camfil FARR Clean air solutions

Analysis Report

of Volatile Organic Compounds & Aldehydes in the indoor air of your Outi Kalliota / Classroom

Kit N° CF-00296

Samples taken from 19/09/14 to 26/09/14

Report Version 1

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PART 1 : Your Results

We have checked in your samples for a series of which might be present in the indoor air of your Outi Kalliota / Classroom. These pollutants are classified as priority according to the French Indoor Air Quality Observatory (OQAI).

Full information on the toxicity and the possible sources of pollutants detected in the indoor air of your Outi Kalliota / Classroom is available in Part 2 of this report.

Global index of the indoor air quality of your Outi Kalliota / Classroom

Pollutants have been detected in the indoor air of your Outi Kalliota / Classroom. However, the levels of concentration measured are lower than the Maximum Acceptable Value (MAV).

This does not require any particular action to be considered.

Your global index of indoor air quality is A and your indoor air is good quality.

A

good indoor air quality

The indexes and their meanings:

A+
very good indoor air quality

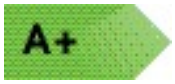
A
good indoor air quality

B
average indoor air quality

C
poor indoor air quality

General review of pollutants checked for in the indoor air of your Outi Kalliota / Classroom

To help you evaluate the quality of your indoor air, we have attributed a pollution index (A+, A, B or C) which represents the level of concentration measured and the potential health impact of each chemical pollutant analyzed.



Absence of pollution

The pollutant is not detected in your indoor air. Its concentration is lower than the minimum quantity measurable by the analysis techniques used. (Limit of Quantification LOQ)

Acceptable level of pollution

The concentration of the pollutant detected in your indoor air is lower than the MAV (Maximum Acceptable Value). **No action to plan.**

Average level of pollution

The concentration of the pollutant detected in your indoor air is between the MAV (Maximum Acceptable Value) and the IAV (Immediate Action Value). **Action must be planned** to improve your indoor air quality.

High level of pollution

The concentration of the pollutant detected in your indoor air is higher than the IAV (Immediate Action Value). **Immediate action is required** to improve your indoor air quality.

Non-conformity has been registered when the samples were received. The G.A.B.I.E VOCs sampler was used over its expiring date. Therefore, the results could be not representatives of the analyzed atmosphere because the sorbent phase could have been impaired and the sampler contaminated by some pollutants during its storage.

The following table shows all the pollutants checked for in your samples. The pollutants of each family (VOCs and aldehydes) are classified from most harmful to least harmful.

Concentrations of chemical pollutants are given in µg/m3 (microgram per cubic meter of air, 1 mg = 1000 µg and 1 g = 1 000 000 µg).

Name	*Concentration measured (µg/m3)*	*Pollution index*
Formaldehyde	2.09	A
Acetaldehyde	1.23	A
Hexanaldehyde	2.03	A
Butyraldehyde & Isobutyraldehyde	< 1.00	A+
Isovaleraldehyde	< 0.64	A+
Valeraldehyde	< 0.64	A+
Benzaldehyde	0.62	A
Acroleine	< 0.86	A+
Benzene	0.68	A
Toluene	1.67	A
Trichlorethylene	< 0.41	A+
Tetrachloroethylene	< 0.49	A+
Lindane	< 3.45	A+
Xylene (3 molecules)	< 1.36	A+
1,2,4-Trimethylbenzene	0.28	A
1,4-Dichlorobenzene	< 0.52	A+
Alpha-Pinene	0.90	A

Name	Concentration measured (µg/m3)	Pollution index
Ethylbenzene	< 0.43	A+
Limonene	< 0.96	A+
n-Decane	1.17	A
n-Undecane	< 1.81	A+
Butyl Acetate	< 0.96	A+
1-Methoxy-2-Propanol	< 20.39	A+
2-Ethyl-1-Hexanol	< 14.72	A+
2-Butoxyethanol	< 9.53	A+
Styrene	< 0.19	A+
2-Ethoxyethyle Acetate	< 11.55	A+
2-Methoxyethanol	< 21.73	A+
2-Methoxyethyle Acetate	< 11.55	A+
2-Ethoxyethanol	< 11.74	A+
1,1,1-Trichloroethane	< 0.41	A+
Naphtalene	< 0.49	A+
Methylene Chloride	< 0.86	A+
Chloroform	< 0.78	A+
1,2-Dichlorobenzene	< 0.46	A+
Carbon Tetrachloride	< 0.50	A+

PART 2 : Detailed presentation of detected pollutants

Only the pollutants detected in your sample will be presented in detail in this report. All the pollutants checked for are summarized in the table at the beginning of this report.

