corr. 1B, Skin Sens. 1,	0.001
2	B	Paint & lacquer	5-chloro-2-methyl-2H-isothiazol-3-on [EU no. 247-500-7], mixture (3:1) with 2-methyl-2H-isothiazol-3-one [EU no. 220-239-6]	VOC	55965-84-9	247-500-7	H301+H311, H314, H317, H331, H400, H410, Acute tox. 3, Aquatic Acute 1, Aquatic Chronic 1, Skin Corr. 1B, Skin Sens. 1,	~0.001
2	A	Paint & lacquer	oxiran, mono[(C12-14-alkyloxy)methyl]derivatives; (C12C14) alkylglycidylether	N	68609-97-2	271-846-8	H315, H317, Skin Irrit. 2, Skin Sens. 1,	5-10
2	A	Paint & lacquer	Bisphenol F reaction product	N	9003-36-5	500-006-8	H315, H317, H319, H411, Aquatic Chronic 2, Eye Irrit. 2, Skin Irrit. 2, Skin Sens. 1,	10-20

ID	C	Product type	Substance	Type	CAS no.	EINECS no.	Classification cf. SDS	Conc.(%)
2	A	Paint & lacquer	Reaction product: bisphenol-A-diglycidylether, homologues with molecular weight ≤ 700	N	25068-38-6	500-033-5	H315, H317, H319, H411, Aquatic Chronic 2, Eye Irrit. 2, Skin Irrit. 2, Skin Sens. 1,	30-60
2	B	Paint & lacquer	Epoxy resin/polyamine adduct	N	238080-05-2	607-272-5	H302, H318, Acute tox. 4, Eye Dam. 1,	10-20
3	A	Paint & lacquer	Alcohols, C8-22, ethoxylated	(VOC)	69013-19-0	-	H302, H315, H318, H400, Acute tox. 4, Aquatic Acute 1, Eye Dam. 1, Skin Irrit. 2,	<0.5
3	B	Paint & lacquer	Poly(oxy(methyl-1,2-ethanediyl)), *alpha*-(2-aminomethylethyl)-*omega*-(2-aminomethylethoxy)-	N	9046-10-0	-	H314, H318, H411, Aquatic Chronic 2, Eye Dam. 1, Skin Corr. 1C,	<10
3	A	Paint & lacquer	Bronopol (INN)	(VOC)	52-51-7	200-143-0	H302, H312, H315, H318, H335, H400, Acute tox. 4, Aquatic Acute 1, Eye Dam. 1, Skin Irrit. 2, STOT SE 3,	0.025
3	B	Paint & lacquer	Benzylalcohol	VOC	100-51-6	202-859-9	H302, H332, Acute tox. 4,	1-5
3	A	Paint & lacquer	1,2-ethandiol	VOC	107-21-1	203-473-3	H302, Acute tox. 4,	1
3	B	Paint & lacquer	1-methoxy-2-propanol	VOC	107-98-2	203-539-1	H226, H336, Flam. Liq. 3, STOT SE 3,	<5
3	A	Paint & lacquer	5-chloro-2-methyl-2H-isothiazol-3-on [EU no. 247-500-7], mixture (3:1) with 2-methyl-2H-isothiazol-3-one [EU no. 220-239-6]	VOC	55965-84-9	247-500-7	H301+H311, H314, H317, H331, H400, H410, Acute tox. 3, Aquatic Acute 1, Aquatic Chronic 1, Skin Corr. 1B, Skin Sens. 1,	0.0005
3	A	Paint & lacquer	oxiran, mono[(C12-14-alkyloxy)methyl]derivater; (C12C14) alkylglycidylether	N	68609-97-2	271-846-8	H315, H317, Skin Irrit. 2, Skin Sens. 1,	5-10
3	A	Paint & lacquer	Bisphenol F reaction product	N	9003-36-5	500-006-8	H315, H317, H319, H411, Aquatic Chronic 2, Eye Irrit. 2, Skin Irrit. 2, Skin Sens. 1,	10-20
3	A	Paint & lacquer	bisphenol-A-diglycidylether, homologues with molecular weight ≤ 700	N	25068-38-6	500-033-5	H315, H317, H319, H411, Aquatic Chronic 2, Eye Irrit. 2, Skin Irrit. 2, Skin Sens. 1,	30-60
4		Paint & lacquer	2-butanone oxime	VOC	96-29-7	202-496-6	Carc. 3, Xn, R21,R40,R41,R43,H312, H317, H318, H351, Acute tox. 4, Carc. 2, Eye Dam. 1, Skin Sens. 1,	0.1-1
4		Paint & lacquer	ALKANES, C11-C15-ISO-	VOC	-	927-285-2	Xn, R65,R66, H304, Asp. tox. 1,	10-30
5	B	Paint & lacquer	Polyoxypropylenediamine (Reaction products of di-, tri-, and tetra-propoxylated Propane-1,2-diol with ammonia)	N	-	-	Skin Corr. 1C, Eye Dam. 1, Acquat. Chronic 3, H314, H318, H412	>1

ID	C	Product type	Substance	Type	CAS no.	EINECS no.	Classification cf. SDS	Conc.(%)
5	B	Paint & lac-quer	propan-2-ol	VOC	67-63-0	200-661-7	H225, H319, H336	1-3
5	A	Paint & lac-quer	1-methoxypropan-2-ol	VOC	107-98-2	203-539-1	H226, H336	5-10
5	B	Paint & lac-quer	2,2'-iminodi(ethylamine)	(VOC)	111-40-0	203-865-4	Acute Tox. 1, Acute Tox. 4, STOT SE 3, Skin Corr. 1B, Eye Dam. 1, Skin Sens. 1, H302, H312, H314, H317, H318, H330, H335	<1
5	B	Paint & lac-quer	2-butoxyethanol	VOC	111-76-2	203-905-0	H302, H312, H315, H319, H332	1-3
5	B	Paint & lac-quer	aduct of aliphatic polyamine (Bis A epoxy adduct with 3-aminomethyl-3,5,5-trimethyl-cyclohexylamine)	N	2855-13-2	220-666-8	H302, H312, H314, H317, H412	5-10
5	A	Paint & lac-quer	Bisphenol-A- (epichlorhydrin); epoxy resin	N	25068-38-6	500-033-5	H315, H317, H319	60-80
5	A	Paint & lac-quer	Water	NN	7732-18-5			25-40
5	B	Paint & lac-quer	Water	NN	7732-18-5			25-40
6		Sealant	Propane	VVOC	74-98-6	200-827-9	Flam. Gas 1, Press.Gas; H220, H280	<15
6		Sealant	Isobutane	VVOC	75-28-5	200-857-2	Flam. Gas 1, Press.Gas; H220, H280	<15
6		Sealant	Butane	VVOC	106-97-8	203-448-7	Flam. Gas 1, Press.Gas; H220, H280	<15
6		Sealant	Dimethylether	VVOC	115-10-6	204-065-8	Flam. Gas 1, Press.Gas; H220, H280	<10
6		Sealant	Tris(2-chloro-1-methylethyl)phosphate	VOC	13674-84-5	237-158-7	Acute Tox. 4; H302	<25
6		Sealant	Alkanes, C14-17-, chloro	N	85535-85-9	287-477-0	Lact., Aquatic Acute 1, Aquatic Chronic 1; H362, H400, H410, EUH066	<20
6		Sealant	Diphenylmethandiisocyanat, isomers and homologues	(VOC)	9016-87-9		Acute Tox. 4, Skin Irrit. 2, Eye Irrit. 2, Resp. Sens. 1, Skin Sens. 1, Carc. 2, STOT SE 3, STOT RE 2; H332, H373, H315, H319, H334, H317, H351, H335	30-60
7		Sealant	Propane	VVOC	74-98-6	200-827-9	Flam. Gas 1, Press.Gas; H220, H280	<15
7		Sealant	Isobutane	VVOC	75-28-5	200-857-2	Flam. Gas 1, Press.Gas; H220, H280	<15
7		Sealant	Butane	VVOC	106-97-8	203-448-7	Flam. Gas 1, Press.Gas; H220, H280	<15
7		Sealant	Dimethylether	VVOC	115-10-6	204-065-8	Flam. Gas 1, Press.Gas; H220, H280	<10

ID	C	Product type	Substance	Type	CAS no.	EINECS no.	Classification cf. SDS	Conc.(%)
7		Sealant	Tris(2-chloro-1-methylethyl) phosphate	VOC	13674-84-5	237-158-7	Acute Tox. 4; H302	<25
7		Sealant	Alkanes, C14-17-, chloro	N	85535-85-9	287-477-0	Lact., Aquatic Acute 1, Aquatic Chronic 1; H362, H400, H410, EUH066 – M=1	<20
7		Sealant	Diphenylmethandiisocyanate, isomers and homologues	(VOC)	9016-87-9		Acute Tox. 4, Skin Irrit. 2, Eye Irrit. 2, Resp. Sens. 1, Skin Sens. 1, Carc. 2, STOT SE 3, STOT RE 2; H332, H373, H315, H319, H334, H317, H351, H335	30-60
8		Sealant	Propane	VVOC	74-98-6	200-827-9	Flam. Gas 1, Press.Gas; H220, H280	<15
8		Sealant	Isobutane	VVOC	75-28-5	200-857-2	Flam. Gas 1, Press.Gas; H220, H280	<15
8		Sealant	Butane	VVOC	106-97-8	203-448-7	Flam. Gas 1, Press.Gas; H220, H280	<15
8		Sealant	Dimethylether	VVOC	115-10-6	204-065-8	Flam. Gas 1, Press.Gas; H220, H280	<8
8		Sealant	Alkanes, C14-17-, chloro	N	85535-85-9	287-477-0	Lact.;H362, Aquatic Acute 1;H400, Aquatic Chronic 1;H410 – M = 100, EUH066	<20
8		Sealant	Diphenylmethandiisocyanate, isomers and homologues	(VOC)	9016-87-9		Skin Irrit. 2;H315, Skin Sens. 1;H317, Eye Irrit. 2;H319, Acute Tox. 4;H332, Resp. Sens. 1;H334, STOT SE 3;H335, Carc. 2;H351, Lact. ;H362, STOT RE 2;H373	38-55
9		Sealant	Liquid Propane	VVOC	74-98-6	200-827-9	Comp. Gas, Flam. Gas 1 H220, H280	<15
9		Sealant	Isobutane	VVOC	75-28-5	200-857-2	Comp. Gas, Flam. Gas 1 H220, H280	<15
9		Sealant	Butane	VVOC	106-97-8	203-448-7	Comp. Gas, Flam. Gas 1 H220, H280	<15
9		Sealant	Dimethylether	VVOC	115-10-6	204-065-8	Comp. Gas, Flam. Gas 1 H220, H280	<10
9		Sealant	Alkanes, C14-17-, chloro	N	85535-85-9	287-477-0	Lact., Aquatic Chronic 1 H362, H410, EUH066 (M-chronic = 1)	<25
9		Sealant	Diphenylmethane Diisocyanate, isomers and homologues	(VOC)	9016-87-9	618-498-9	Acute Tox. 4, STOT RE 2, STOT SE 3, Skin Irrit. 2, Eye Irrit. 2, Resp. Sens. 1, Skin Sens. 1, Carc. 2 H315, H317, H319, H332, H334, H335, H351, H373	30-60
10		Paint & lac-quer	2-butanone oxime	VOC	96-29-7	202-496-6	Acute Tox. 4 H312, Eye Dam. 1 H318, Skin Sens. 1 H317, Carc. 2 H351	≤0.30
10		Paint & lac-quer	calciumbis(2-ethylhexanoate)	N	136-51-6	205-249-0	Eye Dam. 1 H318, Repr. 2 H361fd	<1
10		Paint & lac-quer	cobaltbis(2-ethylhexanoate)	N	136-52-7	205-250-6	Eye Irrit. 2 H319, Skin Sens. 1 H317, Repr. 2, H361f	≤0.30
10		Paint & lac-quer	2-ethylhexanoic acid, zirconiumsalt	N	22464-99-9	245-018-1	Repr. 2, H361fd	≤1

