LIFA AIR

Indoor Air Environment Services

Staying indoor likes diving. **FEEL GOOD!**

But... What does the air quality come from the supply air duct?

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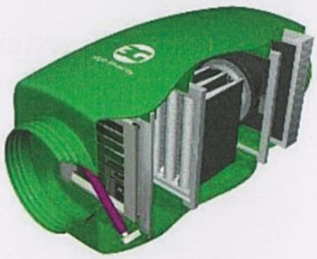
LIFA AIR

Indoor Air Quality Improvement



Finland Lifa Air Technology Focus:

1. Pollutants source control. 控制污染源

2. Sufficient fresh and clean air supply.
   足夠的清新空氣

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LIFA AIR 麗風

LIFA AIR

Lifa Concepts

1) **Ventilation Hygiene**
2) **Renovation Hygiene**
3) **Building Protection**

Accordingly our three concepts are so health related and concerned and applied in the fields of

1) Hospital/medical related
   Allergy, surgery day room, ambulance, home for the aged, etc

2) Public health
   Hospitality, commercial, shopping mall, public transport like Bus, trains and subways etc

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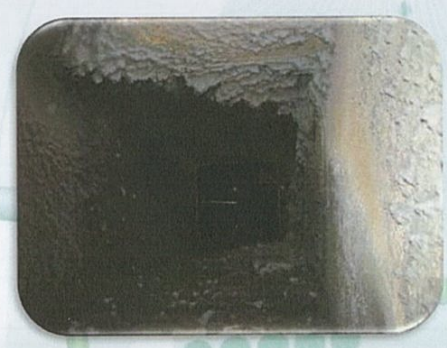
LIFA AIR 麗風

LIFA AIR

General air improvement for HVAC system

For healthy living and protection of vulnerable groups

1) removal of virus/bacteria substrates inside the air passages of HVAC system
2) certification of hygiene, integrity and functioning of air passages and system
3) sterilization of air passages and system
4) according to US and EU health standards



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LIFA AIR 麗風

LIFAAIR

Dust Control System – Renovation Hygiene

Industrial, health and safety protection for construction and renovation not only protects workers but also neighbors, inmates and passers by of building under renovation but could not be totally vacated, eg hospitals, transportation hubs, hotels, schools, etc.

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LIFAAIR 麗風

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為什麼要清洗風管?

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LIFAAIR 麗風


Supply Air Duct Inspection – Wet market
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Supply Air Duct Inspection – Shopping Mall
www.lifa-air.com
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Return Air Duct Inspection – Laundry
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LIFA AIR Before cleaning
鴿子
鴿子的糞便
www.lifa-air.com
LIFA AIR 麗風

LIFA AIR®

After cleaning …

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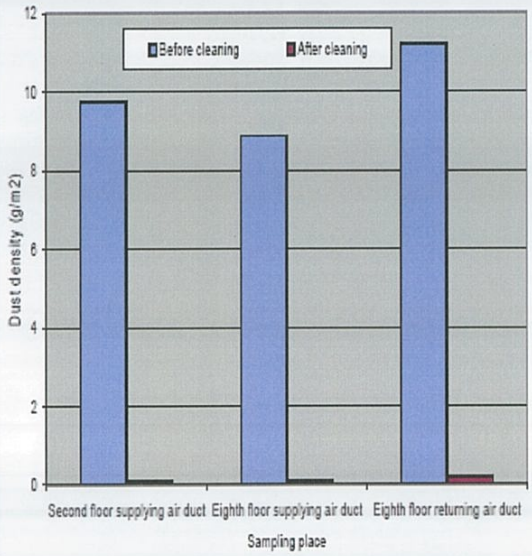
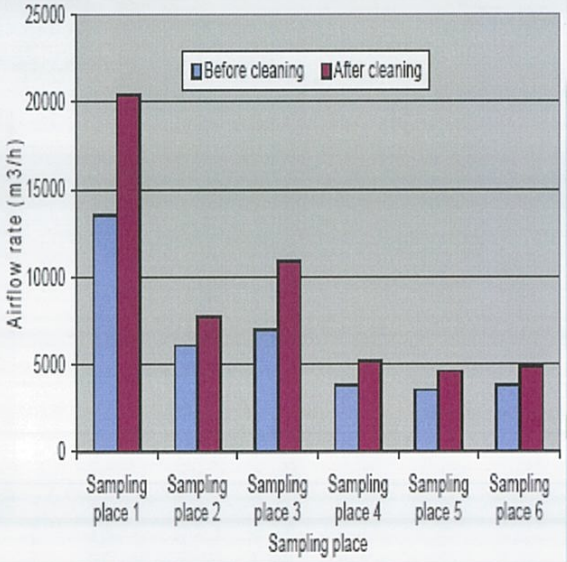
LIFA AIR® 麗風

EVHA
European Ventilation Hygiene Association

Effect of duct cleaning on the **dust** on duct surfaces and **air flows** in an office building in Beijing

(Li, Jun et al. 2006)





Dust reduced >90%

Air flows increased 15-40%

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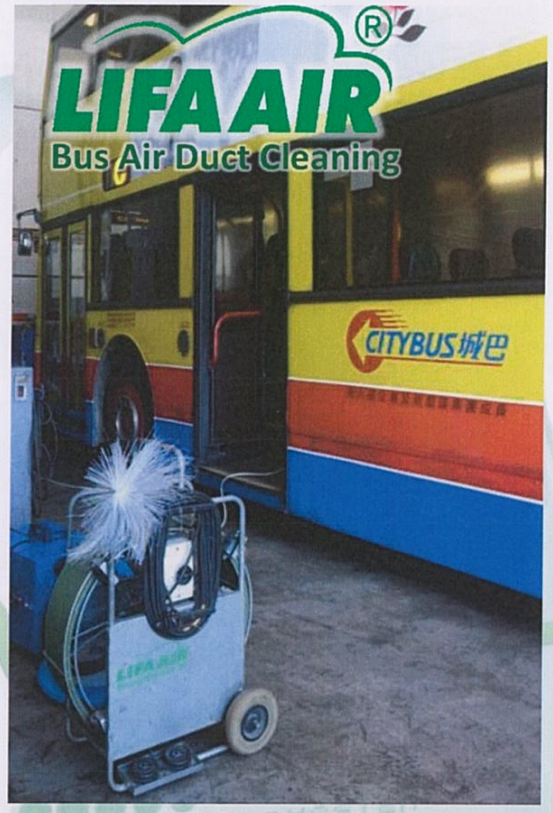
LIFAAIR®



