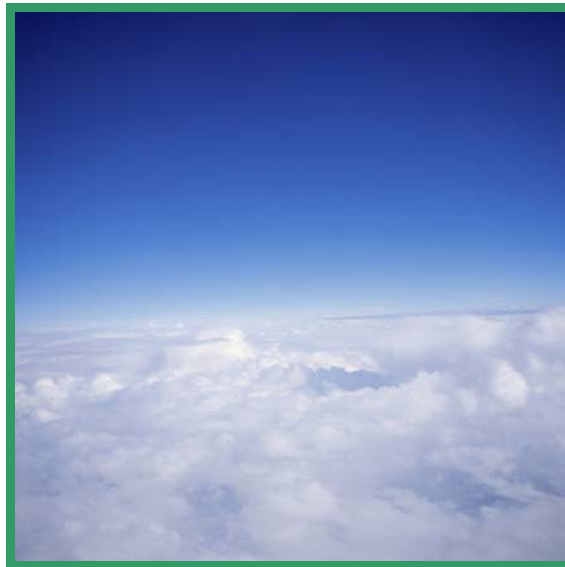


AIR HANDLING PLANT INSPECTION  
&  
AIR MONITORING REPORT

FOR

A Customer



CARRIED OUT FOR:

FACILITIES MANAGER

on  
27<sup>th</sup> January 2005

## **Recommendations at a Glance.**

1. *The Main AHU has debris present within the fan area including rubber fragments. The bacterial count and fungal counts were also raised. We would recommend that this system is cleaned and disinfected as a pre-caution.*
2. *The Toilet AHU has significant sediment to the base. The bacterial count was also raised. We would recommend that this system is cleaned and disinfected as a pre-caution.*
3. *The 3<sup>rd</sup> Floor AHU appeared to be generally clean. The Bacterial and fungal counts were within limits. No remedial actions necessary.*
4. *The carbon dioxide levels were within limits in all areas except the 6<sup>th</sup> Floor. The carbon dioxide levels on this floor were very slightly raised. The occupation level of the 6<sup>th</sup> floor has increased. If possible the volume of “fresh” air supplied to this floor should be slightly increased.*
5. *The temperature was seen to be raised in areas on the Lower Ground (front), 3<sup>rd</sup> Floor (Rear) and 5<sup>th</sup> Floor. Ideally the temperature should be maintained below 23.5°C.*
6. *The relative humidity was low in all areas sampled. There is no humidity control within this building. Low humidity can cause irritation to the eyes, throat and skin in sensitive individuals.*
7. *The particle levels were well within the required limits. Levels were seen to be lower than in previous sampling regimes.*
8. *The bacterial levels were within the required limits in all areas sampled.*
9. *The yeast and mould counts were within the required limits in all areas sampled.*

## **Method Statements**

### **Particle Analysis.**

The particle content of the air was analysed using a Q-Trak Dust Trak System. The Dust Trak system samples the air to analyse the levels of particles down to  $0.001\text{mg}/\text{m}^3$ . Samples were taken at  $4\mu\text{m}$  (Total Respirable Dust) and  $10\mu\text{m}$  (Total Inhalable Dust). These results were compared with the outside air to evaluate the efficiency of the AHU and system filters.

### **Temperature, Humidity, Carbon Dioxide & Monoxide Analysis.**

These parameters are measured using a Q- Trak IAQ Monitor. The results are compared with the relevant standards. Samples were taken at 16 locations.

### **Bacteria and Fungi/Yeast Level Analysis.**

The levels of bacteria and fungi are determined by sampling a preset volume of air (100 litres) onto a 90mm petri dish containing the specific growth media to grow bacteria or fungi/yeast. Two different types of growth media are used at each location. A Merck air sampling system was used for this process. All petri dishes are analysed by our approved laboratory.

## **AHU Inspection**

### **AHU No. 1**



**Debris within the unit including rubber fragments.**



**Some debris evident in the fan area.**

### **3<sup>rd</sup> Floor AHU.**

This unit is generally in satisfactory condition.