ID	C	Product type	Substance	Type	CAS no.	EINECS no.	Classification cf. SDS	Conc.(%)
10		Paint & lacquer	Naphtha (petroleum), hydrotreated heavy <0,1% benzene	VOC	64742-48-9	265-150-3	Flam. Liq. 3 H226, Asp. Tox. 1 H304	≥25 - ≤50
11		Paint & lacquer	2-butanone oxime	VOC	96-29-7	202-496-6	H312, H317, H318, H351, Acute tox. 4, Carc. 2, Eye Dam. 1, Skin Sens. 1,	<1
11		Paint & lacquer	Calcium bis(2-ethylhexanoate)	N	136-51-6	205-249-0	H318, H361d, Eye Dam. 1, Repr. 2,	<1
11		Paint & lacquer	N-Formylmorpholine	VOC	4394-85-8	224-518-3	H317, Skin Sens. 1,	0,5
11		Paint & lacquer	Trizinkbis(orthophosphate)	N	7779-90-0	231-944-3	H400, H410, Aquatic Acute 1, Aquatic Chronic 1,	<1
11		Paint & lacquer	5-chloro-2-methyl-2H-isothiazol-3-on [EU no. 247-500-7], mixture (3:1) with 2-methyl-2H-isothiazol-3-one [EU no. 220-239-6]	VOC	55965-84-9	247-500-7	H301+H311, H314, H317, H331, H400, H410, Acute tox. 3, Aquatic Acute 1, Aquatic Chronic 1, Skin Corr. 1B, Skin Sens. 1,	<0.001; 5
11		Paint & lacquer	Hydrocarbons, C9-C11, n-alkanes, isoalkanes, cyclics, <2% aromatics	VOC	-	919-857-5	H226, H304, H336, Asp. tox. 1, Flam. Liq. 3, STOT SE 3,	30-60
12		Paint & lacquer	2-butanone oxime	VOC	96-29-7	202-496-6	H312, H317, H318, H351, Acute tox. 4, Carc. 2, Eye Dam. 1, Skin Sens. 1,	<1
12		Paint & lacquer	Naphtha (petroleum), hydrotreated heavy <0,1% benzene	VOC	64742-48-9	265-150-3	EUH 066, H226, H304, Asp. tox. 1, Flam. Liq. 3,	30-60
14		Filler	Naphtha (petroleum), hydrotreated heavy <0,1% benzene	(VOC)	64742-48-9	265-150-3	Flam. Liq. 3, Asp. Tox. 1, STOT SE 3	2.5 - <5
14		Filler	Titandioxide	N	13463-67-7	236-675-5		1 - <2.5
14		Filler	2-ethylhexanoic acid, zirconiumsalt	N	22464-99-9	245-018-1	Acute Tox. 4, Repr. 2	0.25 - <1
14		Filler	Hydrocarbons, C10-C13, n-alkanes, isoalkanes, cyclics, aromatics (2-25%)	VOC	64742-82-1	919-164-8	STOT RE 1, Asp. Tox. 1, Aquatic Chronic 3	5 - <10
14		Filler	Hydrocarbons, C9-C11, n-alkanes, isoalkanes, cyclics, <2% aromatics	VOC	64742-48-9	919-857-5	Flam. Liq. 3, STOT SE 3, Asp. Tox. 1	2.5 - <5
20		Paint & lacquer	SDS missing					
26		Filler	Styrene	VOC	100-42-5	202-851-5	Flam. Liq. 3 H226 Acute Tox. 4 H332 Asp. Tox. 1 H304 Eye Irrit. 2 H319 Skin Irrit. 2 H315 STOT RE 1; Inhalation H372 Repr. 2 H361d Aquatic Chronic 3 H412 STOT SE 3 H335	10-20

ID	C	Product type	Substance	Type	CAS no.	EINECS no.	Classification cf. SDS	Conc.(%)
29		Paint & lacquer	1-butoxypropan-2-ol	VOC	5131-66-8	225-878-4	Flam. Liq. 3, Skin Irrit. 2, Eye Irrit. 2, H226, H315, H319	1-3
29		Paint & lacquer	(2-methoxymethylethoxy)propanol	VOC	34590-94-8	252-104-2	N/A	1-3
29		Paint & lacquer	Pentanoic acid, 5-(dimethylamino)-2-methyl-5-oxo, methyl ester	(VOC)	1174627-68-9	N/A	Eye Irrit. 2 H319	<1
30		Paint & lacquer	SDS missing					
32		Paint & lacquer	2-Butanone oxime	VOC	96-29-7	202-496-6	Acute Tox. 4, H312, Eye Dam. 1, H318, Skin Sens. 1, H317, Carc. 2, H351	≥0.3 - <1
32		Paint & lacquer	1-Methoxy-2-propanol	VOC	107-98-2	203-539-1	Flam. Liq. 3, H226, STOT SE 3, H336	≥1 - <3
32		Paint & lacquer	cobaltbis(2-ethylhexanoate)	N	136-52-7	205-250-6	Eye Irrit. 2, H319, Skin Sens. 1, H317, Repr. 2, H361fd, (Suspected of damaging fertility or the unborn child), Aquatic Acute 1, H400, Aquatic Chronic 3, H412	≥0.1 - <0.3
32		Paint & lacquer	Xylene	VOC	1330-20-7	215-535-7	Flam. Liq. 3, H226, Acute Tox. 4, H312, Acute Tox. 4, H332, Skin Irrit. 2, H315, Eye Irrit. 2, H319, STOT SE 3, H335, STOT RE 2, H373 (oral), Asp. Tox. 1, H304	≥3 - <5
32		Paint & lacquer	2-ethylhexanoic acid, zirconiumsalt	N	22464-99-9	245-018-1	Repr. 2, H361fd, (Suspected of damaging fertility or the unborn child)	≥0.1 - <0.3
32		Paint & lacquer	Naphtha (petroleum), hydrotreated heavy <0,1% benzene	VOC	64742-48-9	265-150-3	Flam. Liq. 3, H226, STOT SE 3, H336, Asp. Tox. 1, H304, EUH066	≥25 - <50
32		Paint & lacquer	Fatty acids, tall-oil, compds. with oleylamine	N	N/A	288-315-1	Eye Dam. 1, H318, Skin Sens. 1A, H317	<0.1
36		Filler	SDS: Dangerous substances: not relevant					
45	B	Filler	BENZOYLPEROXIDE	N	94-36-0	202-327-6	Org. Perox. B H241 Eye Irrit. 2 H319 Skin Sens. 1 H317 Aquatic Acute 1 H400 Aquatic Chronic 1 H410 M-factor (Very toxic to aquatic life with long lasting effects): 10 Mfactor (chronic toxicity to aquatic life) 10	45-52
45	A	Filler	Styrene	VOC	100-42-5	202-851-5	Flam. Liq. 3 H226 Acute Tox. 4 H332 Asp. Tox. 1 H304 Eye Irrit. 2 H319 Skin Irrit. 2 H315 STOT RE 1; Inhalation H372 Repr. 2 H361d Aquatic Chronic 3 H412 STOT SE 3 H335	1.5 - <20
56		Membrane	SDS: Does not contain any substances eligible for CLP hazard labelling.					
60		Adhesive	1,2-benzisothiazol-3(2H)-one	N	2634-33-5	220-120-9	Acute Tox. 4, Skin Irrit. 2, Eye Dam. 1, Skin Sens. 1, Aquatic Acute 1, H302, H315, H317, H318, H400	<0.05%