Formaldehyde

Measured concentration in your indoor air : **2.09 µg/m3**

LQ :	MAV :	IAV :	Your measurement :
0.30 µg/m3	**10 µg/m3**	**50 µg/m3**	**2.09 µg/m3**

The concentration measured of the pollutant in your home corresponds to an index A. The level of pollution is acceptable.

The concentration measured for this pollutant is lower than the Maximum Acceptable Value (MAV). At this level of concentration, no effect on health is expected and no action is to be undertaken.

Industrial use and possible sources in consumer goods :

Formaldehyde is produced during combustion processes and is found, for example, in the smoke of forest fires, in car emissions and in tobacco smoke. Small quantities are also produced by the majority of living organisms and it is naturally found in wood. It is also found among the compounds emitted by new books, magazines and printers.

Formaldehyde is used as a disinfectant, in conservation treatment of tissues and human or animal organs (embalming), preservatives in vaccines, treatment of warts, and treatment of devitalized teeth. Thanks to its biocidal properties (fongicide, bactericide and insecticide), it is also used in cleaning products, in the food industry, in the cosmetics and pharmaceutical industry and in human and veterinary medicine.

It is used in the synthesis of many organic compounds, in the manufacture of resins (urea-formaldehyde, melamine formaldehyde, ...), synthetic foams (polyurethane), insulating material, textile, paints, varnishes, explosives and pastes. The latter are commonly used to manufacture chipboard panels, MDF (medium density fiberboard), plywood, oriented strand boards, glue-down parquet, glass wool and rugs.

Classification of toxicity:

Group 1 : The International Agency for Research on Cancer (IARC) says this substance is carcinogenic for humans.

Exposure symptoms and health effects :

Formaldehyde is an irritant compound for the nasal and eye mucous membranes and for the respiratory tract. Chronic exposure can affect lung capacity. Ingestion of formaldehyde may cause digestive disorders.

Formaldehyde is a powerful allergen which may be the cause of skin (eczema and urticaria) and respiratory (rhinitis and asthma) sensitization, even leading to anaphylactic shock. Formaldehyde might also cause neurobehavioral disorders.

The results of epidemiological studies show that high exposure to formaldehydes produces an increase in the incidents of nasopharyngeal cancers and could be the cause of leukemia (the cause and effect link is not established with certainty). As regards effects on reproduction, formaldehyde could be responsible for miscarriage and for a decrease in birth weight. However these results require further examination.

Acetaldehyde

Measured concentration in your indoor air : **1.23 µg/m3**

LQ :	MAV :	IAV :	Your measurement :
0.35 µg/m3	**200 µg/m3**	**400 µg/m3**	**1.23 µg/m3**

The concentration measured of the pollutant in your home corresponds to an index A. The level of pollution is acceptable.

The concentration measured for this pollutant is lower than the Maximum Acceptable Value (MAV). At this level of concentration, no effect on health is expected and no action is to be undertaken.

Industrial use and possible sources in consumer goods :

It is commonly used in the synthesis of organic compounds (acetic acid, acetic anhydride and 1-butanol). Acetaldehyde is also used in the perfume, plastics and colorants industries.

Classification of toxicity:

Group 2B : The International Agency for Research on Cancer (IARC) classifies that substance as possibly carcinogenic for humans.

Exposure symptoms and health effects :

Short-term exposure to an environment which contains acetaldehyde above the Maximum Acceptable Value (MAV) can cause eye irritation or even conjunctivitis and respiratory disorders.

The ingestion of acetaldehyde is likely to produce cardiac disorders and to affect the central nervous system.

It has been reported that acetaldehyde, together with other aldehydes, could contribute to the appearance of cancer (oral and bronchial tumors). Moreover, it could affect the hormonal system and could even be partly responsible for the fetal alcohol syndrome in pregnancy. However, these results must be confirmed by further scientific investigations.