**Pre- filters with light fouling.**



**Bag filters - light fouling.**



**Fan Chamber – generally clean**

## **Toilet System.**



**Filters – clean.**



**The fan chamber has heavy fouling to base.**

## Air Handling Plant Swab Results:

Swabs were taken from the fan chambers of each of the Air handling Units to ascertain the levels of bacteria in the system. In good clean systems, we would expect the following levels:

### Bacteria:

S. Aureus	NIL
Coliforms	< 50 cfu/100 cm <sup>2</sup>
Bacillus sp.	< 50 cfu/100 cm <sup>2</sup>

LOCATION	Aerobic Bacteria	Species
Main AHU	<b>152 cfu/100 cm<sup>2</sup></b> 6 cfu/100 cm <sup>2</sup> 28 cfu/100 cm <sup>2</sup> <b>186 cfu/100 cm<sup>2</sup></b>	Bacillus sp. Micrococcus Other sp. <b>TOTAL</b>
3 <sup>rd</sup> Floor AHU	16 cfu/100 cm <sup>2</sup> 18 cfu/100 cm <sup>2</sup> <b>34 cfu/100 cm<sup>2</sup></b>	Bacillus sp. Micrococcus sp. <b>TOTAL</b>
Toilet AHU	<b>&gt;200 cfu/100 cm<sup>2</sup></b> <b>&gt;200 cfu/100 cm<sup>2</sup></b> <b>&gt;400 cfu/100 cm<sup>2</sup></b>	Bacillus sp. Other sp. <b>TOTAL</b>

Both the Main AHU and the Toilet AHU have raised Bacillus species counts. The contact plate for toilet AHU was overgrown with bacteria and needs urgent attention. Both of these systems need to be cleaned and disinfected. The 3<sup>rd</sup> Floor AHU had satisfactory bacterial levels.

**Fungi:**

Swabs were taken from the fan chambers in each of the Air Handling Systems to ascertain the levels of fungi in the ducts. In good clean systems, we would expect the following levels:

Microsporum sp.  
 Pityriasis sp.  
 Candida sp.  
 Mucor sp.  
 Triophyton sp.  
 Aspergillus sp.  
 Rhizopus sp. < 40 cfu/100 cm<sup>2</sup>

Total Count: < 160 cfu/100 cm<sup>2</sup>

LOCATION	Fungi	Species
Main AHU	224 cfu/100 cm <sup>2</sup> 90 cfu/100 cm <sup>2</sup> <b>314 cfu/100 cm<sup>2</sup></b>	Penicillium sp. Other sp. <b>TOTAL</b>
3 <sup>rd</sup> Floor AHU	120 cfu/100 cm <sup>2</sup> 10 cfu/100 cm <sup>2</sup> <b>130 cfu/100 cm<sup>2</sup></b>	Other sp. Penicillium sp. <b>TOTAL</b>
Toilet AHU	68 cfu/100 cm <sup>2</sup> 32 cfu/100 cm <sup>2</sup> <b>100 cfu/100 cm<sup>2</sup></b>	Other sp. Penicillium sp. <b>TOTAL</b>

The fungal counts were raised in the Main AHU. We recommend that this system is cleaned and disinfected.

The yeast and mould counts were within the required limits in the 3<sup>rd</sup> Floor and Toilet AHU's.

## Particle Analysis.

Standard – 0.075 – 0.1 mg/m<sup>3</sup> (ASHRAE 62/99)

### RESULTS

LOCATION	Dust at 10.0µm		
	Minimum	Average	Maximum
Lower Ground Floor Front	15 µg/m <sup>3</sup>	<b>27 µg/m<sup>3</sup></b>	178 µg/m <sup>3</sup>
Lower Ground Floor Rear	13 µg/m <sup>3</sup>	<b>24 µg/m<sup>3</sup></b>	573 µg/m <sup>3</sup>
Ground Floor Front	13 µg/m <sup>3</sup>	<b>16 µg/m<sup>3</sup></b>	83 µg/m <sup>3</sup>
Ground Floor Rear	15 µg/m <sup>3</sup>	<b>27 µg/m<sup>3</sup></b>	395 µg/m <sup>3</sup>
1 <sup>st</sup> Floor Front	11 µg/m <sup>3</sup>	<b>15 µg/m<sup>3</sup></b>	199 µg/m <sup>3</sup>
1 <sup>st</sup> Floor Rear	10 µg/m <sup>3</sup>	<b>20 µg/m<sup>3</sup></b>	1,398 µg/m <sup>3</sup>
2 <sup>nd</sup> Floor Front	12 µg/m <sup>3</sup>	<b>21 µg/m<sup>3</sup></b>	189 µg/m <sup>3</sup>
2 <sup>nd</sup> Floor Rear	11 µg/m <sup>3</sup>	<b>22 µg/m<sup>3</sup></b>	211 µg/m <sup>3</sup>
3 <sup>rd</sup> Floor Front	7 µg/m <sup>3</sup>	<b>10 µg/m<sup>3</sup></b>	31 µg/m <sup>3</sup>
3 <sup>rd</sup> Floor Rear	7 µg/m <sup>3</sup>	<b>10 µg/m<sup>3</sup></b>	113 µg/m <sup>3</sup>
4 <sup>th</sup> Floor Front	11 µg/m <sup>3</sup>	<b>18 µg/m<sup>3</sup></b>	271 µg/m <sup>3</sup>
4 <sup>th</sup> Floor Rear	9 µg/m <sup>3</sup>	<b>13 µg/m<sup>3</sup></b>	68 µg/m <sup>3</sup>
5 <sup>th</sup> Floor Front	8 µg/m <sup>3</sup>	<b>15 µg/m<sup>3</sup></b>	338 µg/m <sup>3</sup>
5 <sup>th</sup> Floor Rear	9 µg/m <sup>3</sup>	<b>21 µg/m<sup>3</sup></b>	258 µg/m <sup>3</sup>
6 <sup>th</sup> Floor Front	9 µg/m <sup>3</sup>	<b>20 µg/m<sup>3</sup></b>	117 µg/m <sup>3</sup>
6 <sup>th</sup> Floor Rear	8 µg/m <sup>3</sup>	<b>23 µg/m<sup>3</sup></b>	414 µg/m <sup>3</sup>