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LIFAAIR®

Air Flow Rate	Before cleaning	After cleaning	Percentage Diff.
Return air grill	12.7 MPH (5.67 m/s)	14.4 MPH (6.44 m/s)	+13.3%
Air grill (1)	5.4 MPH (2.41 m/s)	6.2 MPH (2.77 m/s)	+14.8%
Air grill (2)	3.0 MPH (1.34 m/s)	4.7 MPH (2.10 m/s)	+56.7%
Air grill (3)	4.8 MPH (2.15 m/s)	6.8 MPH (3.04 m/s)	+41.4%
Air grill (4)	4.4 MPH (1.97 m/s)	5.4 MPH (2.41 m/s)	+22.3%
		Average % increase	**+29.7%**

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Lifa Air Duct Cleaning Set

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LIFA AIR 麗風

EFFECTIVENESS OF DUCT CLEANING METHODS APPLIED IN NEW AIR DUCTS

Rauno Holopainen[1], Vesa Ailikainen[2], Marko Björkroth[1], Marianna Tuomainen[1], Keijo Kovanen[3], Pertti Pasanen[2], Olli Seppänen[1]

[1] Helsinki University of Technology, Laboratory of Heating, Ventilating and Air Conditioning, Finland
[2] University of Kuopio, Department of Environmental Sciences, Finland
[3] VTT Building and Transport, Building Physics and Indoor Climate, Finland

SUMMARY

The aim of this study was to compare two air duct cleaning metho mechanical brushing and compressed air cleaning. The cleaning round air ducts: a metal duct without residual oil (cleanliness cate category P2), and a plastic duct. The brushing methods were mor cleaning was more efficient in the plastic ducts. The oil residues or remove, and none of the cleaning methods were capable of cle

AIM

Due to contamination during storage, transportation and construction phases, a lot of dust may accumulate in the ventilation ducts. The aim of this work was to compare the efficiencies of brushing and compressed air duct cleaning methods. Three different types of new air ducts were used in the tests. Each duct type was cleaned by using three different cleaning methods.

TEST SET-UP

The experimental arrangement in the laboratory is shown in Figure 1.

RESULTS

The amount of residual after brushing and 0.1-1

Table 1. The amount of dust be

Measured parameter									
Amount of dust before (g/m²)	8.63	4.93	7.23	5.83	4.78	5.33	8.74	6.03	6.85
Amount of dust after (g/m²)	0.15	0.19	1.03	0.76	0.15	0.67	0.35	0.32	0.11
Cleaning time (s)	125	205	420	115	150	240	86	-	405

MB 1 = Mechanical brushing (1), MB 2 = Mechanical brushing (2), CAC = Compressed air cleaning
*During the test the low-pressure fan stopped and therefore it was not possible to record the time

According to visual evaluation, none of the cleaning methods were capable of cleaning the oily duct surfaces efficiently enough (Figure 2 and 3).

Fig 1. Locations of sampling points

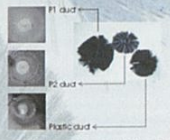

Fig 2. Duct surfaces after mechanical brushing (MB 1) and brushes used

Fig 3. Duct surfaces after compressed air cleaning and air nozzles used

The lengths of the ductworks (Figure 1) were 7.5 m (ø 125) and 7.7 m (ø 160). The test ductworks were contaminated with a dust feeding device. Standardized ASHRAE dust (30 g) was fed at a 1.5 m/s flow velocity into each ductwork during 15-18 min.

CONCLUSION

The best cleaning result in the metal duct was achieved with mechanical brushing. The selected brush type and rotating speed as well as the speed of the moving brush affect the cleanliness level of the duct only slightly. The results of compressed air cleaning were good in the new plastic air duct, but the cleaning method was slower and noisier compared to the brushing methods. Both methods can be used to clean air ducts.

ACKNOWLEDGEMENTS

This study was supported by Oy Lifa Air Ltd, Tekmanni Ltd and Ukon-Ilma Ltd. It was carried out as a part of the Clean Ventilation Systems project funded by the National Technology Agency, Finnish industry and participating research organizations. The Clean Ventilation Systems project is a part of the Finnish Healthy Building Technology Programme.

Measured Parameter	The Type of Duct and the Cleaning Method								
	Category P1 Duct			Category P2 Duct			Plastic Duct		
	MB1	MB2	CAC	MB1	MB2	CAC	MB1	MB2	CAC
Amount of Dust before (g/m²)	8.63	4.93	7.23	5.83	4.78	5.33	8.74	6.03	6.85
Amount of Dust after (g/m²)	0.15	0.19	1.03	0.76	0.15	0.67	0.35	0.32	0.11
Cleaning Time (s)	125	205	420	115	150	240	86	-[1]	405

Table 1. The Amount of Dust before and after Duct Cleaning and the Cleaning Time
MB1 = Mechanical Brush (1),
MB2 = Mechanical Brush (2),
CAC = Compressed Air Cleaning

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Brushing machines, air blowing and liquid spreading equipment

Hydmaster 40

CombiCleaner 40

Special Cleaner 25 Multi

BIG FRAME MACHINES FOR DUCTS >300MM

BRUSHING + AIR-JETTING SAME TIME

SpecialCleaner20

CombiCleaner15

AirJet 20 (+10)

Special Cleaner 2 + driller shaft

SMALL FRAME MACHINES FOR DUCTS <400MM

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Lifa Air Duct Cleaning Technology

Lifa Hydmaster
40m cleaning shaft

Lifa Special Cleaner 20PE
20m shaft, flexible

Lifa Special Cleaner 25 Multi
25m shaft, can spray chemical

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LIFAAIR Cleaning machines 2

- Hydmaster 40: brush rotation by Hydraulic motor, power 220V
- CombiCleaner 40 + 15: brush rotation by compressed air motor, separate air hoses for spraying liquid/air-jetting whilst brushing
- Special Cleaner 25 Multi: brush rotation by electric motor and cable, separate air hoses for spraying liquid/air-jetting whilst brushing
- Special Cleaner 20: brush rotation by electric motor and cable
- AirJet 20: for spraying liquid or air-jetting
- Special Cleaner 2: brush rotation by electric motor and cable, 2-12 meter shafts available

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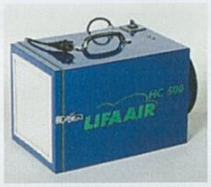
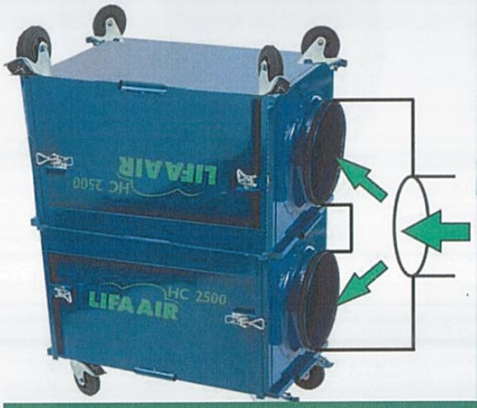
LIFAAIR Vacuum/air cleaner units – negative air machines





