



# **Windcatcher**

Natural Ventilation Systems



August 2009

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## from...2,000 years of success

The principle of encapsulating any prevailing winds and using this natural resource as a form of ventilation originated some 2,000 years ago in the Middle East, where "wind towers" were often a common sight, but the principle is still used today.

The **Monodraught Windcatcher** is an extension of that principle but is also a development of the highly successful Monodraught Vertical Balanced-Flue System patented in 1965 which has now been utilised by almost all leading companies in the UK to provide optimum ventilation for any boiler house configuration.

Clean, fresh air, relatively free from contamination or traffic pollution, is carried down from roof level to the floors below through internal ducts and a controlled damper arrangement. By maximising wind power the need for air conditioning is eliminated.

“ Monodraught Windcatchers have proved to be the most effective method of providing natural ventilation to any commercial building. ”

*National Green Specification*



# Making the best use of our natural resources

Since its inception, Monodraught Ltd has always sought to invent, explore and develop innovative concepts.

In 1990 Monodraught launched the Windcatcher Natural Ventilation system, which was based on the original Vertical Balanced-Flue arrangement and combines all the advantages of passive stack and wind driven natural ventilation.

Professor Terry Payne, founded the Company in 1974. Since then the company has specialised in the development of natural ventilation and low energy systems and products for the built environment.



A significant feature of the Monodraught product range is the high level of Architectural design empathy achieved through design flexibility. This enables designs to be visually appealing whilst still achieving an efficient and practical contribution to the harnessing of our natural resources.

*Indoor Market, Bridgetown, Barbados*



*Imperial College, London*



# Why choose natural ventilation ?

## 1 It is cost effective

The cost of natural ventilation systems is often less than that of a mechanical ventilation system plus there are no running costs or energy consumption. In today's current climate with energy costs escalating at an unprecedented rate, there is no telling what energy costs will be in say, 5 or 10 years' time! Once natural ventilation is installed, there are no running costs ever for the life of the building.

## 2 It is healthier

Natural ventilation brings in a steady supply of fresh air into the building, topping up the oxygen level, whilst at the same time expelling stale air to atmosphere using the natural buoyancy of thermal forces. Fan Noise often associated with mechanical systems or air conditioning is virtually eliminated to the benefit of the occupants.

## 3 It requires no maintenance

Since natural ventilation systems have generally speaking essentially no moving parts, there is nothing to wear out, break down, corrode, or indeed require replacement.

## 4 Has a long term track record

Our Victorian forefathers used natural ventilation extensively, as indeed did the Persians and Arabians before that. Today's natural ventilation systems have all the benefit of sophisticated controls but retain the well established principals of the origins of natural ventilation.

## 5 Is sustainable energy in action

By maximising the use of wind pressure and the natural stack effect of thermal buoyancy, natural ventilation does not use any fossil fuelled energy but relies on harnessing wind power and the thermal rise of warm air to be used in a controlled and sophisticated way.



*St Annes School, Haute Valley, Jersey*

# Why choose *Windcatcher*?

## ▶ Night time cooling

Windcatcher systems provide the benefit of night-time cooling or “free cooling”, which is considered to be one of the most important aspects of the Windcatcher natural ventilation strategy. During summer months, the volume control dampers are programmed to open fully at night time to encapsulate the cool night air.

Any prevailing wind carries this night air down into the building below purging the building of stale air. The cleansing effect of this downwash of cold air leaves the building interior feeling fresh and clean for the benefit of the occupants arriving in the morning.

## ▶ More than just a passive stack

Early naturally ventilated buildings relied purely on a passive stack approach to act like a ‘chimney stack’. The limitation of such an arrangement is that to work effectively, the temperature in the passive stack has to be some 10°C above the ambient temperature in the room, which in summer months may lead to overheating. Windcatchers overcome this problem by incorporating wind driven air intakes to generate a positive pressure in the room below and combined with temperature differential this assists the passive stack element to exhaust the stale air.

## ▶ Proven track record

Monodraught Windcatchers have an impressive history. With over 7,000 Windcatcher installations over the last 15 years, Monodraught systems have consistently and effectively negated the need for air conditioning systems. 70% of Monodraught Windcatchers are installed on Schools, but increasingly, Hospitals, Offices, and many Community Projects are now benefiting from Windcatcher systems.