ID	C	Product type	Substance	Type	CAS no.	EINECS no.	Classification cf. SDS	Conc.(%)
60		Adhesive	5-chloro-2-methyl-2H-isothiazol-3-one, mixture (3:1) with 2-methyl-2H-isothiazol-3-one	VOC	55965-84-9	N/A	Acute Tox. 3, Skin. Corr. 1B, Skin Sens. 1, Aquatic Acute 1, Aquatic Chronic 1, H301, H311, H314, H317, H331, H400, H410 (M-acute = 10)	<0.0015
65		Adhesive	1,2-benzisothiazol-3(2H)-one	N	2634-33-5	220-120-9	Acute Tox. 4, Skin Irrit. 2, Skin Sens. 1, Eye Dam. 1, Acute Tox. 2, Aquatic Acute 1, Aquatic Chronic 2, H302, H315, H317, H318, H330, H400, H411 (M-acute = 1)	<0.01
65		Adhesive	5-chloro-2-methyl-4-isothiazolin-3-one [EC no.247- 500-7] / 2-Methyl-2H-isothiazol-3-one [EC no. 220-239-6] (3:1)	VOC	55965-84-9	N/A	Acute Tox. 3, Acute Tox. 3, Skin Corr. 1B, Skin Sens. 1, Eye Dam. 1, Acute Tox. 3, Aquatic Acute 1, Aquatic Chronic 1, H301, H311, H314, H317, H318, H331, H400, H410 (M-acute = 100) (M-chronic = 10)	
69		Floor wax, polish & care product	Paraffin wax	N	8002-74-2	232-315-6	-	5-10
69		Floor wax, polish & care product	Isododecane	VOC	31807-55-3	250-816-8	Flam.Liq 3, Asp. Tox. 1; H226, H304	50-100
69		Floor wax, polish & care product	Distillates (petroleum), hydrotreated light	VOC	64742-47-8	265-149-8	Asp. Tox. 1; H304	10-25
70		Sealant	Propane	VVOC	74-98-6	200-827-9	F+, R12, H220, H280, Flam. Gas 1, Press. Gas (*),	<15
70		Sealant	Isobutane	VVOC	75-28-5	200-857-2	F+, R12, H220, H280, Flam. Gas 1, Press. Gas (*),	<15
70		Sealant	Butane (content ≥ 0.1 % butadiene (203-450-8))	VVOC	106-97-8	203-448-7	F+, R12, H220, H280, Flam. Gas 1, Press. Gas (*),	<15
70		Sealant	Dimethylether	VVOC	115-10-6	204-065-8	F+, R12, H220, H280, Flam. Gas 1, Press. Gas (*),	<10
70		Sealant	Tris(2-chloro-1-methylethyl) phosphate	VOC	13674-84-5	237-158-7	Xn, R22, H302, Acute tox. 4,	<25
70		Sealant	Chlorinated paraffines C14-17	N	85535-85-9	287-477-0	N, R50/53,R64,R66, EUH 066, H362, H400, H410, Aquatic Acute 1, Aquatic Chronic 1, Lact.,	<20
70		Sealant	Polymethylenpolyphenylisocyanate	(VOC)	9016-87-9	618-498-9	Cancer 3, Xn, R20,R36/37/38,R40,R42/43,R48/20, EUH 204, H315, H317, H319, H332, H334, H335, H351, H373, Acute tox. 4, Carc. 2, Eye Irrit. 2, Resp. Sens. 1, Skin Irrit. 2, Skin Sens. 1, STOT RE 2, STOT SE 3,	30-60
71		Filler	SDS: Does not contain any substances eligible for CLP hazard labelling. Does not contain substances harmful to the environment.					

ID	C	Product type	Substance	Type	CAS no.	EINECS no.	Classification cf. SDS	Conc.(%)
72		Floor wax, polish & care product	SDS missing					
76		Floor wax, polish & care product	SDS missing					
80		Floor wax, polish & care product	Ammonia		1336-21-6	215-647-6	Skin Corr. 1B; H314, Aquatic Acute 1; H400	< 1
83		Floor wax, polish & care product	SDS missing					
85		Floor wax, polish & care product	Linseed oil	(VOC)	8001-26-1	232-278-6		100
88		Sealant	Ethylendimethacrylate	VOC	97-90-5	202-617-2	STOT SE 3: H335 – Skin Sens. 1: H317	10 - <15
88		Sealant	Methacrylic acid, monoester with propan-1,2-diol	(VOC)	27813-02-1	248-666-3	Eye Irrit. 2: H319 – Skin Sens. 1: H317	1 - <10
88		Sealant	Glycerine	(VOC)	56-81-5	200-289		1 - <20
88		Sealant	Dibenzoylperoxide	N	94-36-0	202-327-6	Org. Perox. B: H241 – Eye Irrit. 2: H319 – Skin Sens. 1: H317	1-<2.5
88		Sealant	1,1'-(p-tolylimino)dipropan-2-ol	(VOC)	38668-48-3	254-075-1	Acute Tox. 2: H300 – Eye Dam. 1: H318 – Aquatic Chronic 3: H412	0.1 - <1

Explanation:

C: Component A or B for 2 component products

VVOC: Very volatile organic compound with low boiling point < 60°C, may require specialized analysis

VOC: Volatile organic compound with low boiling point > 60°C, measured by ISO 16000-6/EN 16516

(VOC): Instable, decomposes in air/by GC-analysis (ISO 16000-6/EN 16516), may possibly be measured specialized analysis

N: Not a volatile compound or VOC, degradation- or reaction products may be monitored as VOC

NN: Inorganic volatile substance

Appendix 5. Analysis methods

Appendix 5.1 Calibrated range for quantification of 67 volatile organic compounds (VOC) by Tenax analysis standard method ISO 16000-6

CAS no	Substance	Tenax (ng)	Tenax (ng)	Calibrated 0.05 L air (µg/m^3)		Calibrated 5 L air (µg/m^3)	
		Min.	Max.	Min.	Max.	Min.	Max.
000064-17-5	Ethanol	10	1000	200	20000	2	200
000067-64-1	Acetone	5	1000	100	20000	1	200
000067-63-0	2-Propanol	5	1000	100	20000	1	200
000071-23-8	1-Propanol	5	1000	100	20000	1	200
000078-93-3	2-Butanone	5	1000	100	20000	1	200
000109-97-7	Ethanamine, N-ethyl-	50	400	1000	8000	10	80
000110-54-3	Hexane	5	1000	100	20000	1	200
000064-19-7	Acetic acid	96	398	1920	7960	19	80
000078-83-1	Isobutyl Alcohol	5	194	100	3880	1	39
000071-43-2	Benzene	5	500	100	10000	1	100
000071-36-3	1-Butanol	5	1000	100	20000	1	200
000107-98-2	2-Propanol, 1-methoxy-	5	194	100	3880	1	39
000127-06-0	Acetone oxime	5	400	100	8000	1	80
000121-44-8	Triethylamine	5	400	100	8000	1	80
000142-82-5	Heptane	5	1000	100	20000	1	200
000110-62-3	Pentanal	5	333	100	6664	1	67
000123-91-1	1,4-Dioxane	5	333	100	6666	1	67
000079-09-4	Propanoic acid	108	733	2160	14660	22	147
000108-10-1	2-pentanone-4-methyl	5	300	100	6000	1	60
000057-55-6	1,2-Propandiol	50	300	1000	6000	10	60
000108-88-3	Toluene (TIC)	5	300	100	6000	1	60
000108-88-3	Toluene	5	500	100	10000	1	100
000079-31-2	Propanoic acid, 2-methyl-	15	870	300	17400	3	174
000107-92-6	Butanoic acid	147	871	2940	17420	29	174
000111-65-9	Octane	5	1000	100	20000	1	200
000066-25-1	Hexanal	5	333	100	6666	1	67
000123-86-4	Butylacetat	5	300	100	6000	1	60
000096-29-7	2-Butanone, oxime	5	400	100	8000	1	80
000100-41-4	Ethylbenzene	5	400	100	8000	1	80
179601-23-1	P+M-xylene	5	1000	100	20000	1	200
000109-52-4	Pentanoic acid	86	1010	1720	20200	17	202
000100-42-5	Styrene	5	500	100	10000	1	100
000095-47-6	O-Xylene	5	1000	100	20000	1	200

CAS no	Substance	Tenax (ng)	Tenax (ng)	Calibrated 0.05 L air (µg/m^3)		Calibrated 5 L air (µg/m^3)	
		Min.	Max.	Min.	Max.	Min.	Max.
000108-94-1	Cyclohexanone	5	400	100	8000	1	80
000111-84-2	Nonane	5	1000	100	20000	1	200
000111-76-2	Ethanol, 2-butoxy-	5	194	100	3880	1	39
007785-26-4	S-.alpha.-Pinene	5	1000	100	20000	1	200
005131-66-8	2-Propanol, 1-butoxy-	5	194	100	3880	1	39
000620-14-4	3-ethyltoluene	5	1000	100	20000	1	200
000108-67-8	Benzene, 1,3,5-trimethyl-	5	400	100	8000	1	80
000108-95-2	Phenol	5	300	100	6000	1	60
000142-62-1	Hexanoic acid	49	1149	980	22980	10	230
000611-14-3	2-ethyltoluene	5	400	100	8000	1	80
018172-67-3	b-pinene	5	750	100	15000	1	150
034590-94-8	top a Di(propylene glycol) methyl ether,	5	194	100	3880	1	39
000095-63-6	1,2,4-trimethyl-benzene	5	400	100	8000	1	80
000124-18-5	Decane	5	400	100	8000	1	80
000526-73-8	Benzene, 1,2,3-trimethyl-	5	400	100	8000	1	80
005989-27-5	Limonene	5	1000	100	20000	1	200
000100-51-6	Benzyl alcohol	5	194	100	3880	1	39
000111-14-8	Heptanoic acid	55	1300	1100	26000	11	260
000096-09-3	Styrene oxide	5	333	100	6667	1	67
001120-21-4	Undecane	5	1000	100	20000	1	200
000124-19-6	Nonanal	5	1000	100	20000	1	200
002687-91-4	1-Ethyl-2-pyrrolidinone	5	450	100	9000	1	90
000149-57-5	2-Ethylhexanoice acid	17	664	340	13280	3	133
002682-20-4	2-Methyl-isothiazolin-3-one	13	400	260	8000	3	80
000112-34-5	Butyldiglycol	10	333	200	6667	2	67
000112-40-3	Dodecane	5	750	100	15000	1	150
000112-31-2	Decanal	5	1000	100	20000	1	200
000103-11-7	2-Ethylhexyl-acrylate	5	300	100	6000	1	60
026172-55-4	5-Chloro-2-methyl-3(2H)-isothiazolone	5	450	100	9000	1	90
000629-50-5	Tridecane	5	750	100	15000	1	150
000629-59-4	Tetradecane	5	750	100	15000	1	150
000629-62-9	Pentadecane	5	500	100	10000	1	100
002425-79-8	Butandioldiglycidylether	100	333	2000	6667	20	67
000544-76-3	Hexadecane	5	400	100	8000	1	80

Appendix 5.2 Detection limits (LOD) of C1-C4 aldehydes (VVOC) by DNPH-analysis and standard method ISO 16000-3

CAS no	Substance	LOD (µg)	LOD 30 L air sample (µg/m^3)
50-00-0	Formaldehyde	0.03	1.0
75-07-0	Acetaldehyde	0.03	1.0
123-38-6	Propanal	0.05	1.7
123-72-8	Butanal	0.03	1.0
107-02-8	Acrolein	0.03	1.0

Appendix 6. **Results**

Appendix 6.1 ID 2 – Floor paint 2-component (Paint & lacquer)