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Solutions for Indoor Air Quality

3 filters in same unit

1. PRE-FILTER BOX
2. F7 PARTICLE filter
3. G3/G4 Pre-filter mat
4. HEPA filter

Europe, Headquarters
Lifa Air Ltd.
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00550 Helsinki, Finland

Phone +358-9-394 858
fax +358-9-3948 5781
e-mail europe@lifa.net
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LIFA AIR® Lifa Air Duct Cleaning Technology

Lifa HC 4000

220V, 1.1kW, 1.5Hp
1100x720x960mm,85kg
4190m3/h,1350Pa

Lifa HC2500

220V, 1.1kW, 1.5Hp
860x570x1030mm,60kg
2800m3/h, 1050Pa

Lifa HC1100

220V, 0.34kW,0.5Hp
370x350x550mm,20kg
1100m3/h, 750Pa

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LIFAAIR

Suction power vs air flow

- AirClean 7000:

air flow 6950 m3/h, suction power 2100Pa

- AirClean 3500:

air flow 3600 m3/h, suction power 1350Pa

- HepaClean 4000:

air flow 4190 m3/h, suction power 1350Pa

- HepaClean 2500:

air flow 2800 m3/h, suction power 1050Pa

- HepaClean 1100:

air flow 300-1150 m3/h, suction power 750Pa

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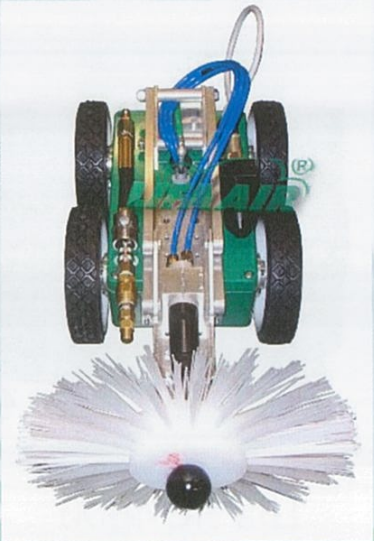
Lifa Air Duct Inspection and Cleaning Set

Duct Control Mini
寬150毫米、長180毫米、高85毫米



Duct Control Cleaning Robot

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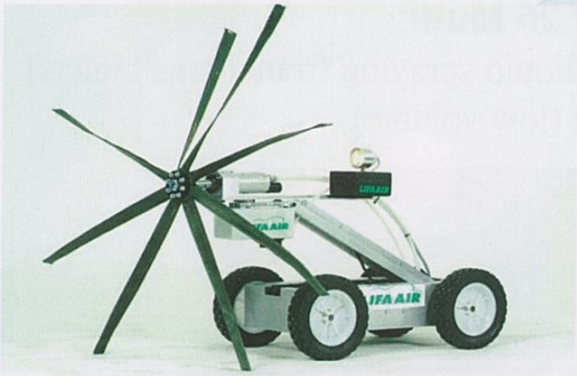
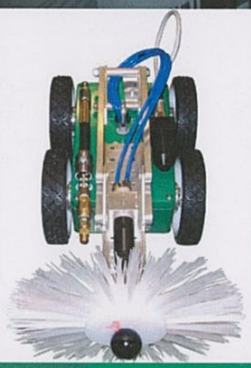
Brushing machines, robots



22 kg,
35cm height
Up to 1,2m
Cable length
30m



8 kg,
18cm height
Up to 70cm
Width 25cm,
Cable length
30m

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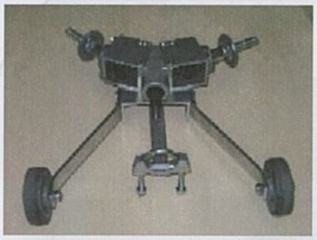
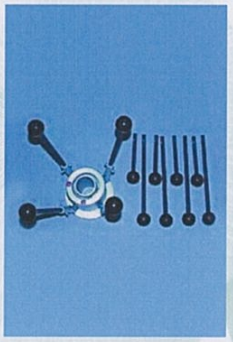
CENTERING DEVICES





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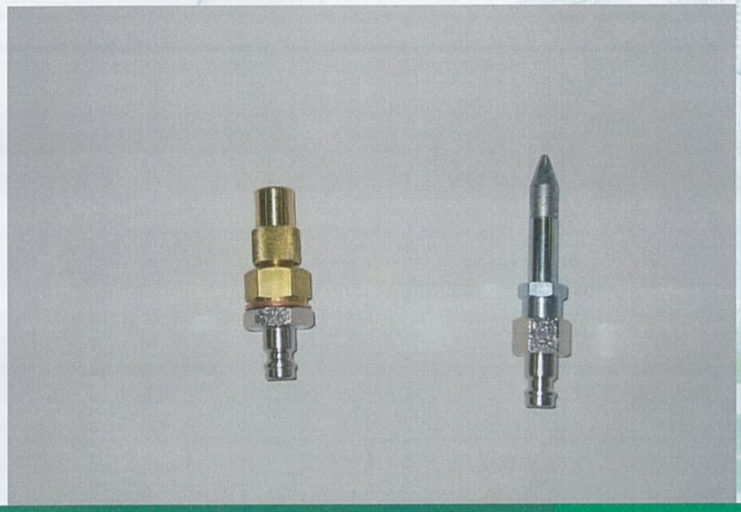
LIFAAIR 麗風

LIFA AIR

Nozzles <u>included in the price</u> for CombiCleaner 15 + 40, AirJet Combi 20 and Special Cleaner 25 Multi:

1) disinfectant and liquid spraying (round-small ducts)
2) air-jetting nozzle (low volume)



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LIFA AIR 麗風

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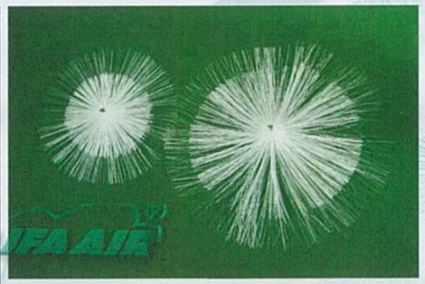
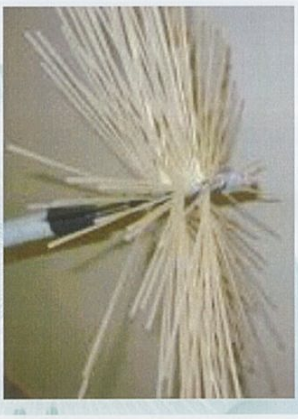
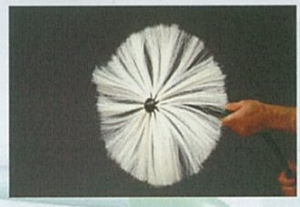
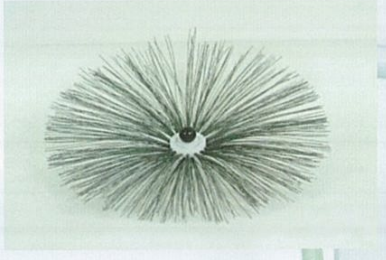
Lifa Air Duct Cleaning Brushes