All areas had particle levels well below the required limits.

Occupational Exposure Limits

EH40/04                    4 mg/m<sup>3</sup> (Long Term Exposure)

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ASHRAE                    0.075 – 0.1 mg/m<sup>3</sup> (Long Term Exposure)

## **Comfort Factor – Temperature and Humidity**

Analysis is carried out to determine whether effects of temperature and humidity are contributing to poor working environments. Within their own parameters apart from instigating discomfort if too hot or too humid, they pose minimal problems to the indoor environment. However their contribution to other factors such as increased bacterial and fungal growth may instigate a much greater cause for concern.

### **Humidity –**

Humidity can have adverse affect on the growth of mould and dust mites within an area if allowed to become too high. Rapid growth occurs when levels of humidity increase **above 60%**, with great effects to respiratable illnesses such as asthma. In the same aspect if levels of humidity become too dry, **below 30%** this too can have adverse effects, with some people susceptible to sore throats due to the dryness of the air.

The optimum level of humidity should be between **30 - 60%**, which is much dependent on the indoor environment in question and any seasonal variation.

### **Temperature –**

Temperature levels within an indoor environment will vary greatly on the time of year and personal preference. However increased temperature within a confined space such as an indoor environment can instigate a more suitable environment for the growth of unwanted bacteria and fungi.

Analysis must be carried out in close collaboration with other parameters analysed to determine characteristics of change.

In general the optimum level of air temperature within a building should be below **23.5°C**.

## RESULTS

LOCATION	Temperature	Relative Humidity
Lower Ground Floor Front	<b>24.0°C</b>	<b>17.3 %</b>
Lower Ground Floor Rear	21.9°C	<b>18.6 %</b>
Ground Floor Front	21.9°C	<b>16.3 %</b>
Ground Floor Rear	22.8°C	<b>16.5 %</b>
1 <sup>st</sup> Floor Front	22.9°C	<b>17.1 %</b>
1 <sup>st</sup> Floor Rear	23.1°C	<b>17.2 %</b>
2 <sup>nd</sup> Floor Front	23.4°C	<b>18.3 %</b>
2 <sup>nd</sup> Floor Rear	22.8°C	<b>19.5 %</b>
3 <sup>rd</sup> Floor Front	23.4°C	<b>16.5 %</b>
3 <sup>rd</sup> Floor Rear	<b>23.7°C</b>	<b>16.5 %</b>
4 <sup>th</sup> Floor Front	23.0°C	<b>17.9 %</b>
4 <sup>th</sup> Floor Rear	23.9°C	<b>19.9 %</b>
5 <sup>th</sup> Floor Front	<b>23.8°C</b>	<b>21.8 %</b>
5 <sup>th</sup> Floor Rear	<b>23.8°C</b>	<b>20.2 %</b>
6 <sup>th</sup> Floor Front	23.1°C	<b>24.9 %</b>
6 <sup>th</sup> Floor Rear	22.1°C	<b>26.9 %</b>

The temperature was seen to be slightly raised in a number of areas. Ideally temperatures should be kept below 23.5°C.