Substance	CAS no.	5 hours (µg/m³)	3 days (µg/m³)	28 days (µg/m³)
Formaldehyde	50-00-0	10	24	4.9
Acetaldehyde	75-07-0	3.6	1.8	6.6
Propanal	123-38-6	15		
Acetone	000067-64-1	8		7
1-Butanol	000071-36-3	17	<5	
1-Methoxypropan-2-ol	000107-98-2	160		
Triethylamine	000121-44-8	44		
1,2-Ethanediol #	000107-21-1	2300	45	
Butanoic acid	000107-92-6			21
Hexanal	000066-25-1			<5
Oxiranes (Dodecyl and tetradecyl glycidyl ethers) #	068609-97-2	200	290	<5
Pentanoic acid	000109-52-4			20
2-Butoxy ethanol	000111-76-2	6300	7	
alpha-Pinene	007785-26-4		<5	
Hexanoic acid	000142-62-1			13
Benzaldehyde #	000100-52-7			<5
Di(propylene glycol) methyl ether, mixture of isomers (A)	034590-94-8	5600		
1-Hexanol, 2-ethyl- #	000104-76-7			<5
Benzyl alcohol	000100-51-6	220	29	
Heptanoic acid	000111-14-8			17
Acetophenone #	000098-86-2			<5
2-Ethylhexanoic acid	000149-57-5			6
Nonanal	000124-19-6	5	<5	
Decanal	000112-31-2	7	6	<5
5-Chloro-2-methyl-1,2-thiazol-3(2H)-one (CMIT)	**26172-55-4**	17	16	
Tetradecane	000629-59-4	41	<5	
Unknown alcohol? #			290	
Pentadecane	000629-62-9	<5		
Hexadecane	000544-76-3	12		
Oxirane, [(dodecyloxy)methyl]- #	002461-18-9			51
Naphtha C7-C13 #	64742-82-1/64742-48-9	420	6	<5
Sum of unidentified VVOC	Rt < C6	6		
Sum of unidentified VOC	Rt C6-C16	1400	38	46
Sum of unidentified SVOC	Rt >C16	12	37	15
Sum of all measured VVOC*	Rt < C6	14	<5	7

Substance	CAS no.	5 hours (µg/m^3)	3 days (µg/m^3)	28 days (µg/m^3)
Sum of all measured VOC*	Rt C6-C16	16743	727	123
Sum of all measured SVOC*	Rt >C16	12	37	66
TVOC (Toluene equivalents)		7000	640	28
TSVOC (Toluene equivalents)		200	300	59

Appendix 6.2 ID 4 Paint 1-component (Paint & lacquer)

Substance	CAS no.	5 hours (µg/m^3)	3 days (µg/m^3)	28 days (µg/m^3)
Formaldehyde	50-00-0		22	7.8
Acetaldehyde	75-07-0		230	18
Propanal	123-38-6		131	4.6
Butanal	123-72-8		103	7.2
Acrolein	107-02-8		39	
Ethanol	000064-17-5	50	31	
Acetone	000067-64-1	78	74	
2-Butanone	000078-93-3	1400	44	
Acetic acid	000064-19-7		230	38
1-Butanol	000071-36-3		34	
1-Methoxypropan-2-ol	000107-98-2	770		
Pentanal	000110-62-3		960	32
Propanoic acid	000079-09-4		200	37
1-Pentanol #	000071-41-0		290	
Butanoic acid	000107-92-6		97	31
Hexanal	000066-25-1			230
Cyclotrisiloxane, hexamethyl- #	000541-05-9	<25	47	8
2-Butanone, oxime	000096-29-7	≥220000		1
1-Hexanol #	000111-27-3		64	
Pentanoic acid	000109-52-4		560	100
Heptanal #	000111-71-7		180	17
Oxirane, pentyl- #	005063-65-0		170	
Benzaldehyde #	000100-52-7		44	9
Di(propylene glycol) methyl ether, mixture of isomers (A)	034590-94-8	3700	270	
Hexanoic acid	000142-62-1		3200	600
Octanal	000124-13-0		81	52
Acetophenone #	000098-86-2	<25		
Heptanoic acid	000111-14-8		68	160
Undecane	001120-21-4			<5
Nonanal	000124-19-6	<25		78
2-Ethylhexanoic acid	000149-57-5		3200	410
Decane #	000124-18-5			7
Octanoic acid #	000124-07-2			23

Substance	CAS no.	5 hours (µg/m³)	3 days (µg/m³)	28 days (µg/m³)
Decanal	000112-31-2	<25		18
Nonanoic acid #	000112-05-0			10
Tetradecane	000629-59-4	<25	38	
Pentadecane	000629-62-9	<25	11	
Hexadecane	000544-76-3	<25	<5	
Alkaner, iso-, < 2% aromater C7-C13	927-285-2	≥1100000	≥110000	
Sum of unidentified VVOC	Rt < C6	84	160	
Sum of unidentified VOC	Rt C6-C16	≥15000	≥9200	260
Sum of unidentified SVOC	Rt >C16			12
Sum of all measured VVOC*	Rt < C6	1612	260	
Sum of all measured VOC*	Rt C6-C16	≥1339470	≥128944	2121
Sum of all measured SVOC*	Rt >C16	<5	<5	12
TVOC (Toluene equivalents)		≥1200000	≥240000	1200
TSVOC (Toluene equivalents)		<5	<5	7

Appendix 6.3 ID 5 Floor lacquer 2-component (Paint & lacquer)

Substance	CAS no.	5 hours (µg/m³)	3 days (µg/m³)	28 days (µg/m³)
Formaldehyde	50-00-0		2.4	N
Acetaldehyde	75-07-0	11	2.6	N
Propanal	123-38-6			N
Butanal	123-72-8	1.4		N
Acetone	000067-64-1	40		7
2-Propanol	000067-63-0	360	<5	
2-Butanone	000078-93-3	<5		
1-Butanol	000071-36-3	250	<5	
1-Methoxypropan-2-ol	000107-98-2	130		
Heptane	000142-82-5		54	
1,4-Dioxane	000123-91-1	460		
1,2-Propandiol	000057-55-6	≥9400	570	22
Ethylbenzene	000100-41-4	7		
m,p-Xylene	179601-23-1	18		
Styrene	000100-42-5	2		
o-Xylene	000095-47-6	8		
Nonane	000111-84-2	81	<5	<5
2-Butoxy ethanol #	000111-76-2	≥23000	230	12
Hexanoic acid	000142-62-1			14
Phenol	000108-95-2		1	
Propylene Carbonate #	000108-32-7	4700	360	
Decane	000124-18-5	4200	42	<5
1-Hexanol, 2-ethyl- #	000104-76-7	1200		
Benzyl alcohol	000100-51-6	67	10	<5

Substance	CAS no.	5 hours (µg/m³)	3 days (µg/m³)	28 days (µg/m³)
Heptanoic acid	000111-14-8			18
Undecane	001120-21-4	12000	150	11
2-Ethylhexanoic acid	000149-57-5			7
Dodecane	000112-40-3	11000	120	9
5-Chloro-2-methyl-3(2H)-isothiazolone (CMIT)	026172-55-4			7
Tridecane	000629-50-5	4900	70	<5
Tetradecane	000629-59-4	48	<5	
Oxirane, [(dodecyloxy)methyl]- #	002461-18-9		86	<5
Sum of unidentified VVOC	Rt < C6	38		
Sum of unidentified VOC	Rt C6-C16	550	80	8
Sum of unidentified SVOC	Rt >C16			
Sum of all measured VVOC*	Rt < C6	438	<5	7
Sum of all measured VOC*	Rt C6-C16	≥72021	1687	108
Sum of all measured SVOC*	Rt >C16	<5	86	<5
TVOC (Toluene equivalents)		≥52000	1000	54
TSVOC (Toluene equivalents)		<5	86	<5

Appendix 6.4 ID 11 Paint 1-component (Paint & lacquer)

Substance	CAS no.	5 hours (µg/m³)	3 days (µg/m³)	28 days (µg/m³)
Formaldehyde	50-00-0		16	6.5
Acetaldehyde	75-07-0		111	20
Propanal	123-38-6	4.7	284	9.4
Butanal	123-72-8		39	4.4
Acrolein	107-02-8		22	
Ethanol	000064-17-5	<200	36	
Acetone	000067-64-1	150	31	5
2-Butanone	000078-93-3	350	23	
Acetic acid	000064-19-7		250	21
1-Butanol	000071-36-3	<100		<5
Pentanal	000110-62-3		490	19
Propanoic acid	000079-09-4		250	34
1-Pentanol #	000071-41-0		97	
2-Butanone, oxime	000096-29-7	≥58000		
Butanoic acid	000107-92-6		55	
Octane	000111-65-9		38	
Hexanal	000066-25-1		5300	250
Butylacetat	000123-86-4		19	
Cyclotrisiloxane, hexamethyl- #	000541-05-9			<5
Oxiraner	068609-97-2	<100	<5	<5
Butylacetat	000123-86-4	570		
Pentanoic acid	000109-52-4		370	39

Substance	CAS no.	5 hours (µg/m³)	3 days (µg/m³)	28 days (µg/m³)
Cyclohexanone	000108-94-1		24	
Benzaldehyde #	000100-52-7			<5
Phenol	000108-95-2		49	3
Hexanoic acid	000142-62-1		3400	
2-ethyltoluene	000611-14-3		<5	
beta-pinene	018172-67-3	180		
Hexanoic acid	000142-62-1			340
Di(propylene glycol) methyl ether, mixture of isomers (A)	034590-94-8	≥3900	76	
Decane	000124-18-5			<5
Octanal	000124-13-0		59	14
1-Hexanol, 2-ethyl- #	000104-76-7			<5
Heptanoic acid	000111-14-8		50	48
Undecane	001120-21-4			5
Nonanal	000124-19-6		48	29
2-Ethylhexanoic acid	000149-57-5		3500	200
Dodecane	000112-40-3			10
Decanal	000112-31-2			6
2-Ethylhexyl-acrylate	000103-11-7		11	
Cyclohexasiloxane, dodecamethyl- #	000540-97-6			<5
Tetradecane	000629-59-4	100	73	
Pentadecane	000629-62-9	<100	15	
Hexadecane	000544-76-3	<100	<5	
Naphtha C7-C13	064742/064742-48-9	≥2600000	4200	81
Sum of other aliphatic hydrocarbons VOC	Rt C6-C16		160	
Sum of unidentified VVOC	Rt < C6		100	5
Sum of unidentified VOC	Rt C6-C16	1900	2700	200
Sum of unidentified SVOC	Rt >C16		90	
Sum of all measured VVOC*	Rt < C6	500	190	10
Sum of all measured VOC*	Rt C6-C16	≥2664650	21234	1299
Sum of all measured SVOC*	Rt >C16	<5	90	<5
TVOC (Toluene equivalents)		≥2600000	12000	780
TSVOC (Toluene equivalents)		<5	76	<5

Appendix 6.5 ID 14 Filler (Fillers)

Substance	CAS no.	5 hours (µg/m³)	3 days (µg/m³)	28 days (µg/m³)
Formaldehyde	50-00-0	1.5	2.0	N
Acetaldehyde	75-07-0	35	18	N
Propanal	123-38-6	1.9	2.6	N
Butanal	123-72-8	1.2	1.5	N