## ▶ Precise control

Monodraught provide a range of highly sophisticated control systems (see Page 7 and also separate controls brochure) to enable the user to easily control the flow of fresh air depending on either internal temperature, CO<sub>2</sub>, wind movement, or humidity. The option of acoustic lining to the internal Windcatcher quadrants provides control over external noise transmission into the room.



*Oxley Park School, Milton Keynes*

## How does *Windcatcher* work ?

The main advantage of the Monodraught Windcatcher system over other forms of natural ventilation is that it doesn't matter which way the wind blows, the louvres on one side will always encapsulate the prevailing wind and turn that air movement down through 90°.

Stack effect is achieved as a result of the difference between the air temperature inside and outside of a building - and the subsequent imbalance effect on air density and pressure gradient of the internal and external air masses, results in the warm air rising up through the quadrants, dispersing to atmosphere.

### Daytime Operation

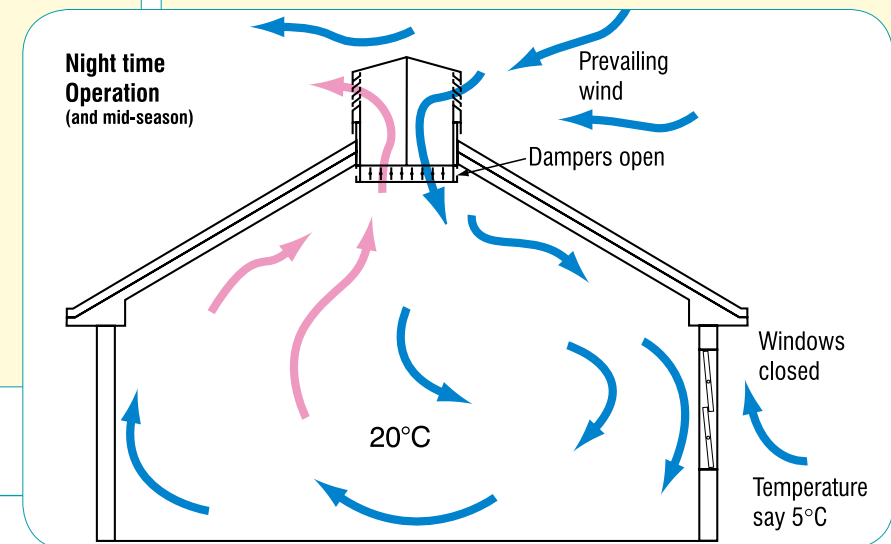
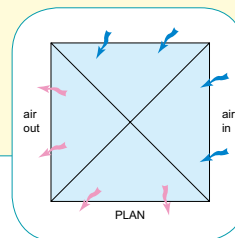
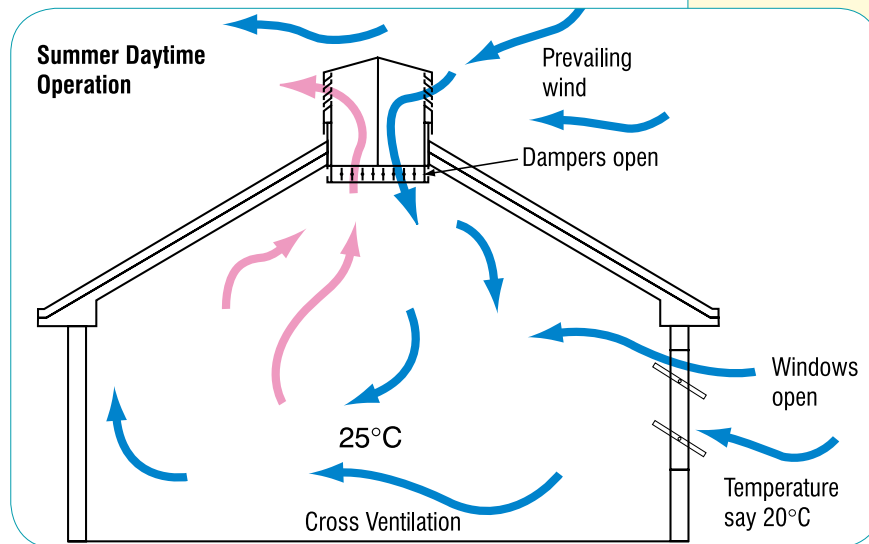
In the Summer months, perimeter windows can be utilised to aid cross flow ventilation. With fresh air coming in through the windows on the windward side of the building, stale air will be exhausted through the passive stack element of the Windcatcher system. Warm air will naturally rise to ceiling level but at the same time any prevailing wind on the Windcatcher system carries a supply of fresh air down into the room below, thereby slightly pressurising the building and increasing the outward flow of stale air.

