Improving Air Quality in the City of London

A practical guide for building engineers and facilities managers

CityAir

cityoflondon.gov.uk/cityair

CITY OF LONDON

A City of London initiative supported by:

NHS

East London and the City

SITUATION

Air Quality in parts of the City of London is the worst in the country and amongst the worst in Europe. It may not be as visible as the smog of Victorian London, but it is ever present.

Nitrogen dioxide (NO_2) is up to three times the recommended level for health and particulate matter (PM_{10}) regularly breaches EU limits.

IMPACT

Poor Air Quality has a significant impact on health, with up to 8,000 premature deaths in London each year attributed to it.

Fine particles have the greatest impact on health. Young children and the elderly are most susceptible.

The UK could face significant fines from the EC for failure to comply with Limit Values.

SOURCES

As with carbon, the major sources of air pollution are from combustion as a direct result of transportation and heating.

Carbon reduction, energy efficiency and modifying transport policies should therefore go hand-in-hand with improving air quality.

With the help of City businesses, and the people that live and work in the Square Mile, we can make a difference to our health and the wellbeing of those around us.

THE FUTURE

There are many measures in place to deal with emissions from new developments including the construction and development phase, but no measures are in place to address existing building stock and how activities associated with them can reduce emissions.

A great deal is already being done at the 'high end', where capital investment is required, to measure, monitor and retrofit, to reduce carbon emissions and improve the energy efficiency of buildings.

Although troubleshooting guides exist there is very little available that either relates to the air quality impact of the built environment, nor simple guidance where the building engineer can have a direct impact on a day to day basis.

The information in this document provides a short and simple toolkit, to address general, air quality, behavioural change and engagement issues resulting from day to day building usage. This document has been produced with the Chartered Institute of Building Service Engineers (CIBSE), the professional organisation for the building engineer www.cibse.org.

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MANAGEMENT PROCESSES

Initial Survey

- **An initial baseline survey gives an assessment of the present condition of components or systems**
- They provide information on both short term and long term maintenance needs
- They are valuable in setting priority objectives and when planning short and long term expenditure
- **In the absence of any other detailed listing of the plant and equipment within the property, for example a building log book, they provide an opportunity for such information to be collected and assembled in a consistent format**
- **For further information see the CIBSE website**
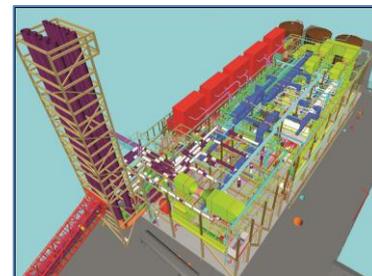
Performance Monitoring

- **Understanding how a building is performing by comparing data against recognised indicators can be invaluable in assessing whether the building has a fundamental problem**
- Considerable energy performance data is available for a range of building types, listing both 'good practice' and 'typical practice'
- Since all buildings are provided with regular invoices showing the energy used, based on meter readings, it is relatively straightforward to make comparisons with published information
- **For further information see the CIBSE website**
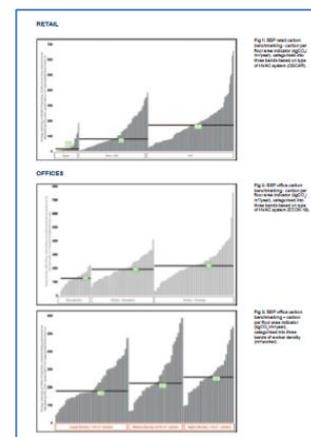
Building Log Book

- **To undertake any form of performance monitoring, suitable records need to be kept**
- Log books should improve the understanding, management and operation of buildings, resulting in more sustainable buildings with lower running costs:
    - to span the gap between design and operation
    - to improve the facilities manager's understanding of the design intent
    - to provide more concise and accessible information than in manuals provided
    - to provide a vehicle for recording building alterations and performance
- **For further information see the CIBSE website**

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Checklist

- Alongside establishing a building log book it is useful to keep a record of the changing requirements of individual tenants
- **Maintain a checklist across all building operations to assist with energy management**
- **The template below has been developed to help the building engineer achieve this and is available free by contacting CityAir@cityoflondon.gov.uk**