Substance	CAS no.	5 hours (µg/m^3)	3 days (µg/m^3)	28 days (µg/m^3)
Acetone	000067-64-1	150	12	<5
1-Methoxypropan-2-ol	000107-98-2		180	
1-Butanol	000071-36-3	170	17	<5
1-Methoxypropan-2-ol	000107-98-2	3100		
Propanoic acid	000079-09-4			20
2-pentanone-4-methyl	000108-10-1	<100		
1,2-Propandiol	000057-55-6	2700	680	51
1-Pentanol #	000071-41-0			9
Butanoic acid	000107-92-6			22
Hexanal	000066-25-1		53	18
Oxiraner	068609-97-2	<100	<5	<5
1-Pentanol #	000071-41-0			<5
Pentanoic acid	000109-52-4			22
3-Heptanone #	000106-35-4			<5
Heptanal #	000111-71-7			<5
Benzaldehyde #	000100-52-7			7
Hexanoic acid	000142-62-1			33
Phenol	000108-95-2	160	15	3
Di(propylene glycol) methyl ether, mixture of isomers (A)	034590-94-8	510	56	<5
Octanal #	000124-13-0			<5
Heptanoic acid	000111-14-8			28
2-Ethylhexanoic acid	000149-57-5		110	18
Decanal	000112-31-2			<5
Cyclohexasiloxane, dodecamethyl- #	000540-97-6			<5
Tetradecane	000629-59-4	<100	<5	
1,1'-Biphenyl #	000092-52-4	<100	<5	
Pentadecane	000629-62-9		<5	
Hexadecane	000544-76-3	<100		
Naphtha C7-C13	64742-82-1/64742-48-9	≥340000	12000	220
Sum of unidentified VVOC	Rt < C6		7	
Sum of unidentified VOC	Rt C6-C16	30000	1700	7
Sum of unidentified SVOC	Rt >C16			
Sum of all measured VVOC*	Rt < C6	150	19	<5
Sum of all measured VOC*	Rt C6-C16	≥376640	14811	458
Sum of all measured SVOC*	Rt >C16	<5	<5	<5
TVOC (Toluene equivalents)		≥370000	13000	260
TSVOC (Toluene equivalents)		<5	<5	<5

Appendix 6.6 ID 20 Epoxy-based floor paint 2-component (Paint & lacquer)

Substance	CAS no.	5 hours (µg/m³)	3 days (µg/m³)	28 days (µg/m³)
Formaldehyde	50-00-0		1.1	N
Acetaldehyde	75-07-0	22	1.6	N
Propanal	123-38-6	84		N
Butanal	123-72-8	75		N
Ethanol	000064-17-5	230		
Acetone	000067-64-1	150	10	
2-Butanone #	000078-93-3	5		
1-Butanol	000071-36-3	130	<5	
1-Methoxypropan-2-ol	000107-98-2	≥7100		
Acetone oxime	000127-06-0	170		
1,4-Dioxane	000123-91-1	7		
2-pentanone-4-methyl	000108-10-1	7		
1,2-Propandiol	000057-55-6	75		
Toluene	000108-88-3	4		
Cyclohexanone	000108-94-1	<5		
2-Butoxy ethanol	000111-76-2	12		
Benzaldehyde #	000100-52-7			
Di(propylene glycol) methyl ether, mixture of isomers (A)	034590-94-8			
Benzyl alcohol	000100-51-6	610	18	
Nonanal	000124-19-6	<5		<5
Decanal	000112-31-2	6	<5	
Tetradecane	000629-59-4	110	<5	
Pentadecane	000629-62-9	<5		
Hexadecane	000544-76-3	16	<5	
Oxirane, [(dodecyloxy)methyl]-	002461-18-9	33	59	
Naphtha C7-C13 (3) #	64742-82-1/64742-48-9	1100	<5	<5
Sum of unidentified VVOC	Rt < C6	38		5
Sum of unidentified VOC	Rt C6-C16	720	45	
Sum of unidentified SVOC	Rt >C16	39	18	
Sum of all measured VVOC*	Rt < C6	423	10	5
Sum of all measured VOC*	Rt C6-C16	≥10100	122	<5
Sum of all measured SVOC*	Rt >C16	39	18	<5
TVOC (Toluene equivalents)		≥6200	34	<5
TSVOC (Toluene equivalents)		72	76	<5

Appendix 6.7 ID 26 Chemical wood (Filler)

Substance	CAS no.	5 hours (µg/m³)	3 days (µg/m³)	28 days (µg/m³)
Formaldehyde	50-00-0	4.2	1.1	N

Substance	CAS no.	5 hours (µg/m³)	3 days (µg/m³)	28 days (µg/m³)
Acetaldehyde	75-07-0	4.9	1.5	N
Acetone	000067-64-1		6	12
2-Propanol	000067-63-0		<5	
1-Methoxypropan-2-ol	000107-98-2	44		
Hexanal	000066-25-1			<5
Styrene	000100-42-5	380	6	
O-xylene	000095-47-6		<5	
Heptanal #	000111-71-7		<5	
2-Butoxy ethanol	000111-76-2	32	5	
alpha-Pinene	007785-26-4	5		
3-ethyltoluene	000620-14-4	<5		
Hexanoic acid	000142-62-1			22
Phenol	000108-95-2		5	
1,2,4-trimethyl-benzene	000095-63-6		<5	
Benzyl alcohol	000100-51-6	<5	<5	
Heptanoic acid	000111-14-8			28
Styrene oxide	000096-09-3	16		
2-Ethylhexanoic acid	000149-57-5			10
Nonanal	000124-19-6		11	<5
1-Ethyl-2-pyrrolidinone	002687-91-4	12	2	
Naphtha C7-C13 #	64742-82-1/64742-48-9	32		
Sum of unidentified VVOC	Rt < C6	9	9	
Sum of unidentified VOC	Rt C6-C16	130	25	
Sum of unidentified SVOC	Rt >C16			
Sum of all measured VVOC*	Rt < C6	9	15	12
Sum of all measured VOC*	Rt C6-C16	651	54	60
Sum of all measured SVOC*	Rt >C16	<5	<5	<5
TVOC (Toluene equivalents)		830	18	<5
TSVOC (Toluene equivalents)		<5	<5	<5

Appendix 6.8 ID 29 Floor lacquer (Paint & lacquer)

Substance	CAS no.	5 hours (µg/m³)	3 days (µg/m³)	28 days (µg/m³)
Formaldehyde	50-00-0			2.0
Acetaldehyde	75-07-0	16	2.2	1.6
Propanal	123-38-6	343	32	3.6
Butanal	123-72-8	7.6		
Acetone	000067-64-1	840		<5
1-Propanol	000071-23-8		<5	
Diethylamine	000109-97-7	2300		
2-Butanone	000078-93-3		<5	
1-Butanol	000071-36-3			<5

Substance	CAS no.	5 hours (µg/m^3)	3 days (µg/m^3)	28 days (µg/m^3)
Disiloxane, hexamethyl- #	000107-46-0	120		
Triethylamine	000121-44-8	≥19000	140	9
Heptane	000142-82-5			<5
2-pentanone-4-methyl	000108-10-1	<100		
Cyclotrisiloxane, hexamethyl- #	000541-05-9	230		<5
Naphtha C7-C13	064742/064742-48-9	370	780	
Oxiraner	068609-97-2	<100	430	
Trisiloxane, octamethyl- #	000107-51-7	810		
Cyclohexanone	000108-94-1		21	
2-Butoxy ethanol	000111-76-2	140		
Propylene glycol butyl ether	005131-66-8	300		
Benzaldehyde #	000100-52-7	<100		<5
Cyclotetrasiloxane, octamethyl- #	000556-67-2	130		
Phenol	000108-95-2		12	2
Di(propylene glycol) methyl ether, mixture of isomers (A)	034590-94-8	≥190000	100	<5
1-Propanol, 2-(2-methoxy-1-methylethoxy)- #	055956-21-3	1700		
1-Propanol, 2-(2-methoxypropoxy)- #	013588-28-8	2800		
Tetrasiloxane, decamethyl- #	000141-62-8	1200		
Acetophenone #	000098-86-2			<5
Nonanal	000124-19-6	<100	6	<5
1-Ethyl-2-pyrrolidinone	002687-91-4			1
Cyclopentasiloxane, decamethyl- #	000541-02-6	150	<5	
Decanal	000112-31-2	110	<5	<5
Unknown ether (002396-61-4?) #		16000	2200	9
Unknown ether (002396-61-4?) #		18000	2400	15
Cyclohexasiloxane, dodecamethyl- #	000540-97-6	<100	<5	
Tetradecane	000629-59-4	<100		
Pentadecane	000629-62-9	<100		
Butylated Hydroxytoluene #	000128-37-0	<100		
Hexadecane	000544-76-3	<100		
Sum of unidentified VOC	Rt C6-C16	1800	560	59
Sum of unidentified SVOC	Rt >C16	110	5	5
Sum of all measured VVOC*	Rt < C6	3140	<5	<5
Sum of all measured VOC*	Rt C6-C16	≥252860	6649	95
Sum of all measured SVOC*	Rt >C16	110	5	5
TVOC (Toluene equivalents)		≥150000	5700	74
TSVOC (Toluene equivalents)		110	5	5

Appendix 6.9 ID 30 Epoxy-based floor paint 2-component (Paint & lacquer)

Substance	CAS no.	5 hours (µg/m³)	3 days (µg/m³)	28 days (µg/m³)
Formaldehyde	50-00-0		1.0	N
Acetaldehyde	75-07-0	13	1.4	N
Propanal	123-38-6	5.3		N
Butanal	123-72-8	3.6		N
Ethanol	000064-17-5	230		
Acetone	000067-64-1	300	6	8
2-Propanol	000067-63-0	<100		
2-Butanone	000078-93-3	200		
Hexane	000110-54-3	210		
Acetic acid	000064-19-7	4100		
Benzene (Carc.)	000071-43-2	180		
1-Butanol	000071-36-3	170	<5	
1-Methoxypropan-2-ol	000107-98-2	≥42000	49	8
Heptane	000142-82-5	810		
Propanoic acid	000079-09-4	900		
1,4-Dioxane	000123-91-1	320		
2-pentanone-4-methyl	000108-10-1	<100		
1,2-Propandiol	000057-55-6	4300		
Toluene	000108-88-3	130		
2-Butanone, oxime	000096-29-7	≥9700		
Butylacetat	000123-86-4	280		
Ethylbenzene	000100-41-4	230		
m,p-Xylene	179601-23-1	520		
Styrene	000100-42-5	<100		
O-xylene	000095-47-6	290		
Nonane	000111-84-2	<100		<5
2-Butoxy ethanol	000111-76-2	220	<5	
alpha-Pinene	007785-26-4	<100	<5	
3-ethyltoluene	000620-14-4	<100		
Benzene, 1,3,5-trimethyl-	000108-67-8	<100		
Phenol	000108-95-2	110		4
Di(propylene glycol) methyl ether, mixture of isomers (A)	034590-94-8	≥13000		
1,2,4-Trimethyl-benzene	000095-63-6	<100	<5	
Benzene, 1,2,3-trimethyl-	000526-73-8	<100		
Limonene	005989-27-5		<5	
Benzyl alcohol	000100-51-6	≥14000	200	29
Undecane #	001120-21-4	<100		
Nonanal	000124-19-6		8	<5
2-Ethylhexanoic acid	000149-57-5	100		
Butyldiglycol	000112-34-5	430	17	
Dodecane	000112-40-3	<100		