### Night Time and Mid-Season Operation

During mid-seasons and in the evenings or at weekends, when the building is perhaps not being used, the Windcatcher system is not dependent on openable windows or vents in the side of the building, which allows the building to fully secure.

With all external windows closed, the Monodraught Windcatcher will still continue to operate providing all the benefits of this "free air conditioning". This is particularly important at night time to provide free cooling. Volume control dampers at the base of the system at ceiling level will precisely control the amount of airflow through the system. If the internal temperature falls below 15°C the dampers will automatically close to prevent overcooling.

By the movement of external air at roof level, a negative or suction zone is also created to one side of the Monodraught system that serves to encourage the extraction of stale air to atmosphere.



# How is it controlled ?

There are three basic methods of controlling the Monodraught Windcatcher natural ventilation system.

### Automatic Control

A fully programmable Automatic Control Panel is provided as standard in the Monodraught package. These panels can be controlled by either temperature or CO<sub>2</sub> sensors, depending upon the requirements of each specific application. Rain sensors are included as standard. These panels can serve multiple rooms and are supplied in four standard configurations to meet the project requirements.

### Temperature

One or more temperature sensors are normally positioned in the room to achieve an average reading. This is the simplest method of automatic control and is suitable for most applications. The dampers are normally set to commence opening at 16°C during summer months and open 20% for every 1°C rise in internal room temperature. Seasonal switching enables the temperature set points to be increased in the winter setting to prevent heat loss during this period.



### CO<sub>2</sub>

In the case of densely populated areas of a building, such as classrooms, conference rooms or social areas, CO<sub>2</sub> sensors are recommended normally set to 1500ppm, to be used in conjunction with the temperature sensors.

### Manual Override

Each room has a manual override, which forms part of the temperature sensor. This consists of a push button arrangement with three LED lights to give the end user complete control over their ventilation strategy. The system automatically reverts to its pre-programmed setting after a 20 minute delay, or can be configured to 1 or 3 hours.

### Semi-Automatic Control

The Windcatcher can be supplied with a Semi-Automatic Controller that also allows the end user to control the opening or closing of the dampers using the push button overrides. The automatic control system opens the damper arrangement when the internal temperature rises above 20°C. Below 20°C the dampers will begin to close. However, at anytime the user can override the damper position using the push buttons.



*iNVENT: Intelligent Natural Ventilation control system*

The iNVENT system is a bespoke in-house designed natural ventilation management system for up to 4 zones of Sola-boost or Windcatcher systems. Utilising our seasonally adjusted proportional control based on temperature and CO<sub>2</sub>.

The unobtrusive look allows the system to be sited all around buildings rather than just the boiler room. This means each panel can be local to the zones it controls minimising cabling.

### Manual Control

This is the most basic method of control with manual dampers operated by a lever at ceiling diffuser level. In general terms this means that dampers are normally left fully open during summer months and only partially open during winter months to allow trickle ventilation, but still allow full end user control.

Classrooms and other teaching spaces are one of the main areas where natural ventilation is vital for the wellbeing of the occupants. The Government guidelines on ventilation for educational buildings have changed. The DfEE document, BB87, concentrated on internal temperatures as the overriding factor to determine ventilation levels. However, BB101 concentrates more on air quality than on internal temperature and provides guidelines on acceptable levels of CO<sub>2</sub> over the course of the School day. A figure of 1,500 parts per million (ppm) as an average over the day has been adopted in the document, although the upper level is 5000ppm. However, BB101 still refers to acceptable internal temperature limits and all Monodraught ventilation schemes take this into account.