Hexanaldehyde

Measured concentration in your indoor air : **2.03 µg/m3**

LQ :	MAV :	IAV :	Your measurement :
0.89 µg/m3	**650 µg/m3**	**1300 µg/m3**	**2.03 µg/m3**

The concentration measured of the pollutant in your home corresponds to an index A. The level of pollution is acceptable.

The concentration measured for this pollutant is lower than the Maximum Acceptable Value (MAV). At this level of concentration, no effect on health is expected and no action is to be undertaken.

Industrial use and possible sources in consumer goods :

Hexanal is used in the perfumes and flavors industry notably for fruit flavors (apricot, banana, kiwi, mango, peach, strawberry, ...). It is produced naturally by fruits such as apples, avocados, coconuts, peaches, ...)

Classification of toxicity:

Not classified.

Exposure symptoms and health effects :

Hexanaldehyde is an irritant compound for the skin, the eyes and the respiratory tract.

The effects on humans of chronic exposure to hexanaldehyde were not studied.

Benzaldehyde

Measured concentration in your indoor air : **0.62 µg/m3**

LQ :	MAV :	IAV :	Your measurement :
0.59 µg/m3	**90 µg/m3**	**180 µg/m3**	**0.62 µg/m3**

The concentration measured of the pollutant in your home corresponds to an index A. The level of pollution is acceptable.

The concentration measured for this pollutant is lower than the Maximum Acceptable Value (MAV). At this level of concentration, no effect on health is expected and no action is to be undertaken.

Industrial use and possible sources in consumer goods:

Benzaldehyde is a naturally occurring substance in bitter almond essence and presents an odor of almond. It is also naturally found in peaches, grapes, strawberries and raspberries and is responsible for the smell of cranberries.

It is used in the perfumes industry, as an artificial aroma in the food industry (almond and cherry), and as an aromatic additive in the tobacco industry. It is also used as a solvent (resins, cellulose nitrate, white paste, ...) and as a bee repellent during honey harvests. Finally, it is also used in the synthesis of organic compounds (benzoic acid, ephedrine, ...)

Classification of toxicity :

Not classified.

Exposure symptoms and health effects :

Benzaldehyde is an irritant compound for the eyes and the skin.

The health effects on humans of chronic exposure to benzaldehyde were not studied.

Benzene

Measured concentration in your indoor air : **0.68 µg/m3**

LQ :	MAV :	IAV :	Your measurement :
0.35 µg/m3	**2 µg/m3**	**10 µg/m3**	**0.68 µg/m3**

The concentration measured of the pollutant in your home corresponds to an index A. The level of pollution is acceptable.

The concentration measured for this pollutant is lower than the Maximum Acceptable Value (MAV). At this level of concentration, no effect on health is expected and no action is to be undertaken.

Industrial use and possible sources in consumer goods:

Benzene is mainly present in gasoline, cigarette smoke and some DIY products. It is one of the constituents of crude oil. It is often used as a solvent in the chemical industry for the synthesis of plastics, synthetic rubber and colorants.

It is used mainly as an intermediate in the synthesis of other compounds such as the production of polymers and plastics (styrene), the production of resins and adhesives (phenol), and the production of nylon (cyclohexane).

Classification of toxicity :

Group 1 : The International Agency for Research on Cancer (IARC) says this substance is

carcinogenic for humans.

Exposure symptoms and health effects:

There is no minimum exposure threshold for benzene. Its effects on health may appear after repeated exposure at very low doses.

Exposure to benzene, by inhalation or ingestion, may cause neurological disorders (irritability, inattention, ...) digestive disorders (nausea, vomiting, ...). Benzene is irritating to the skin and the mucous membranes of the eye. Benzene is widely believed to be the cause of several types of leukemia and reproduction disorders (decrease in fertility, menstrual disorders and miscarriage)

It has been shown that, during pregnancy, benzene passes through the placenta, carried by the blood in the umbilical cord. However, to date there is no reason to believe that it is toxic for the fetus.

It is highly recommended to avoid any exposure to benzene.