Substance	CAS no.	5 hours (µg/m³)	3 days (µg/m³)	28 days (µg/m³)
Decanal	000112-31-2	<100		<5
Dibutyl phthalate #	000084-74-2	200		
Sum of unidentified VVOC	Rt < C6		7	
Sum of unidentified VOC	Rt C6-C16	850	94	2
Sum of unidentified SVOC	Rt >C16			
Sum of all measured VVOC*	Rt < C6	730	13	8
Sum of all measured VOC*	Rt C6-C16	≥92850	368	43
Sum of all measured SVOC*	Rt >C16	200	<5	<5
TVOC (Toluene equivalents)		≥41000	140	18
TSVOC (Toluene equivalents)		200	<5	<5

Appendix 6.10 ID 32 Floor paint 1-component (Paint & lacquer)

Substance	CAS no.	5 hours (µg/m³)	3 days (µg/m³)	28 days (µg/m³)
Formaldehyde	50-00-0	2.6	7.1	2.9
Acetaldehyde	75-07-0	2.0	30	5.4
Propanal	123-38-6	7.4	31	2.8
Butanal	123-72-8		12	3.7
Ethanol	000064-17-5	<200	28	
Acetone	000067-64-1	140	10	<5
2-Butanone	000078-93-3	530	23	
Acetic acid	000064-19-7		36	
1-Butanol	000071-36-3	420	<5	<5
1-Methoxypropan-2-ol	000107-98-2	650		
Pentanal	000110-62-3		59	7
Propanoic acid	000079-09-4		77	
2-pentanone-4-methyl	000108-10-1	<100		
1-Pentanol	000071-41-0		16	
Butanoic acid	000107-92-6		31	22
2-Butanone, oxime	000096-29-7	≥60000		
Octane	000111-65-9			8
Hexanal	000066-25-1		600	44
Cyclotrisiloxane, hexamethyl- #	000541-05-9	170	5	<5
Butylacetat	000123-86-4	210		
Pentanoic acid	000109-52-4		120	40
2-Heptanone #	000110-43-0			<5
Cyclohexanone	000108-94-1			<5
Heptanal #	000111-71-7			<5
Benzaldehyde #	000100-52-7		20	<5
Phenol	000108-95-2		16	3
Hexanoic acid	000142-62-1		790	240

Substance	CAS no.	5 hours (µg/m³)	3 days (µg/m³)	28 days (µg/m³)
Di(propylene glycol) methyl ether, mixture of isomers (A)	034590-94-8		16	
Octanal	000124-13-0		32	8
Heptanoic acid	000111-14-8		46	49
Acetophenone #	000098-86-2			<5
Nonanal	000124-19-6		32	11
2-Ethylhexanoic acid	000149-57-5		600	50
Hexanoic acid, 3,5,5-trimethyl- #	003302-10-1		270	
Octanoic acid #	000124-07-2			18
Decanal	000112-31-2			<5
Tridecane #	000629-50-5			<5
Nonanoic acid #	000112-05-0			6
Tetradecane	000629-59-4	100	8	<5
Pentadecane	000629-62-9	<100	<5	<5
Hexadecane	000544-76-3	<100	<5	
Naphtha C7-C13	064742/064742-48-9	≥1600000	1900	84
Sum of unidentified VVOC	Rt < C6		63	7
Sum of unidentified VOC	Rt C6-C16		150	96
Sum of unidentified SVOC	Rt >C16		43	
Sum of all measured VVOC*	Rt < C6	780	124	7
Sum of all measured VOC*	Rt C6-C16	≥1661550	4824	686
Sum of all measured SVOC*	Rt >C16	<5	43	<5
TVOC (Toluene equivalents)		≥1600000	3100	400
TSVOC (Toluene equivalents)		<5	57	<5

Appendix 6.11 ID 36 Filler (Filler)

Substance	CAS no.	5 hours (µg/m³)	3 days (µg/m³)	28 days (µg/m³)
Formaldehyde	50-00-0	1.7	1.2	N
Acetaldehyde	75-07-0	1.6	1.2	N
Acetone	000067-64-1	13	<5	<5
2-Propanol	000067-63-0	<5		
1-Butanol	000071-36-3	<5		
1-Methoxypropan-2-ol	000107-98-2	43		
Ethylbenzene	000100-41-4	<5	<5	
Styrene	000100-42-5	4	4	
Nonane	000111-84-2	5	<5	<5
2-Butoxy ethanol	000111-76-2	8		
3-ethyltoluene	000620-14-4	<5		
Benzene, 1,3,5-trimethyl-	000108-67-8	<5		
2-ethyltoluene	000611-14-3	<5		
1,2,4-trimethyl-benzene	000095-63-6	<5		

Substance	CAS no.	5 hours (µg/m^3)	3 days (µg/m^3)	28 days (µg/m^3)
Benzene, 1,2,3-trimethyl-	000526-73-8	<5		
Benzyl alcohol	000100-51-6	<5		
Undecane	001120-21-4	<5		<5
Nonanal	000124-19-6	8	<5	<5
Sum of unidentified VVOC	Rt < C6		9	
Sum of unidentified VOC	Rt C6-C16		1	6
Sum of unidentified SVOC	Rt >C16			
Sum of all measured VVOC*	Rt < C6	13	9	<5
Sum of all measured VOC*	Rt C6-C16	68	5	6
Sum of all measured SVOC*	Rt >C16	<5	<5	<5
TVOC (Toluene equivalents)		16	<5	6
TSVOC (Toluene equivalents)		14	<5	<5

Appendix 6.12 ID 56 Waterproofing coating (Primer/membrane)

Substance	CAS no.	5 hours (µg/m^3)	3 days (µg/m^3)	28 days (µg/m^3)
Formaldehyde	50-00-0	70	5.7	N
Acetaldehyde	75-07-0	10	1.6	N
Propanal	123-38-6	-	-	N
Butanal	123-72-8	2.0	-	N
Acetone	000067-64-1		<5	
2-Propanol	000067-63-0	860		
2-Methyl-1-propanol (isobutyl alcohol)	000078-83-1	100		
1,2-Propandiol #	000057-55-6		10	
alpha-Pinene	007785-26-4	<5		
Benzaldehyde #	000100-52-7	100	<5	<5
Cyclotetrasiloxane, octamethyl- #	000556-67-2		<5	
Phenol	000108-95-2	110	11	2
Ethanone, 1-phenyl- #	000098-86-2			<5
Nonanal	000124-19-6	<5		
Cyclopentasiloxane, decamethyl- #	000541-02-6			<5
Decanal	000112-31-2		<5	<5
Cyclohexasiloxane, dodecamethyl- #	000540-97-6	<5		
Sum of unidentified VVOC	Rt < C6	7		
Sum of unidentified VOC	Rt C6-C16	390	52	
Sum of unidentified SVOC	Rt >C16			
Sum of all measured VVOC*	Rt < C6	867	<5	<5
Sum of all measured VOC*	Rt C6-C16	700	73	2
Sum of all measured SVOC*	Rt >C16	<5	<5	<5
TVOC (Toluene equivalents)		1500	230	24
TSVOC (Toluene equivalents)		<5	<5	<5

Appendix 6.13 ID 60 Adhesive for wet room (bathroom)

Substance	CAS no.	5 hours (µg/m³)	3 days (µg/m³)	28 days (µg/m³)
Formaldehyde	50-00-0	120	1.4	N
Acetaldehyde	75-07-0	11	1.3	N
Propanal	123-38-6	3.9		N
Butanal	123-72-8	2.3		N
Acetone	000067-64-1	48		
2-Methyl-1-propanol (isobutyl alcohol)	000078-83-1	<5		
Acetic acid	000064-19-7		1000	31
1-Butanol	000071-36-3	650	<5	<5
Heptane	000142-82-5		12	<5
Propanoic acid	000079-09-4		22	
1,2-Propandiol #	000057-55-6		44	
Butanoic acid	000107-92-6		15	13
Butylacetat	000123-86-4	170		
Benzaldehyde #	000100-52-7	130		<5
Cyclotetrasiloxane, octamethyl- #	000556-67-2	<5		<5
Phenol	000108-95-2	100	5	3
Di(propylene glycol) methyl ether, mixture of isomers (A)	034590-94-8		<5	
Benzyl alcohol	000100-51-6		<5	
Acetophenone #	000098-86-2			<5
Nonanal	000124-19-6	10	<5	<5
Cyclopentasiloxane, decamethyl- #	000541-02-6	<5		
2-Methyl-1,2-thiazol-3(2H)-one (MIT)	2682-20-4		9	<5
Decanal	000112-31-2	7	<5	
5-Chloro-2-methyl-3(2H)-isothiazolone (CMIT)	026172-55-4	18	21	1
Sum of unidentified VVOC	Rt < C6	260		
Sum of unidentified VOC	Rt C6-C16	610		
Sum of unidentified SVOC	Rt >C16			
Sum of all measured VVOC*	Rt < C6	48	<5	<5
Sum of all measured VOC*	Rt C6-C16	1085	1128	47
Sum of all measured SVOC*	Rt >C16	<5	<5	<5
TVOC (Toluene equivalents)		1400	78	<5
TSVOC (Toluene equivalents)		<5	<5	<5

Appendix 6.14 ID 65 Wall adhesive

Substance	CAS no.	5 hours (µg/m³)	3 days (µg/m³)	28 days (µg/m³)
Formaldehyde	50-00-0	15	5.0	N
Acetaldehyde	75-07-0	107	1.5	N