During the summer period, temperature levels will be the overriding factor but in the winter, CO<sub>2</sub> levels will dictate the amount of ventilation required. The Monodraught Windcatcher automatic control panels are linked to temperature and CO<sub>2</sub> sensors, to ensure the requirements of both BB101 and BB87 are met.

Windcatcher systems are also ideal for providing ventilation to other non-teaching areas, such as Dining Halls, Libraries, and Gymnasiums and are also ideal for corridors, store rooms and similar areas that do not have the benefit of openable windows.

Windcatchers and their associated systems are now also being increasingly used in Sports Halls and the like.

## Best in class

**M**onodraught Windcatcher have achieved an enviable reputation although there have been some companies that have attempted to copy the Monodraught Windcatcher systems and indeed, many Engineers and Designers have designed their own bespoke natural ventilation systems.

The fact cannot be ignored however that over the last 10 years, Windcatcher systems have proved to be consistently effective and reliable and have performed in accordance with the initial design criteria. It is the constant 'fine tuning' and feedback to Monodraught's dedicated Design Teams which enables this state of perfection to have been achieved. The 'acid test' of the effectiveness of Windcatcher



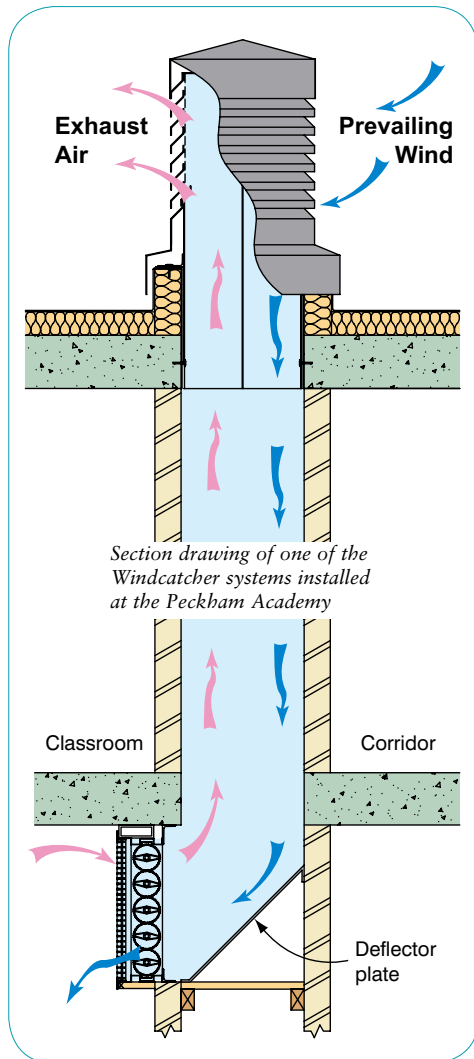
**Queen Elizabeth Sixth Form College,  
Darlington, Co Durham**  
Architect: **Brown Smith Barker, Darlington**

The area once formed an open courtyard, which was roofed over to provide a Library and IT Room. 6N°. GRP 1000 Windcatcher systems were installed to provide natural ventilation – and the College landscape gardeners were given a free hand to provide an attractive garden-like setting for the new Windcatchers. The Architects remarked that ever since the new building was occupied there had been nothing but praise for the natural ventilation provided by Windcatchers as compared to the adjoining, air conditioned, IT Room. A far more pleasant working environment is immediately noticeable to everyone using the school.

systems has perhaps best been demonstrated during the hot summer of 2006, where daytime temperatures as high as 36°C were recorded and yet, throughout this unprecedented and extensive 'hot spell', Schools and offices where Windcatcher systems were fitted, experienced a high satisfaction rate – with no reports of any failures or overheating. No-one knows what future summers hold in store but if 2006 was anything to go by, Monodraught are confident that their Windcatcher natural ventilation systems will continue to provide a completely reliable and dependable method of providing energy free natural ventilation.