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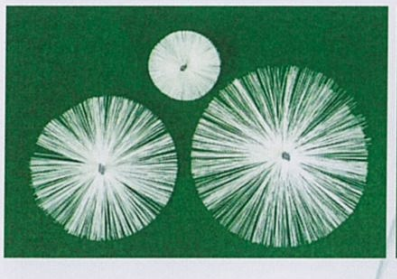
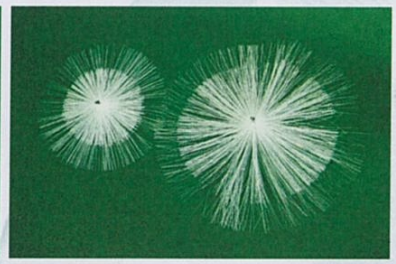
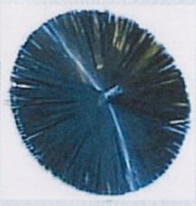
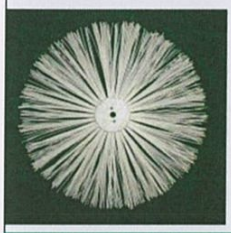
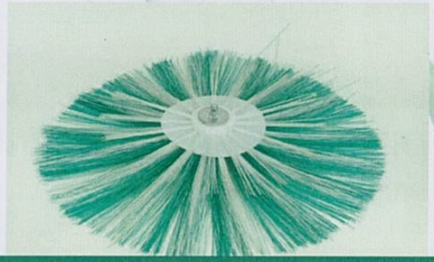
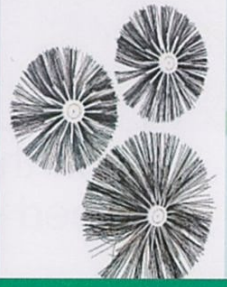
Brushes

1) M12 screw connection (old type)


2) Brush adapter connection for brushes with nylon center



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Lifa Air Duct Cleaning Technology

Y-gear

Brush with central disc

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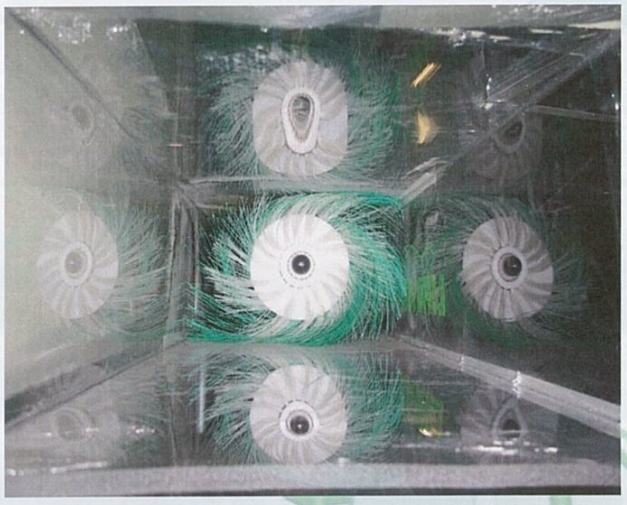
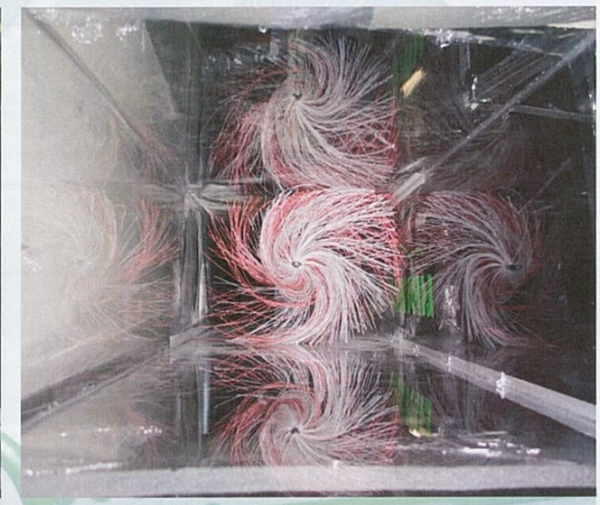
Comparison inside duct





Disk in the center of the brush greatly enhances the speed of vacuum air flow

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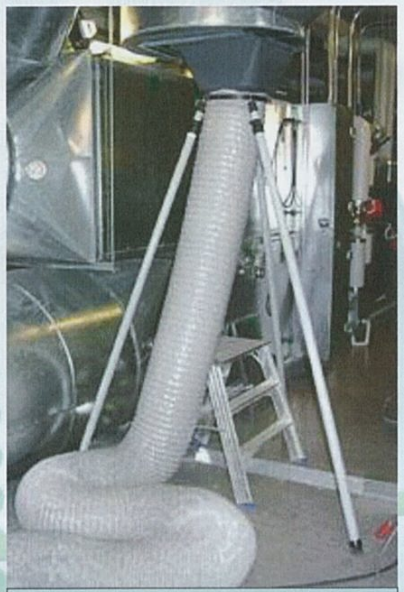
ACCESSORIES FOR VENTILATION CLEANING

Y-Connection unit for HC2500/4000, To combine 2 vacuum units

Exhaust Hose, clear plastic foil 700 mm x 0,15 mm, 75 m roll



Telescope lifting set + flexible duct, properly attached into duct

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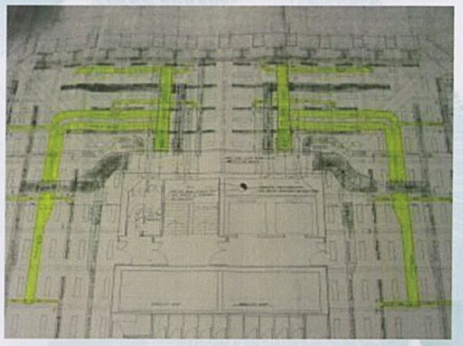
Planning