Substance	CAS no.	5 hours (µg/m^3)	3 days (µg/m^3)	28 days (µg/m^3)
Propanal	123-38-6	-	-	N
Butanal	123-72-8	1.4	-	N
Acetone	000067-64-1		<5	<5
2-Propanol	000067-63-0	<5		
Hexane	000110-54-3		6	
Acetic acid	000064-19-7		64	43
1-Butanol	000071-36-3	32	<5	<5
Propanoic acid	000079-09-4			20
Heptane	000142-82-5		10	
1,2-Propandiol #	000057-55-6		82	
Butanoic acid	000107-92-6			13
Cyclotrisiloxane, hexamethyl- #	000541-05-9		<5	
Styrene	000100-42-5			1
Cyclohexanone	000108-94-1			
Benzaldehyde #	000100-52-7	8	<5	<5
Cyclotetrasiloxane, octamethyl- #	000556-67-2			1
Phenol	000108-95-2	10	8	2
Acetophenone #	000098-86-2	10		<5
Nonanal	000124-19-6	8	5	<5
2-Methyl-isothiazolin-3-one	002682-20-4		<5	14
Decanal	000112-31-2	8		<5
5-Chloro-2-methyl-1,2-thiazol-3(2H)-one (CMIT)	26172-55-4		13	
Sum of unidentified VVOC	Rt < C6	10		
Sum of unidentified VOC	Rt C6-C16	87	7	12
Sum of unidentified SVOC	Rt >C16			
Sum of all measured VVOC*	Rt < C6	10	<5	<5
Sum of all measured VOC*	Rt C6-C16	163	195	106
Sum of all measured SVOC*	Rt >C16	<5	<5	<5
TVOC (Toluene equivalents)		600	7	12
TSVOC (Toluene equivalents)		<5	<5	<5

Appendix 6.15 ID 71 Wood repair (Filler)

Substance	CAS no.	5 hours (µg/m^3)	3 days (µg/m^3)	28 days (µg/m^3)
Formaldehyde	50-00-0	7.2	2.1	N
Acetaldehyde	75-07-0	2.9	1.8	N
Propanal	123-38-6	3.2		N
Butanal	123-72-8	4.1		N
Acetone	000067-64-1	<100		<5
2-Propanol	000067-63-0	<100		
1-Butanol	000071-36-3	150		<5
Heptane	000142-82-5		11	

Substance	CAS no.	5 hours (µg/m³)	3 days (µg/m³)	28 days (µg/m³)
Hexanal	000066-25-1			<5
Cyclotrisiloxane, hexamethyl- #	000541-05-9	<100	16	
Butylacetat	000123-86-4	<5		
Propylene glycol butyl ether	005131-66-8	<5		
Hexanoic acid	000142-62-1			23
Benzaldehyde #	000100-52-7	<100	<5	<5
Cyclotetrasiloxane, octamethyl- #	000556-67-2	<100	1	
Phenol	000108-95-2	110	12	3
Acetophenone #	000098-86-2	<100		<5
2-Ethylhexanoic acid	000149-57-5			10
Cyclopentasiloxane, decamethyl- #	000541-02-6	<100		
Decanal	000112-31-2	<100		<5
Unknown ether #	(055956-25-7 el 029911-28-2)	1400	210	67
Unknown ether #	(055956-25-7 el 029911-28-2)	1700	270	89
Cyclohexasiloxane, dodecamethyl- #	000540-97-6	<100		
Pentadecane	000629-62-9	<100		
Hexadecane	000544-76-3	<100		
Naphtha C7-C13	64742-82-1/64742-48-9	670	19	
Sum of unidentified VVOC	Rt < C6			
Sum of unidentified VOC	Rt C6-C16		13	
Sum of unidentified SVOC	Rt >C16			
Sum of all measured VVOC*	Rt < C6	<5	<5	<5
Sum of all measured VOC*	Rt C6-C16	4030	552	192
Sum of all measured SVOC*	Rt >C16	<5	<5	<5
TVOC (Toluene equivalents)		3700	520	160
TSVOC (Toluene equivalents)		<5	<5	<5

Appendix 6.16 ID 72 Oil (Floor wax, polish and care products)

Substance	CAS no.	5 hours (µg/m³)	3 days (µg/m³)	28 days (µg/m³)
Formaldehyde	50-00-0	2.8	6.6	N
Acetaldehyde	75-07-0	15	6.9	N
Propanal	123-38-6	71	6.2	N
Butanal	123-72-8	13	4.2	N
Acetone	000067-64-1	110	<5	<5
2-Propanol	000067-63-0	<25		
1-Butanol	000071-36-3		<5	<5
Butanoic acid	000107-92-6			21
Hexanal	000066-25-1	340	120	7
Pentanoic acid	000109-52-4		19	21

Substance	CAS no.	5 hours (µg/m³)	3 days (µg/m³)	28 days (µg/m³)
Cyclohexanone	000108-94-1	680		<5
Benzaldehyde #	000100-52-7	58	<5	6
Hexanoic acid	000142-62-1			25
Cyclotetrasiloxane, octamethyl- #	000556-67-2	94		
Hexanoic acid	000142-62-1		360	
Phenol	000108-95-2	53	11	3
Di(propylene glycol) methyl ether, mixture of isomers (A)	034590-94-8	290	9	
Ethanol, 2-(2-ethoxyethoxy)- #	000111-90-0	3700		
Octanal	000124-13-0		7	
Heptanoic acid	000111-14-8		12	
Acetophenone #	000098-86-2			<5
Nonanal	000124-19-6	<25		<5
2-Ethylhexanoic acid	000149-57-5		55	10
Decanal	000112-31-2	320		
Tetradecane	000629-59-4	2200		<5
Pentadecane #	000629-62-9	<25	8	
Hexadecane	000544-76-3	<25		
Naphtha C7-C13	64742-82-1/64742-48-9	≥210000	310	
Sum of other aliphatic hydrocarbons VOC	Rt C6-C16	4800	490	
Sum of unidentified VVOC	Rt < C6	39		
Sum of unidentified VOC	Rt C6-C16	3900	82	
Sum of unidentified SVOC	Rt >C16			
Sum of all measured VVOC*	Rt < C6	149	<5	21
Sum of all measured VOC*	Rt C6-C16	≥226435	1483	72
Sum of all measured SVOC*	Rt >C16	<5	<5	<5
TVOC (Toluene equivalents)		≥220000	1000	6
TSVOC (Toluene equivalents)		<5	<5	<5

Appendix 6.17 ID 80 Oil for polish & care of wood and stone floors

Substance	CAS no.	5 hours (µg/m³)	3 days (µg/m³)	28 days (µg/m³)
Formaldehyde	50-00-0		1.8	N
Acetaldehyde	75-07-0	4.8	1.3	N
Propanal	123-38-6		1.3	N
Acetone	000067-64-1	8	<5	<5
2-Propanol	000067-63-0	<5	<5	
1-Butanol	000071-36-3	17		<5
1,4-Dioxane	000123-91-1	70		
2-pentanone-4-methyl	000108-10-1		<5	
1,2-Ethanediol #	000107-21-1	19		
2-Butoxy ethanol	000111-76-2	1900	<5	

Substance	CAS no.	5 hours (µg/m³)	3 days (µg/m³)	28 days (µg/m³)
alpha-Pinene	007785-26-4	<5	<5	
Benzaldehyde #	000100-52-7		<5	<5
Phenol	000108-95-2		<5	4
1,2,4-trimethyl-benzene	000095-63-6		<5	
Ethanol, 2-(2-ethoxyethoxy)- #	000111-90-0	≥18000	97	
Limonene	005989-27-5	<5		
Nonanal	000124-19-6	9	7	
2-Methyl-isothiazolin-3-one	002682-20-4	16		
Butyldiglycol	000112-34-5	310	9	
Decanal	000112-31-2	9	8	
Pentadecane	000629-62-9		<5	
Naphtha C7-C13 #	64742-82-1/64742-48-9	330	23	<5
Sum of unidentified VVOC	Rt < C6			
Sum of unidentified VOC	Rt C6-C16	340		
Sum of unidentified SVOC	Rt >C16			
Sum of all measured VVOC*	Rt < C6	8		
Sum of all measured VOC*	Rt C6-C16	≥21020	144	4
Sum of all measured SVOC*	Rt >C16			
TVOC (Toluene equivalents)		≥20000	110	
TSVOC (Toluene equivalents)		<5	<5	<5

Appendix 6.18 ID 83 Oil for polish & care of wood and stone floors

Substance	CAS no.	5 hours (µg/m³)	3 days (µg/m³)	28 days (µg/m³)
Formaldehyde	50-00-0		1.9	N
Acetaldehyde	75-07-0	2.5	1.4	N
Propanal	123-38-6	4.7		N
Acetone	000067-64-1	21	7	<5
2-Propanol	000067-63-0	<5		
1-Butanol	000071-36-3	23	<5	<5
1,4-Dioxane	000123-91-1	68		
Ethanol, 2-ethoxy- #	000110-80-5	27		
2-pentanone-4-methyl	000108-10-1	<5	<5	
Propanoic acid, 2-methyl-	000079-31-2	1800		
Hexanal	000066-25-1	<5		
2-Butoxy ethanol	000111-76-2	460		
alpha-Pinene	007785-26-4	<5		
Ethanol, 2-(2-ethoxyethoxy)- #	000111-90-0	≥17000	300	
Limonene	005989-27-5	<5		
Benzyl alcohol	000100-51-6	830	6	
Nonanal	000124-19-6	7		
1,3-Pentanediol, 2,2,4-trimethyl- #	000144-19-4		110	
2-Methyl-isothiazolin-3-one	002682-20-4		10	

Substance	CAS no.	5 hours (µg/m³)	3 days (µg/m³)	28 days (µg/m³)
Butyldiglycol	000112-34-5	35		
Decanal	000112-31-2	9		
Texanol A+B #	025265-77-4	5300	910	39
Tetradecane	000629-59-4	<5		
Pentadecane	000629-62-9	24	<5	
Tributyl phosphate #	000126-73-8	60		
Pentan-1,3-dioldiisobutyrate, 2,2,4-trimethyl- #	006846-50-0		5	
Unknown (TXIB?) / Butandioldiglycidylether #	002425-79-8	45		
Naphtha C7-C13 #	64742-82-1/64742-48-9	450	93	<5
Sum of unidentified VVOC	Rt < C6			
Sum of unidentified VOC	Rt C6-C16	620	48	
Sum of unidentified SVOC	Rt >C16			
Sum of all measured VVOC*	Rt < C6	21	7	<5
Sum of all measured VOC*	Rt C6-C16	≥26758	1482	39
Sum of all measured SVOC*	Rt >C16	<5	<5	<5
TVOC (Toluene equivalents)		≥26000	1300	39
TSVOC (Toluene equivalents)		<5	<5	<5