Toluene

Measured concentration in your indoor air : **1.67 µg/m3**

LQ :	MAV :	IAV :	Your measurement :
0.41 µg/m3	**300 µg/m3**	**600 µg/m3**	**1.67 µg/m3**

The concentration measured of the pollutant in your home corresponds to an index A. The level of pollution is acceptable.

The concentration measured for this pollutant is lower than the Maximum Acceptable Value (MAV). At this level of concentration, no effect on health is expected and no action is to be undertaken.

Industrial use and possible sources in consumer goods :

Toluene is an aromatic compound of the benzene family. It is used mainly as solvent in paints, varnishes, inks for printing, pastes and waxes. It is also used as starting material for the synthesis of many organic compounds (benzene, xylene, phenol, ...) and as fuel additive.

Classification of toxicity :

Group 3 : The International Agency for Research on Cancer (IARC) says this substance cannot be classified as regards its carcinogenic effect on humans.

Exposure symptoms and health effects :

Toluene is an irritant compound for the skin, the respiratory tract (nose and throat) and the eyes.

Chronic exposure to toluene in the long-term may cause neurological disorders (memory, concentration, personality ...). Toluene has no reported mutagenic effects and its link to the appearance of cancers has not been proved.

Toluene could affect reproduction causing abnormalities of hormone levels, an increase in the rate of late miscarriages, and delay of intrauterine growth. A syndrome similar to fetal alcohol syndrome was observed with the presence of malformations (ears, heart, face, kidneys and limbs) and neurological disorders (attention deficit, hyperactivity and acquisition of speech).

It is highly recommended that expectant mothers avoid any exposure to toluene.

1,2,4-Trimethylbenzene

Measured concentration in your indoor air : **0.28 µg/m3**

LQ :	MAV :	IAV :	Your measurement :
0.20 µg/m3	**1000 µg/m3**	**2000 µg/m3**	**0.28 µg/m3**

The concentration measured of the pollutant in your home corresponds to an index A. The level of pollution is acceptable.

The concentration measured for this pollutant is lower than the Maximum Acceptable Value (MAV). At this level of concentration, no effect on health is expected and no action is to be undertaken.

Industrial use and possible sources in consumer goods :

1,2,4-trimethylbenzene, an aromatic compound of the benzene family. It is naturally present in tar and crude oil. It is found in gasoline and is used in varnishes and resins.

Classification of toxicity:

Not classified

Exposure symptoms and health effects:

1,2,4-trimethylbenzene is an irritant compound for the skin and the respiratory system.

Chronic exposure to 1,2,4-trimethylbenzene may cause behavioral disorders such as confusion, nervousness, dizziness, drowsiness, headaches and breathing disorders such as bronchitis and sore throats.

The mutagenic and carcinogenic effects of 1,2,4-trimethylbenzene on humans , and on reproduction, were not studied.

Alpha-Pinene

Measured concentration in your indoor air : **0.90 µg/m3**

LQ :	MAV :	IAV :	Your measurement :
0.45 µg/m3	**450 µg/m3**	**900 µg/m3**	**0.90 µg/m3**

The concentration measured of the pollutant in your home corresponds to an index A. The level of pollution is acceptable.

The concentration measured for this pollutant is lower than the Maximum Acceptable Value (MAV). At this level of concentration, no effect on health is expected and no action is to be undertaken.

Industrial use and possible sources in consumer goods :

alpha-pinene is a constituent of pine resin and other coniferous trees. This compound is naturally present in some plants such as mint, lavendar, sage and ginger. It is present in turpene and pine oils. It is also used in air fresheners, indoor fragrances and cleaning products.

Classification of toxicity:

Not classified.

Exposure symptoms and health effects :

Alpha-pinene is an irritant compound for the skin, the respiratory tract and the eyes.

The effects on humans of chronic exposure to alpha-pinene were not studied.

Laboratory studies on mice and salmonella bacteria showed that alpha-pinene is not mutagenic (genotoxic).

n-Decane

Measured concentration in your indoor air : **1.17 µg/m3**

LQ :	MAV :	IAV :	Your measurement :
1.03 µg/m3	**6000 µg/m3**	**12000 µg/m3**	**1.17 µg/m3**

The concentration measured of the pollutant in your home corresponds to an index A. The level of pollution is acceptable.