The relative humidity levels were low in all areas sampled. Low humidity can lead to irritation of the eyes, skin and throat in sensitive individuals. There is no humidity control within this building.

## **Gas Level Monitoring**

Analysis is carried out in respect of the amount of that gas present within an area of air. Levels of contamination can have varied effects on those inhabitants in the area of concern, depending on the gas in question.

### **Carbon Dioxide (CO<sub>2</sub>) -**

High levels of carbon dioxide can lead to lethargy, and poor working conditions for those concerned. To the employer this can mean a lower working efficiency, and a higher rate of sick leave.

**1,000 ppm** - is considered to be the level of concern at which the amount of CO<sub>2</sub> is undesirable within the indoor air environment.

LOCATION	Carbon Dioxide	Carbon Monoxide
Lower Ground Floor Front	494 ppm	0 ppm
Lower Ground Floor Rear	554 ppm	0 ppm
Ground Floor Front	445 ppm	0 ppm
Ground Floor Rear	460 ppm	0 ppm
1 <sup>st</sup> Floor Front	463 ppm	0 ppm
1 <sup>st</sup> Floor Rear	472 ppm	0 ppm
2 <sup>nd</sup> Floor Front	579 ppm	0 ppm
2 <sup>nd</sup> Floor Rear	620 ppm	0 ppm
3 <sup>rd</sup> Floor Front	510 ppm	0 ppm
3 <sup>rd</sup> Floor Rear	509 ppm	0 ppm
4 <sup>th</sup> Floor Front	512 ppm	0 ppm
4 <sup>th</sup> Floor Rear	636 ppm	0 ppm
5 <sup>th</sup> Floor Front	812 ppm	0 ppm
5 <sup>th</sup> Floor Rear	569 ppm	0 ppm
6 <sup>th</sup> Floor Front	<b>1,029 ppm</b>	0 ppm
6 <sup>th</sup> Floor Rear	<b>1,004 ppm</b>	0 ppm

The Carbon Dioxide levels were within the required limits in all areas sampled except the 6<sup>th</sup> Floor. This floor now has high levels of occupation. The volume of “fresh” air supplied to this floor should be increased if possible.

All Carbon Monoxide levels are within limits.

Occupational Exposure Limits

Eh40/04                      Carbon Dioxide        - 5,000 ppm (Long Term Exposure)  
                                    Carbon Monoxide     - 30 ppm (Long Term Exposure)

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ASHRAE62/89              Carbon Dioxide        - 1,000 ppm  
                                    Carbon Monoxide     - 9 ppm

## **Microbiological Analysis**

Contamination Levels are determined by the total colony forming units per cubic meter using Merck Air Sampler, which utilises 90mm Petri Dishes for increased accuracy, thus complying to COSHH Regulations 1988 in respect to:-

Maximum Exposure Levels - MEL

Occupational Exposure Standards - OES

EH40 Occupational Exposure Limits

Use of Control Measures

The parameters for levels of contamination are classed as follows:-

### **Aerobic Bacteria -**

0	-	500	cfu/m <sup>3</sup> -	<i>SATISFACTORY</i>
501	-	+	cfu/m <sup>3</sup> -	<i>UNSATISFACTORY</i>

### **Yeasts & Moulds -**

0	-	300	cfu/m <sup>3</sup> -	<i>SATISFACTORY</i>
301	-	+	cfu/m <sup>3</sup> -	<i>UNSATISFACTORY</i>

Above results based on Swedish Guidelines.

Bacteria in air and fungi in air are measured in units expressed as Colony Forming Units per m<sup>3</sup> (cfu/m<sup>3</sup>). The surface of nutrient agars (formulated to favour the growth of either bacteria or yeast & mould) are exposed to measured volumes of air, drawn through the sampler. Samples are then incubated and analysed by an independent UKAS – registered laboratory. A wide range of population and species is detectable.