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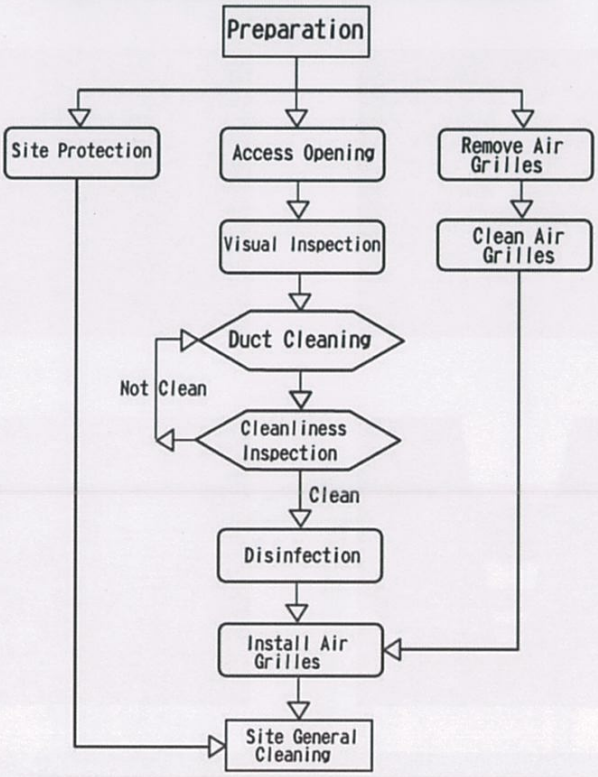
DUCT CLEANING FLOWCHART



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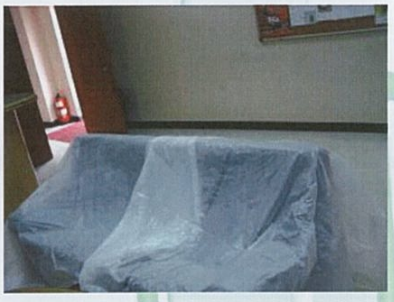
LIFAAIR®

Protecting Office Furniture and Facilities

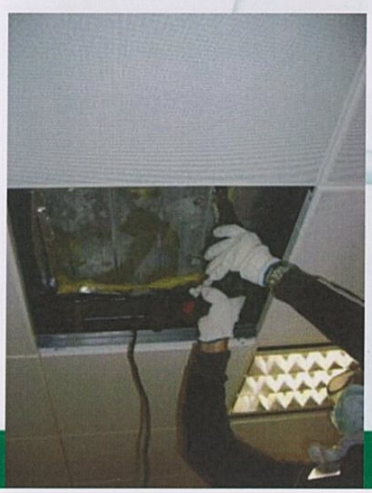


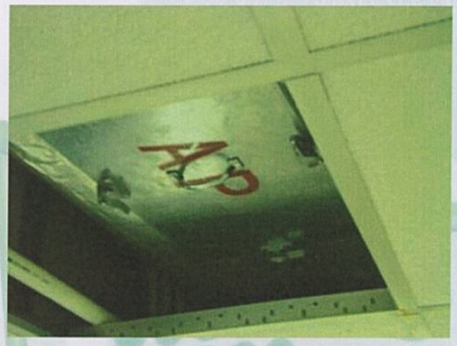
LIFAAIR®

Removing and Cleaning Air Grilles

LIFA AIR

Access Opening



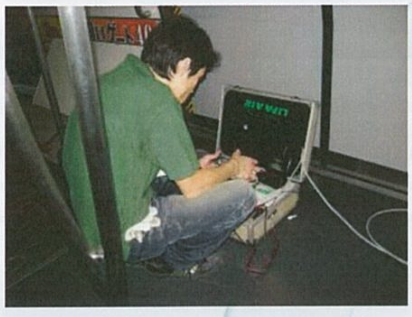


LIFA AIR

Air Duct Cleaning

LIFAAIR

Air Duct Inspection

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Air Duct Cleanliness Verification







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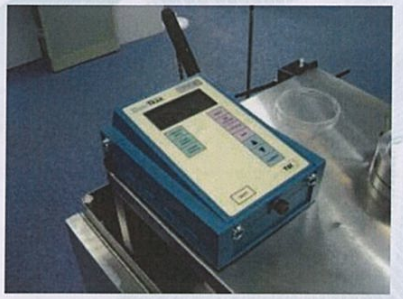
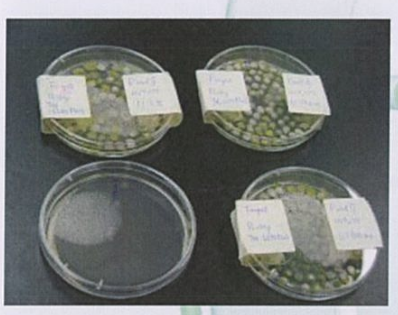
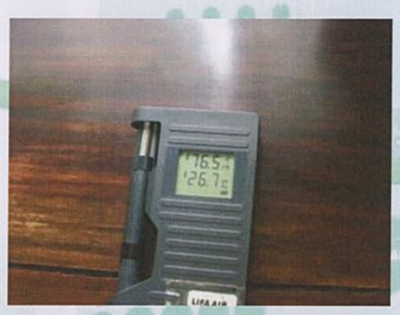
LIFA AIR

Indoor Air Quality Verification

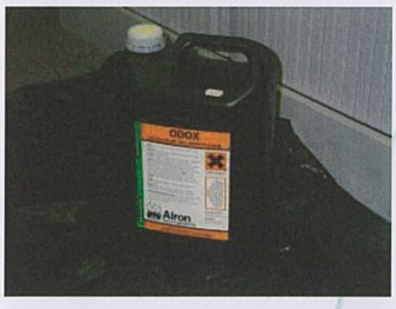


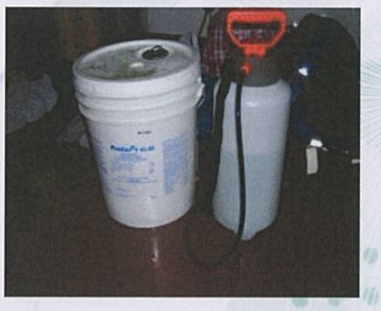




LIFA AIR

Air Duct Disinfection





General Site Cleaning

LIFA AIR

Air Duct Cleaning Report

www.lifa.net

LIFA AIR

AIR DUCT CLEANING - Cases
清洗空調風管 - 案例

www.lifa.net

LIFA AIR

GuangZhou Metro

地鐵施工現場

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LIFA AIR 麗風

LIFA AIR

LIFA AIR設備進入施工現場

LIFA AIR風管檢測機器人作清洗前檢測

技術人員在作清洗前的取樣檢測

精密的計量儀器確保資料的準確

www.lifa-air.com

LIFA AIR 麗風

LIFA AIR®

車箱頂空調百葉清洗前佈滿污漬

回風口上結出了厚厚的汙塵

技術人員對對風口進行清洗

在車頂進行高空作業的技術人員

www.lifa-air.com

LIFA AIR® 麗風

LIFA AIR®

LIFA AIR4000型高效吸塵器

超長20米的吸塵軟管

清洗後乾淨如新的空調百葉

清洗後聽回風口一塵不染

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LIFA AIR® 麗風

LIFA AIR

地鐵車箱清洗案例: 香港 MTR

MTR

13th April, 2011

To Whom It May Concern

We would like to prove that Lifa Air had provided the air duct cleaning services for APM vehicle in Hong Kong International Airport Restricted Area under maintenance by MTRC for Airport Authority in April 2010.