| MAIN THEME	Method	SCHEDULE OF ENERGY MANAGEMENT HOUSEKEEPING MEASURES — SITE ADDRESS;	Building Manager	Tenant	Cleaning	Security	Maintenance
HEATING & COMFORT	Control	Review with Staff that best setting for TRV's is between '3' & '4'	X				
	Control	Engage with tenants to remind that energy best practice room temperature is 21 deg. C	X				
	Control	Setting of local cooling plant temperatures - often fighting heating?					X
	Control	Weekly management of local overtime/heating times	X				X
	Control	Turn off ventilation /heating to occasional meeting rooms when not in use.		X			
	Manage	Close doors and windows especially at end of day		X	X	X	
	Manage	Liaise with tenant manager to report any early finish of requested heating extensions	X				
	Manage	Manage adjustment of thermostats down GRADUALLY (1 degree/week) 1 degree C reduction on heating thermostat saves 10%					X
	Manage	Obvious waste e.g. overheated corridors/stairwells/lobbies (produce 6 monthly temperature logs)	X			X	X
	Review	Avoid using local electric heaters - investigate reason for need and resolve the cause - heating defects/filtration	X	X			
	Review	Check that grilles to ventilation systems are clean - dirt lowers efficiency					X
	Review	Check that heat emitters are not blocked with office equipment- lowers efficiency					X
	Review	Investigate all reports e.g. 'overheating' - Ask for heating to be turned down /don't open windows	X	X			X
	Review	Check room thermostat is in a position to represent the temperature of the occupied space	X	X			X
	Review	Reports draughty windows/doors/grilles - often reported as area is 'cold' causing thermostats to go up.	X	X			
COOLING	Control	Before starting local cooling make sure heat emitters are timed/switched off					X
	Control	Check the setting of local cooling plant & temperatures/ fighting heating					X
	Control	Computer Servers usually OK to 28 deg. C - set local 'Stat to 25 degrees C min.	X	X			
	Control	Cooled rooms- keep doors and windows closed - Don't try to cool the street	X	X			
	Control	Switch off PC monitors at vacant desks/out of hours - the monitor is 75% of total power use		X			
	Review	In summer close blinds to East windows over night - less heat gain for 9.00AM start		X		X	
	Review	Cooled areas-use blinds or curtains in summer to mitigate the effects of solar gain	X	X		X	
	Review	switch off unwanted office equipment -if left on takes a further 1/3 kW to remove by Cooling systems		X			
WATER ISSUES	Control	Reduce excessive hot tap temperatures waste energy - extra cold is used to cool it	X				X
	Control	Report leaking taps and running overflows	X	X	X	X	
	Control	Where available, only use dishwashers on 'full loads' - 'part loads' = same use		X	X		
	Manage	Attend to exceptional use promptly - water leaks are expensive					
	Review	WC cisterns use approx. 7 litres/flush - save by using a 'half flush' on light loads	X				
	Review	Where spray taps are not fitted use the basin plug when washing your hands	X	X			
LIGHTING / ELECTRICAL POWER ISSUES	Control	At end of day switch off the lights when areas are vacated		X	X	X	
	Control	Cooled rooms - lights left on waste energy twice - 1/3 kW is used in cooling power for every kW of light		X	X	X	
	Control	Resolve obvious waste e.g. external lights on in middle of day	X			X	X
	Control	Resolve obvious waste e.g. lights on in corridors/stairwells/lobbies	X	X		X	X
	Control	Arrange for canteen lights to be switched of after lunchtime		X			X
	Control	Switch off kitchen & WC lights in good daylight and at end of working period		X			
	Manage	Consider a local energy 'mentor' to switch lights off to stores etc	X	X			
	Manage	Consider green labels to switches so everyone knows what can be off when OK	X				
	Manage	Consider local task lighting instead of lighting whole zones (especially out of core hours)	X				X
	Manage	Report dim/yellow lamps - lamps that need changing use the same power for less light	X	X		X	
	Review	Ask management about improved zoning of light switches/fittings	X				X
	Review	Make best use of daylight - consider switching of lights by windows	X	X			
	Review	Switching economy -10% saving on 90% is as good as 90% on 10%	X				
POWER	Control	Check automatic plant - is it correctly set for British Summer /Winter time?	X				X
	Control	Avoid local electric heaters and fans - cost up to 4 X main central heating system	X	X			
	Control	Heat & vent plant 'on' out of hours wastes fan/pump power as well as heat					X
	Control	Kitchen/smoking room fans - switch off when you leave		X			X
	Control	PC screens = 75% of PC computer load - switch off if away 1/2 hr or more		X			
	Control	Refrigerators - do not set stats to achieve lower than 5 degrees C = waste	X				X
	Manage	Switch off sundry equipment at end of working day e.g. copiers and printers		X			
	Review	Only going down or up one floor- why not use the stairs?		X			
	Review	If practical turn the AC off 1 hour before the scheduled end of the working day					
GENERAL ISSUES	Manage	Basic good Housekeeping can save up to 10%	X	X	X	X	X
	Manage	Be responsible for advising staff of need for control and care about power use		X	X	X	
	Manage	If you do not manage the switch off the lights and air conditioning at the end of the day, who else will?		X	X	X	
	Manage	Energy Awareness helps shortfalls in controls etc. to be rectified = more saved	X	X	X	X	X
	Manage	Energy Awareness reduces costs without affecting comfort or performance	X	X	X	X	X
	Manage	Extra savings are available for minimum of effort - providing it is sustained	X	X	X	X	X
	Manage	Induct new staff to the need to control Energy /waste	X	X	X	X	X