## Microbiological Results

LOCATION	Aerobic Bacteria	Yeast & Fungi
Lower Ground Floor Front	10 cfu/m <sup>3</sup>	20 cfu/m <sup>3</sup>
Lower Ground Floor Rear	120 cfu/m <sup>3</sup>	10 cfu/m <sup>3</sup>
Ground Floor Front	10 cfu/m <sup>3</sup>	NIL
Ground Floor Rear	10 cfu/m <sup>3</sup>	NIL
1 <sup>st</sup> Floor Front	10 cfu/m <sup>3</sup>	NIL
1 <sup>st</sup> Floor Rear	10 cfu/m <sup>3</sup>	NIL
2 <sup>nd</sup> Floor Front	100 cfu/m <sup>3</sup>	30 cfu/m <sup>3</sup>
2 <sup>nd</sup> Floor Rear	190 cfu/m <sup>3</sup>	NIL
3 <sup>rd</sup> Floor Front	20 cfu/m <sup>3</sup>	NIL
3 <sup>rd</sup> Floor Rear	30 cfu/m <sup>3</sup>	NIL
4 <sup>th</sup> Floor Front	40 cfu/m <sup>3</sup>	10 cfu/m <sup>3</sup>
4 <sup>th</sup> Floor Rear	30 cfu/m <sup>3</sup>	10 cfu/m <sup>3</sup>
5 <sup>th</sup> Floor Front	50 cfu/m <sup>3</sup>	NIL
5 <sup>th</sup> Floor Rear	50 cfu/m <sup>3</sup>	NIL
6 <sup>th</sup> Floor Front	60 cfu/m <sup>3</sup>	10 cfu/m <sup>3</sup>
6 <sup>th</sup> Floor Rear	110 cfu/m <sup>3</sup>	10 cfu/m <sup>3</sup>

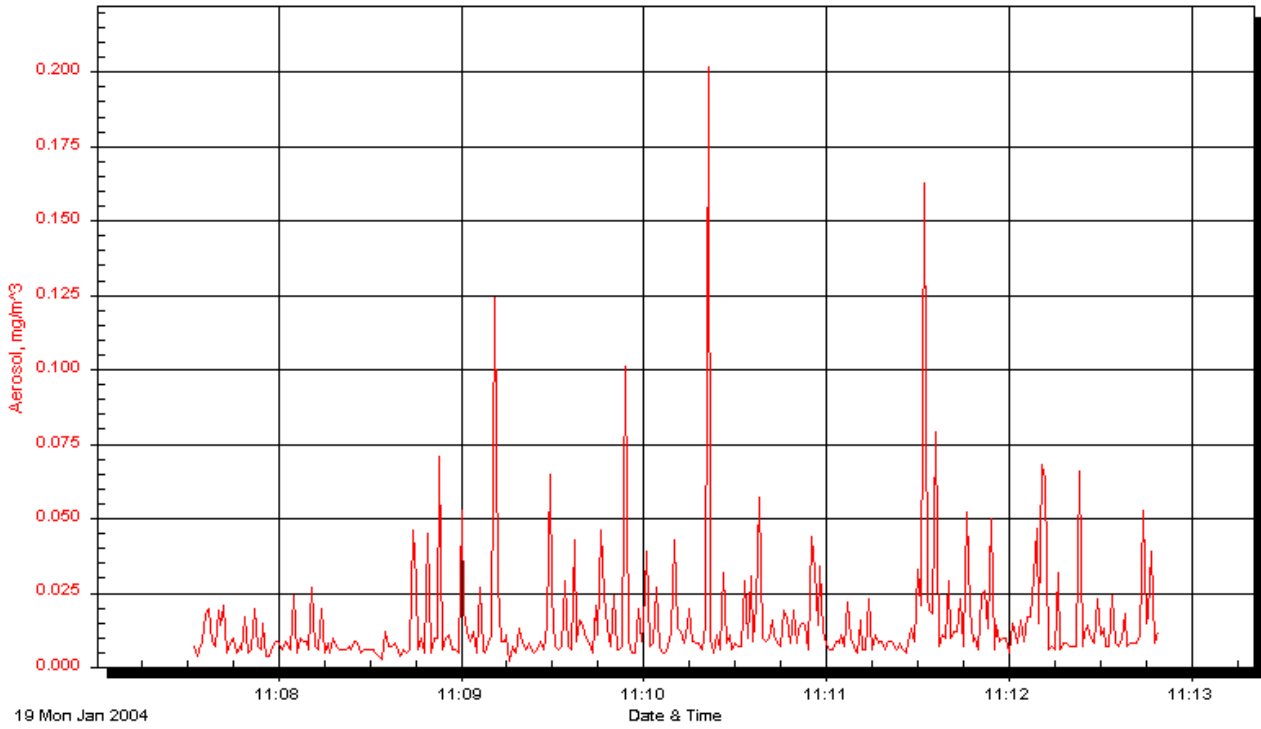
All the bacterial levels are within the required limits.

All yeast & mould counts were within the required limits.

Visit carried out by: John Norris.

Signed:

**Example**  
7th Floor - Location 1



**Example**  
5th Floor - Location 2