Lifa Air had submitted the cleanliness report to support for the cleaning result. During the air duct cleaning process, its engineer and the working crews had provided the friendly engineering and customer services and complete the task on schedule.

Yours sincerely,

Name: KH Suen
Title: Technical Officer
Email: khsuen@mtr.com.hk

www.lifa-air.com

LIFA AIR 麗風

DB 德國地鐵車箱清洗選用Lifa Air設備

www.lifa-air.com

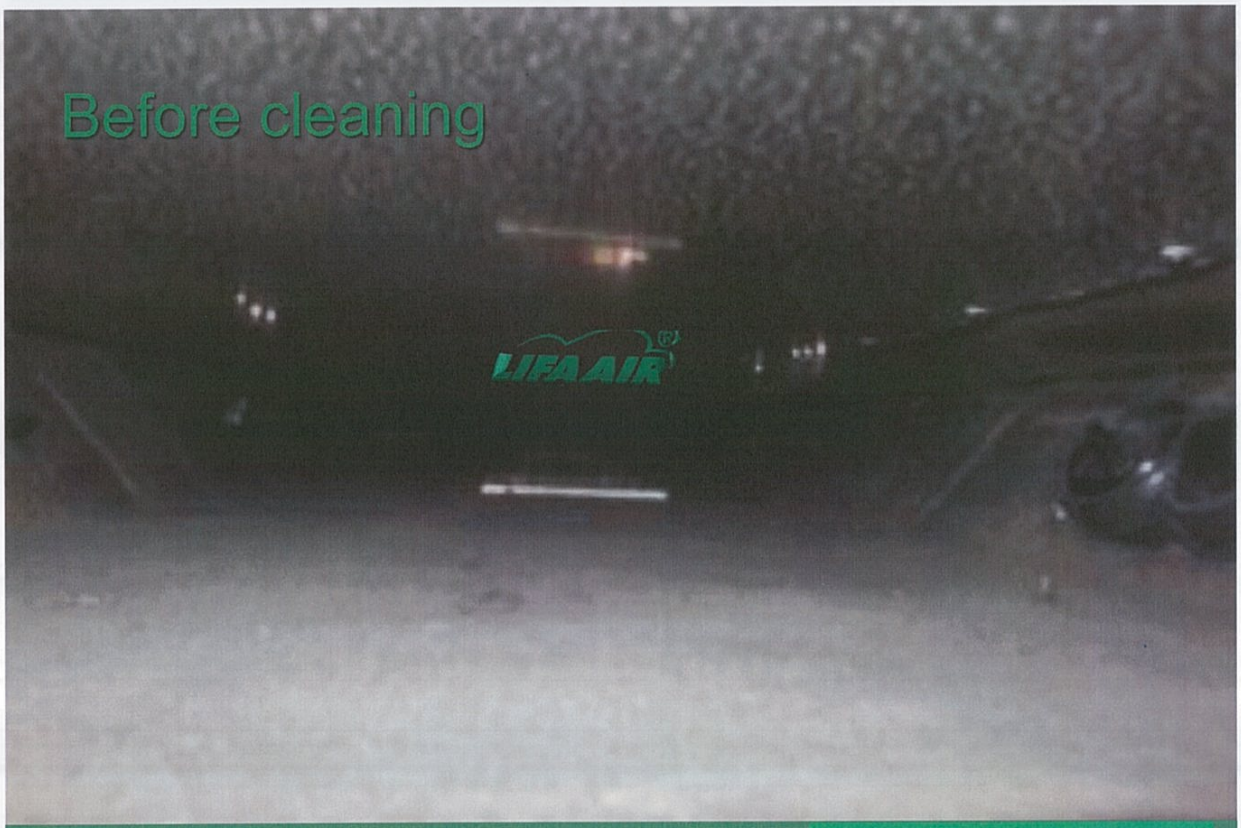
LIFA AIR 麗風

LIFA AIR®

Bus

www.lifa-air.com

LIFA AIR® 麗風



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LIFA AIR

技術施工方案

第一節 專案概況及施工範圍

- 一、項目概況
- 根據有關國家對集中空調通風系統的有關規定，我司現建議擬對捷運車箱空調通風系統進行清洗，為保證工程品質滿足捷運需求，我司擬採用國外先進設備對車站空調風管進行清洗及消毒。
- 二、工程範圍
- 擬定對臺北捷運車箱空調通風系統系統清洗消毒，清洗範圍包括車站內所有空調送風管路、回風管路、通風系統回風室、出風口百葉等附屬設備。

第二節 專案施工進度計畫

- 施工工作時間為：9：00～6：00，從週一至週五施工，採用五天工作制，也可以根據部門需要調整。

施工計畫表

名稱工期	起始日期	完成日期	作業時間	施工地點	備註
列車空調風管清洗消毒	2013-3-1	2015-3-31	9:00～6:00	捷運車箱	擬設一至二組施工隊；每列一組施工，每組約6-8人

第三節 專案人員配備計畫

- 一、專案人員配備計畫.
- 現場主要人員安排（表一）

序號	人員	類別	人 數	備註
1	管理人員	專案（正、副）經理	1	
		行政管理人員	1	
2	經濟管理人員	總經濟師	1	
		經濟管理辦事人員	1	
3	技術人員	專案工程師	2	
		技術工作人員	4	其中包括新設備技術操作指導
4	熟練技術工人	電工	2	擬分二組人員，每個施工組約6至8人
		製冷工	2	
		風管清洗工	4至6人	

第四節 專案設備配備計畫

一、施工主要設備配備情況

Lifa Air Hydmaster 40

- 電動油壓式風管清洗機；
- 最大轉矩10Nm。 40 米傳動軟軸的配置；
- 擁有內置鏡頭的產品，低電壓的設計，使其明顯比其它氣動清洗機噪音低以及容易操作。

LIFA AIR

Lifa Air Duct Cleaning Technology

Lifa Hydmaster
40m cleaning shaft

Lifa Special Cleaner 20PE
20m shaft, flexible

Lifa Special Cleaner 25 Multi
25m shaft, can spray chemical

www.lifa-air.com

LIFA AIR 麗風

LIFA AIR

Lifa Air Duct Cleaning Technology

Lifa HC 4000
220V, 1.1kW, 1.5Hp
1100x720x960mm,85kg
3580m3/h,1350Pa

Lifa HC2500
220V, 1.1kW, 1.5Hp
860x570x1030mm,60kg
2800m3/h, 1050Pa

Lifa HC1100
220V, 0.34kW,0.5Hp
370x350x550mm,20kg
1100m3/h, 750Pa

www.lifa-air.com

LIFA AIR 麗風

Lifa Air 擁有數十款型號毛刷以對應任何型號的風管

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第五節 專案操作流程

- **一、施工供水、供電需求、材料供應計畫**
- **二、 施工進度**
- 1、 施工進度計畫
- 根據合同要求，制訂具體的施工進度計畫表，並報甲方確認後實施。
- 2、施工各階段的組織部署
- 施工前階段
- 施工中階段
- 系統驗收階段
- 2.1 施工前階段
- 1）組建專案經理部：
- 2）施工臨時設施及臨電、臨水的規劃
- 3）施工前的其它準備工作
- 2.2 施工中階段
- 2.3 施工驗收和交付階段