The concentration measured for this pollutant is lower than the Maximum Acceptable Value (MAV). At this level of concentration, no effect on health is expected and no action is to be undertaken.

Industrial use and possible sources in consumer goods :

N-decane is part of the family of alkanes. It is one of the constituents of gasoline.

Classification of toxicity:

Not classified.

Exposure symptoms and health effects :

N-décane is an irritant compound for the respiratory tract, the skin and the eyes.

The effects on humans of chronic exposure to n-decane were not studied.

Information about your sample

Sampling Equipment

Badge SKC Umex-100 for sampling aldehydes and badge Tecora GABIE for sampling VOCs.

Sample

Date of receipt of the sample in the laboratory : 2014-09-29
Date of sample analysis: 2014-10-02

Laboratory

Institut de Recherche et d'Expertise Scientifique (IRES), Parc d'innovation – BIOPARC 3, 850 Bd Sébastien Brandt, 67400 ILLKIRCH, France

Method of analysis

VOC sample was analyzed by GC-MS (Gas Chromatography coupled with Mass Spectrometry detection) and aldehyde sample was analyzed by LC-UV-MS (Liquid Chromatography coupled with UV detection and Mass Spectrometry detection.

Report validation

The Analysis report was validated on 2014-10-09 by

C. BURG, M.Sc., Responsable du laboratoire.

PART 3 : ADVICE

You have just received the analysis results of the indoor air quality of your Outi Kalliota / Classroom. In this part of the report you will find advice to improve the indoor air quality of your home.

The consequences of exposure to indoor air pollutants are variable because each individual is unique !

It is essential to distinguish between the notions of danger and risk. Risk is the conjunction of several factors which are danger (toxicity of pollutants), exposure (time during which one is exposed) and individual sensitivity (a person in good health is less sensitive than a sick person).

The reference values (MAV and IAV) are indicated for healthy people, in other words for people who are not particularly sensitive.

In the case of exposure to VOCs and aldehydes, « fragile » organisms will be more sensitive and the health effects stronger. Children, unweaned infants, expectant mothers and elderly or sick people (cardiovascular and/or respiratory diseases) are more particularly concerned.

If you experience specific symptoms to the pollutants detected in your home, consult your GP (General Practitioner).

Frequency of measurements

Due to climatic conditions, our lifestyle differs according to the season and consequently our indoor air quality may vary. On the one hand, sources of VOCs and aldehydes may vary according to temperature and on the other hand, we air rooms more frequently when it is hot.

Consequently, the indoor air in our home is not the same during the winter (the windows are closed, the temperature is around 20°C, we make fires, ...) and in the summer (the windows are open and the indoor air is renewed, temperatures are around 30°C).

For this reason, in order to get more representative evaluation of your indoor air quality throughout the year, we advise you to make measurements in summer and in winter.

How can you improve your indoor air quality ?

Setting up of **products from City family** developped by Camfil Farr is the right solution to improve your indoor air quality. City filters can be installed inside the make-up air units, as well as inside the recycling air handling units. When the size of the air handling unit is too limited, the use of **2 in 1 filters** (CityCarb) can substitute particles filters. The alternative solution is to set up **autonomous air cleaners CamCleaner City** which are easy to set up, without any modification of the air handling units of the building.

If setting up such solutions is essential for B and C pollution indexes, it can also be judicious for A and A+ pollution indexes, in order to prevent from any incidental peak that would occur (summer and winter pollution peaks, indoor renovation work, use of cleaning agents ...).

Thus, these solutions will trap efficiently pollutants to avoid their concentration growth to high levels harmful for health. The advantage of **City solutions** is the guarantee of total innocuousness, without any generation of new pollutants, in opposition to other technologies that can be used inside some other air cleaners.

To design the best suited solution improving your indoor air quality, it is necessary to contact your Camfil Farr representative to give him precise information on the analysed room (room dimensions and geometry, airflows, etc ...)

After implementation of Camfil Farr solution, we advise you to achieve a second Indoor CityCheck, in order to check the efficiency of the set up solution.

Contacts

For any enquiries, please contact our customer service department by email info@camfil.fr or by phone + 33 (0)1 46 52 48 00