Appendix 6.19 ID 85 Linseed oil for polish of wood floors

Substance	CAS no.	5 hours (µg/m³)	3 days (µg/m³)	28 days (µg/m³)
Formaldehyde	50-00-0		1.9	12
Acetaldehyde	75-07-0		1.6	30
Propanal	123-38-6	5.9	2.0	257
Butanal	123-72-8			2.8
Acetone	000067-64-1	12		
2-Propanol	000067-63-0		<5	
Acetic acid	000064-19-7			120
1-Butanol	000071-36-3	7		
Acetone oxime	000127-06-0			<5
Pentanal	000110-62-3			44
Propanoic acid	000079-09-4			420
2-pentanone-4-methyl	000108-10-1	<5		
2-Butanone, oxime	000096-29-7	92		
Butanoic acid	000107-92-6			16
Hexanal	000066-25-1	<5		670
Pentanoic acid	000109-52-4			19
Heptanal #	000111-71-7			<5
alpha-Pinene	007785-26-4	<5		
beta-pinene	018172-67-3	<5		
Hexanoic acid #	000142-62-1			260
Octanal	000124-13-0			17

Substance	CAS no.	5 hours (µg/m³)	3 days (µg/m³)	28 days (µg/m³)
Limonene	005989-27-5	5		
Heptanoic acid	000111-14-8			12
Undecane	001120-21-4			<5
Nonanal	000124-19-6		<5	23
Decanal	000112-31-2			<5
Tetradecane	000629-59-4	<5		
Naphtha C7-C13 (3) #	64742-82-1/64742-48-9	4500	48	<5
Sum of unidentified VVOC	Rt < C6	13		40
Sum of unidentified VOC	Rt C6-C16	590	34	370
Sum of unidentified SVOC	Rt >C16			
Sum of all measured VVOC*	Rt < C6	25	<5	40
Sum of all measured VOC*	Rt C6-C16	5194	82	1971
Sum of all measured SVOC*	Rt >C16	<5	<5	<5
TVOC (Toluene equivalents)		5100	67	810
TSVOC (Toluene equivalents)		<5	<5	<5

Appendix 6.20 ID 88 Sealant (repair of concrete)

Substance	CAS no.	5 hours (µg/m³)	3 days (µg/m³)	28 days (µg/m³)
Formaldehyde	50-00-0	9.2	1.7	N
Acetaldehyde	75-07-0	28	2.4	N
Propanal	123-38-6	2.3		N
Acetone	000067-64-1	120	6	15
2-Propanol	000067-63-0		<5	
1-Methoxypropan-2-ol	000107-98-2	39		
1,2-Ethanediol #	000107-21-1	64		
1,2-Propandiol	000057-55-6	94		
Toluene	000108-88-3	<5	<5	
Octane	000111-65-9		<5	<5
Ethylbenzene	000100-41-4	<5		
Styrene	000100-42-5	7	2	
O-xylene	000095-47-6		<5	
Nonane	000111-84-2		5	<5
2-Butoxy ethanol	000111-76-2	10		
1,2,4-trimethyl-benzene	000095-63-6	<100		
Decane	000124-18-5	<5	<5	
Octanal	000124-13-0			<5
Unknown (2-Hydroxyethyl methacrylate?) #	000868-77-9	100	<5	
Unknown (2-Hydroxyethyl methacrylate?) #	000868-77-9	4200	41	
Unknown (acrylate?) #		2100	21	
Undecane	001120-21-4	<5		
Nonanal	000124-19-6		8	<5

Substance	CAS no.	5 hours (µg/m^3)	3 days (µg/m^3)	28 days (µg/m^3)
2-Propenoic acid, 2-methyl-, 1,2-ethanediyl ester #	000097-90-5	5800	360	<5
Dimethyl phthalate #	000131-11-3		60	<5
Pentan-1,3-dioldiisobutyrate, 2,2,4-trimethyl- #	006846-50-0	130	98	<5
Diethyleneglycol dimethacrylate #	002358-84-1			<5
Hexadecane	000544-76-3	<100		
Sum of unidentified VVOC	Rt < C6	11	10	
Sum of unidentified VOC	Rt C6-C16	1300	29	6
Sum of unidentified SVOC	Rt >C16			
Sum of all measured VVOC*	Rt < C6	131	16	15
Sum of all measured VOC*	Rt C6-C16	13844	624	6
Sum of all measured SVOC*	Rt >C16	<5	<5	<5
TVOC (Toluene equivalents)		13000	550	6
TSVOC (Toluene equivalents)		<5	100	<5

General explanation to the tables of results:

* Sum of all calibrated substances plus toluene equivalents of identified and unidentified substances
# Substance quantified using toluene calibration curve
N: Measurement not carried out
≥X: Substance measured at concentration above the calibrated range, larger or equal to X µg/m^3
<X: Substance identified and measured at concentration below the calibrated linear range, larger or equal to X µg/m^3 at collected volume of air

Whenever a substance has not been detected, there is no entry (number or symbol) and the cell is left blank at a given measuring point.

Appendix 7. Calculation of DNEL values

Appendix 7.1 Benzene

Hitherto as well as in the pre-project benzene has been regarded as a carcinogenic substance with no lower limit for the carcinogenic effect. Therefore, a very low threshold value of 0.00017 mg/m^3 has been defined as a tolerable exposure level. In 2018 the Committee for Risk Assessment at the European Chemicals Agency reassessed benzene and ascertained that sufficient data is available to define a threshold value for the detrimental effect on DNA and thus on the carcinogenic effect of benzene (ECHA 2018).

Based on this data the committee adopted an 8-hour threshold value of 0.16 mg/m^3 in the working environment. Converting this value from worker exposure to exposure to the general population requires a conversion factor of 2 due to higher susceptibility of the more diverse general population. Furthermore, the value must be converted from 8 hours per week for a worker to 24 hours per day 7 days per week for DIY consumers. This gives the following DNEL value for the general population:

$$DNEL_{inhalation\ general\ population} = \frac{DNEL_{inh\ worker}}{2} \times \frac{8\ hours}{24\ hours} \times \frac{5\ days}{7\ days}$$

$$DNEL_{inhalation\ general\ population} = \frac{0{,}16\ mg/m^3}{2} \times \frac{8\ hours}{24\ hours} \times \frac{5\ days}{7\ days} = 0.019\ mg/m^3$$

ECHA (2018). Opinion on scientific evaluation of occupational exposure limits for Benzene. Committee for Risk Assessment, RAC. ECHA/RAC/ O-000000-1412-86-187/F. Adopted 9 March 2018.

Appendix 7.2 Dibutylphthalate

The Committee for Risk Assessment of the European Chemicals Agency assessed dibutyl phthalate together with a number of other phthalates and concluded a DNEL value of 0.0067 mg/kg/d for dibutylphtalate calculated as an internal dose after absorption into the body (ECHA 2017). Further, an absorption of 100% by inhalation was assumed. If an adult (70 kg) inhales 20 m^3 per day, the following DNEL value in air can be calculated:

$$DNEL_{inh} = \frac{DNEL_{inh} \times 70\ kg}{20\ m^3/day} = \frac{0.0067\ \frac{mg}{kg}/day \times 70\ kg}{20\ m^3/day} = 0.023\ mg/m^3$$

ECHA (2017). Opinion on an Annex XV dossier proposing restrictions on FOUR PHTHALATES (DEHP, BBP, DBP, DIBP). Committee for Risk Assessment (RAC), Committee for Socio-economic Analysis (SEAC). RES-O-0000001412-86-140/F. Adopted 10 March 2017

Appendix 7.3 Propylene glycol butyl ether

No LCI value has been found for this substance. Data from the REACH registration of the substance indicate that signs of eye irritation may occur in rats at concentration levels of 300 and 600 ppm (1620 and 3240 mg/m^3) when the animals were exposed for 6 hours/day for 9 days. In other studies, opague cornea was observed in one animal at 700 ppm (Data from REACH registration of the substance).

Data is not sufficient to determine a NOAEL value (No Observed Effect Level), which is needed to establish a DNEL value. Instead these somewhat limited data may be used to estimate a LOAEL (Lowest Observed Adverse Effect Level) value of 1620 mg/m^3.

$$DNEL = LOAEL / (AF\ I \times AF\ II \times AF\ III \times AF\ IV) = 0.9\ mg/m^3$$

$$DNEL = 1620\ mg/m^3 \times 6hours/24hours / (2.5 \times 10 \times 3 \times 6) = 0.9\ mg/m^3$$

AF I: In the extrapolation from rat to human a factor of 2.5 is used for local eye irritation.

AF II: A factor of 10 is used to take varying susceptibility among individuals in the human population into account

AF III: A factor of 3 is used to extrapolate from LOAEL to a no-effect-level

AF IV: A factor of 6 is used due to the short duration of the study (9 days)

Appendix 7.4 2-propanol

An acceptable exposure level of 31.25 ppm (77 mg/m^3) for an exposure period of 8 hours was determined in connection with approval of this substance as an active biocide (ECHA 2015). This level was based on effect on the central nervous system, which is considered to be the critical effect of this compound. The calculated value is further supposed to protect against eye and respiratory tract irritation. Based on this, a DNEL value of 26 mg/m^3 is calculated, since a factor 8/24 is used to estimate the tolerable level for continuous exposure for 24 hours:

$$DNEL = 77\ mg/m^3 \times 8hours/24hours = 26\ mg/m^3$$

ECHA (2015). Propan-2-ol. Evaluation of active substances under Regulation (EU) No 528/2012 concerning the making available on the market and use of biocidal products- Assessment Report Product-type 1 (Human hygiene biocidal products)

Survey and risk assessment of chemical sub-stances in chemical products used for "do-I yourself" projects in the home – follow-up project
The project contains three parts: 1) Mapping of products and establishment of exposure scenarios, 2) Analysis of volatile chemical substances 3) Risk assessment.

20 products have been chosen based on the mapping and these have been sampled by The Chemical Inspection Service. The analysis of volatile chemical substances in these products has been conducted by emissions testing in climate chambers after 5 hours, 3 days, and 28 days, respectively after application. The analysed products have been chosen based on their chemical content as well as their hazard classification, with the aim that all the aforementioned product categories are represented.

After 28 days emissions have generally dropped to much lower levels for all products, however for some substances tolerable exposure levels are still exceeded. This applies, for example, to the substance 2-ethylhenxanoic acid from 1-component paints and lacquers, which is considered critical, as the substance is potentially harmful to unborn children. Furthermore, an unacceptably high emission of the mucosal irritant preservative CMIT was found for a 2-component paint after 28 days, which was not measured after neither 5 hours nor 3 days.

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