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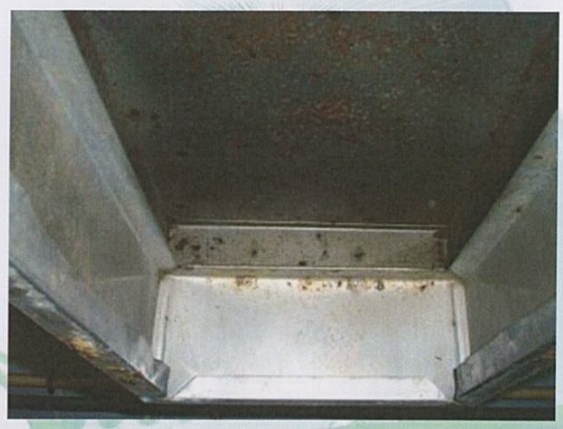
Air Duct Inspection

Before Cleaning.



After Cleaning.

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Air Duct Inspection

Before Cleaning.

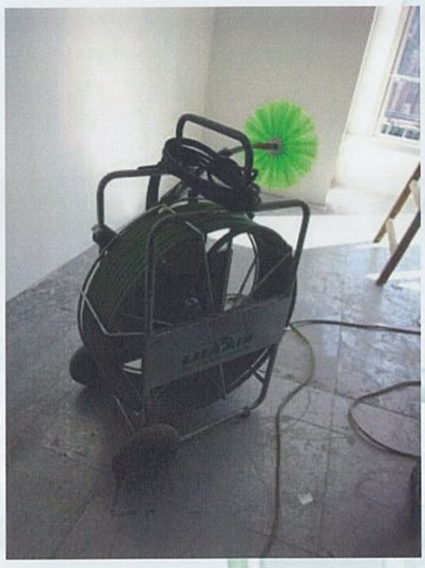
After Cleaning.

Air Duct Cleaning Project

International Finance Centre I, Central,
Hong Kong

LIFA AIR

Air Duct Cleaning Equipment



Air Duct Cleaning Machine

Air Duct Contaminant Collector

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Air Duct Cleaning

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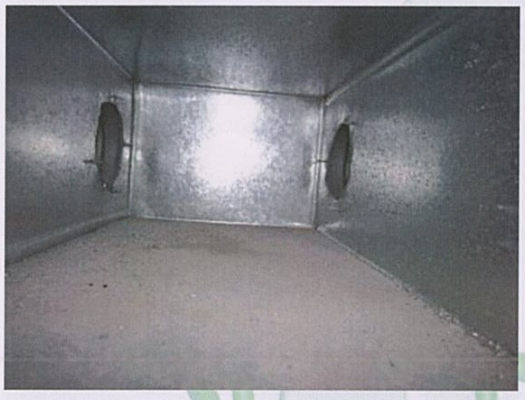
Air Duct Inspection



Before Cleaning.

After Cleaning.

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Air Duct Cleaning Project Report

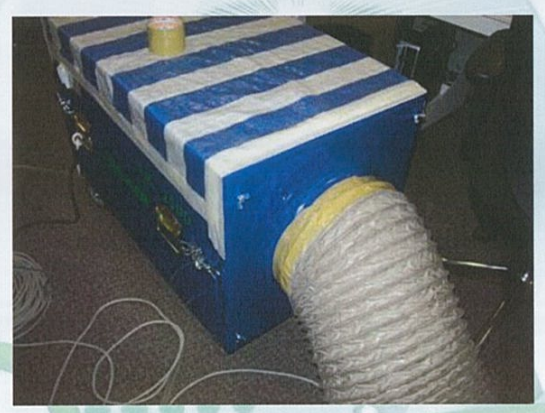
HSBC

HSBC Building in Central, Hong Kong

LIFA AIR

Air Duct Cleaning Equipment

Air Duct Cleaning Machine



Air Duct Contaminant Collector

LIFA AIR

Air Duct Cleaning

Workers are using the Air Duct Cleaning Machine and Air Duct Contaminant Collector to facilitate the duct cleaning.

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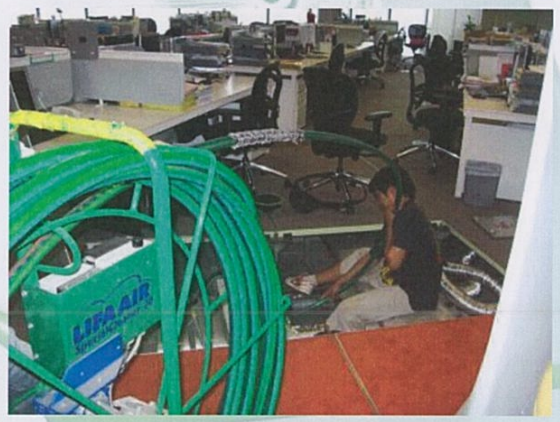
Air Duct Cleaning



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Air Duct Inspection

Before Cleaning.

After Cleaning.

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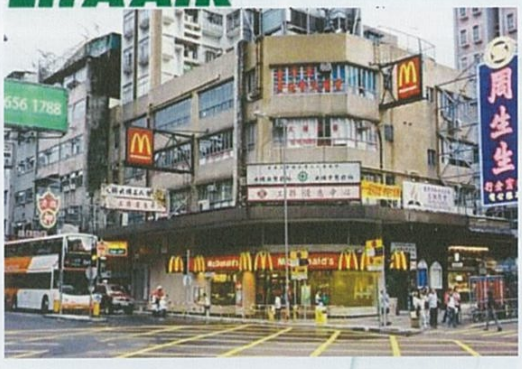
Job Reference in Hong Kong SAR, China



McDonald's, New Territories

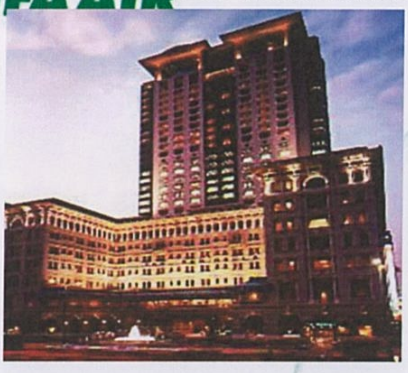
Bank of China, Kowloon

Canossa Hospital, Hong Kong

TWGHs Wong Tai Sin Hospital

LIFA AIR

Job Reference in Hong Kong SAR, China



Peninsula Hong Kong Hotel, Kowloon

The Hong Kong Polytechnic University, Kowloon

Hong Kong Convention & Exhibition Centre, Hong Kong

Port Health Centre, Hong Kong Airport

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Job Reference in Hong Kong SAR, China

Wah Fu Shopping Mall, Hong Kong Gov.