OPERATIONAL BEST PRACTICE

Building Management System

- By reviewing the surveys and log books described above - at this point establish better:
    - Temperature set points for each room/floor
    - Time setting for occupancy usage
    - Anomaly detection with action settings
    - Logging of requests to change settings and reverting when the sitaution changes back
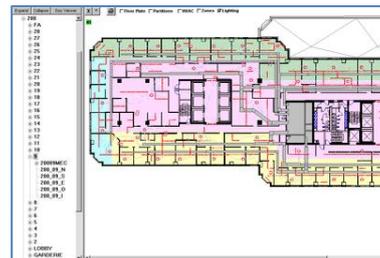
Boilers

- To ensure boilers operate at maximum efficiency and produce minimum airborne contaminants, it is essential to have regular combustion efficiency tests and routine maintenance procedures in place
    - Annual for gas and six monthly for oil
- **Inspection and maintenance - ensure:**
    - Planned preventive maintenance regime
    - Engineers have appropriate training and familiarity with the installed systems
    - Engineers have access to manufacturers guidelines and diagnostic equipment
- **Routine checks of the plant room**
    - Identify signs of damage, breakage and leaks
    - Is it uncomfortably hot or are there any dry pungent smells?
    - Establish a weekly report on flue gas temperatures and a full combustion analysis
- **Where a full boiler upgrade is not feasible look to install a lean burner**
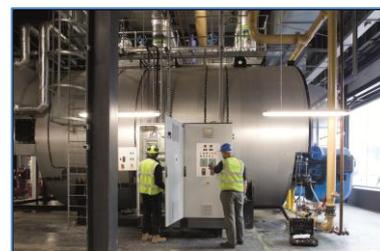
Generators

- Ensure that a regular inspection and testing regime is in place
- The inspection should result in the production of a report detailing the emissions during testing
- Does the exhaust cause environmental nuisance for particle discharge or noise?
- Lengthen the time between testing as long as it does not invalidate the manufacturer's warranty

Air Conditioning & Filtration

- Improving indoor air quality is also an important consideration in increasing employee wellbeing:
    - Ensure that your air filters are regularly maintained and comply with EN 13779*
    - Install low energy two stage particle and gas filters for maximum effect and cost savings


Particles caught by air filter
Photo: Lennart Nilsson

* It is a legal requirement to inspect all air conditioning systems with a rated output over 12kW at intervals not greater than 5 years

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ENGAGEMENT

Profile Raising

- **The City of London would be happy to provide support with a range of campaigns and initiatives - please contact CityAir@cityoflondon@gov.uk**
- **Engage with tenants and encourage a free flowing discussion on both energy usage and the importance of improving air quality**
- **Run awareness raising campaigns such as:**
    - Walking (rather than a journey by taxi)
    - Jumper to work (to keep the heating off)
    - Stair days (to avoid lift use)

- **Start an open an honest dialogue to establish:**
    - Impact of energy usage decisions
    - Real user requirements
    - Supply chain consolidation
    - Waste rationalisation
    - Employee transportation policy

- **Practical Engagement:**
    - Explain why rooms are the way they are…
    - Define comfort and defend your decisions

- **If conducting an energy review don't just settle for pure energy efficiency - look at low NOx boilers and reducing gas consumption**

- **Identify floor-by-floor usage and bill monthly accordingly, rewarding occupiers through billing reductions**

- **Ensure that the filters in air handling units are suitable for the levels of NOx and PM_{10} in London and that they are changed regularly**

- **Show how important it is to reduce what the building emits alongside why there is a need to filter what is coming in!**
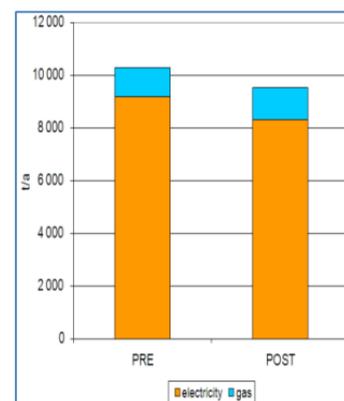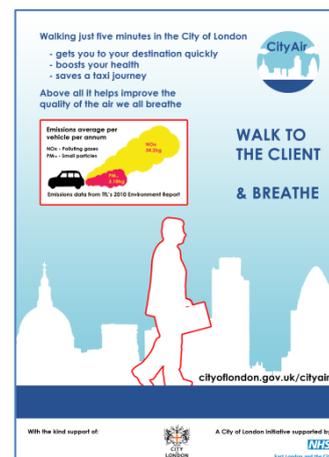
The Bigger Picture

- **Think air quality!**
- **Sign up to CityAir**
    - **Launch an awareness raising campaign**
    - **Share your knowledge and ideas**
    - **Follow us on Twitter @_CityAir**

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AIR QUALITY CHECKLIST

Management Processes	
Situation Survey	☐
Performance Monitoring	☐
Building Log Book	☐
Checklist	☐

Operational Best Practice	
Building Management System	☐
Boilers	☐
Generators	☐
Air Conditioning & Filtration	☐

Engagement	
Profile Raising	☐
The Bigger Picture	☐
Sign up to CityAir	☐

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