Wah Lai Carpark, Hong Kong Gov.

Siu Hong Wet Market, Hong Kong Gov.

Hong Tung Refuse Collection Station, HK Gov.

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Job Reference in Hong Kong SAR, China

SONIA Yacht, Hong Kong Shipyard

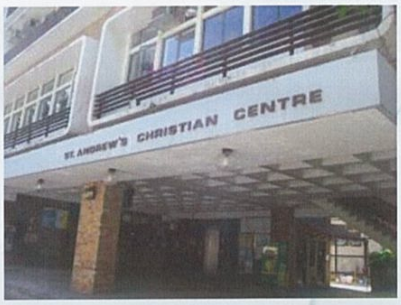
Institute of Vocational Education, Hong Kong

Double-decker bus, Hong Kong

5 Star Hotel, Kowloon

LIFA AIR®

Job Reference in Hong Kong SAR, China



St Andrew's Church, Kowloon

Jockey Club Staff Canteen, Shatin, N.T.

Tai Koo Shing, Hong Kong

HSBC Building, Hong Kong

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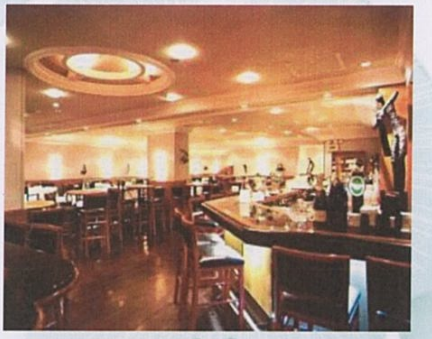
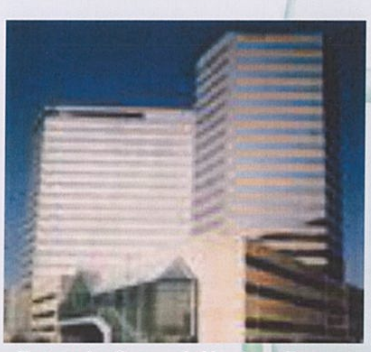
Job Reference in Hong Kong SAR, China

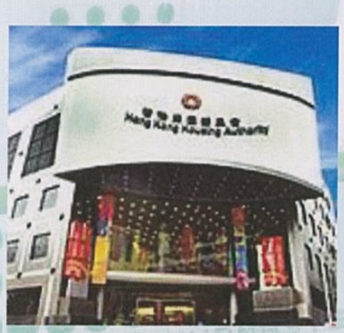
Hong Kong Productivity Council, Kowloon Tong



Dot Cod Seafood Restaurant & Oyster Bar, Central



Enterprise Square I, Kowloon Bay



Hong Kong Housing Authority, Lok Fu

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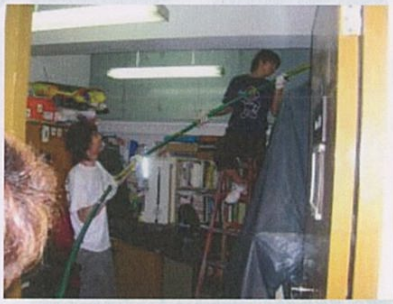
Job Reference in Hong Kong SAR, China

Wong's Industrial Center, Kwun Tong



Duke of Windor Social Service Building, Wan Chai

International Finance Centre Tower I, Central

Hong Kong Housing Authority, Pak Tin

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Job Reference in Hong Kong SAR, China

Elegantia College, Sheung Shui

Hong Kong Electric Centre, Kennedy Road

MTR Corporation

PRADA Shop, South Horizons

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LIFA AIR

Lifa Air Ltd. 芬蘭麗風

麗風焦點:

Focus on combating with:

- Environmental Pollutants
  環境污染物

Mission 麗風使命:

- Deliver clean and fresh air
  提供清新及潔淨的空氣

1988	2000	2003	2006	2012	2015
Lifa Air Oy founded in Finland	Lifa Air Asian Head Office in Hong Kong	New York, Dubai	Beijing	Guangzhou, Taiwan & Macau	Lifa Dongguan (First JV in China)

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LIFA AIR 麗風

Lifa History

Lifa history begins with protection of Asbestos removal workers, with its technological advancement in **delivering clean air**, we have been selected as members in International events and EU significant projects.

- Beijing Olympics to ensure air quality for athletes and public after Beijing been a SARS victim by Beijing Central Disease Control
- EU Air Secure project against threat of attack by toxic gases to EU airports
- EU Eden project re protection of vulnerable or groups unable to evacuate during emergency that poses air related threat
- EU Space Shuttle project re protection of astronauts from unknown air related biological threat.
- Finland High Tech Hospital project

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LIFA AIR 麗風

Lifa Air in Asia – Cooperation with Center for Diseases Prevention and Control (CDC) in Beijing
Examination & training center for approval of Beijing Olympics 2008 contractors

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LIFA AIR 麗風

Lifa Air in Asia – Cooperation with Government/Universities in Taiwan

LIFA AIR

Seminars to promote indoor air quality concepts
advise Taiwan government re Indoor Air Quality law 2012

Air Quality improvement in Taiwan Chang Gung hospitals (長庚醫院)

Mr. Stephen Shen (沈世宏) – Minister of Environmental Protection Administration Executive Yuan, R.O.C

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LIFA AIR 麗風

Lifa Air in Asia – Achievements in Hong Kong

LIFA AIR

Cooperate with Housing Authority to sustain air quality to protect occupants and workers during repair and renovation

Cooperation with MTR for air quality improvement in train cars

Cooperation with Hospital Authority for air quality improvement in wards and TB isolation rooms

Air filter testing lab

Cooperation with HK PolyU

Occupational Health Awards

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LIFA AIR 麗風

Lifa Air in Asia – Cooperation with Macau Government

LIFA AIR

Air quality improvement in Cultural Dept.

Meeting with Tobacco Control Office and sharing anti-smoking Experience in Europe

H2S incident investigation in 2012 & improvement recommendation for similar residential building.

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LIFA AIR

Thank you!! 謝謝!!

www.lifa.net