# Multi-floor operation



Where it is necessary to provide natural ventilation on multi-floor installations, Monodraught Windcatcher systems have provided an effective solution.

Each room should be served by a separate duct to avoid problems of cross talk and acoustic lining can be provided, where required, to eliminate the ingress of external traffic noise. Motorised dampers and eggcrate ceiling grilles can either be located at ceiling level to each duct or the duct can be turned through 90° at ceiling level. This is now a typical arrangement for schools whereby multiple floors are common place. Rectangular shaped systems are generally provided to lower floors as these reduce the impact on floor space as the duct passes through an intermediate floor.

Windcatchers increase the utilisation of the thermal mass of the building by maximising the advantage of night time cooling. For multi-floor applications, it is a relatively simple matter to provide builders work ductwork to lower floors.



**Peckham Academy, London**  
Architect: **Curl La Tourelle**  
Consulting Engineers: **Halcrow, Burderop Park, Swindon**

The £23m Academy in central London consists of 3-storey buildings, where it was necessary to provide natural ventilation not only to the top floor but also to the two floors below. Monodraught Windcatchers were used to provide a sustainable solution to achieve ventilation to deep plan Classrooms on multiple floors. The top floor Classrooms are served by 800mm units, positioned in the centre of each room, whereas ground and first floors are served by rectangular units measuring 1300mm x 450mm, connected up to internal blockwork ventilation shafts formed in the walls of the central corridors.



Roofscape of Peckham Academy

# Fresh air for inner city schools

The demands on Designers for such Projects is considerable. Schools in inner cities suffer from even higher adverse external ambient conditions than the rest of the country but the demand for energy free solutions is even greater.

A counter argument put forward against the use of natural ventilation for inner city Schools is the question of air pollution related to air quality. Monodraught's answer to that is that children still have to travel to School, they often walk to School, and they still probably go out to play between Classes! The alternative cost of filtration and cooling by mechanical means for such Schools would be immense.

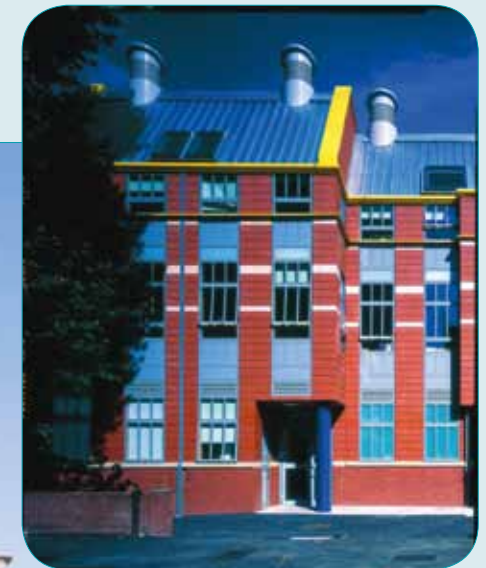
Monodraught Windcatchers are not necessarily the perfect cure but it is considered that drawing air from above roof level, which is well above the traffic pollution that pervades at pedestrian level, must surely be a far better option.

At Addey & Stanhope School, situated on the busy A2 trunk road in Deptford, Guy Shackle, Associate for the Architects, explained, "Any design solution could not rely on opening the windows to provide fresh air for the occupants. I was impressed with the simplicity of the Windcatcher technology. The systems proved the most appropriate technical solution and also met our pragmatic agenda on other issues. They are cost effective and provide a low energy passive system with good green credentials."

**Addey and Stanhope School, Deptford**  
Architect: **Barron and Smith Architects**

The School was completed in 2004 and the acoustic design by Bickerdike Allen Partners, determined that the external traffic noise was 70dB but post-occupancy tests showed that all Classrooms achieved a performance criteria of between 38dB and 40dB.

Brunel University are currently carrying out acoustic, occupancy, and air quality monitoring as part of a 4-year Study.



*Two views of the external elevations of Addey & Stanhope School in Deptford*

# Acoustic matters

Acoustic issues are increasingly important with the stringent requirements of BB93 and the dilemma faced by many Designers of the need to have openable windows, which themselves are prone to noise ingress.

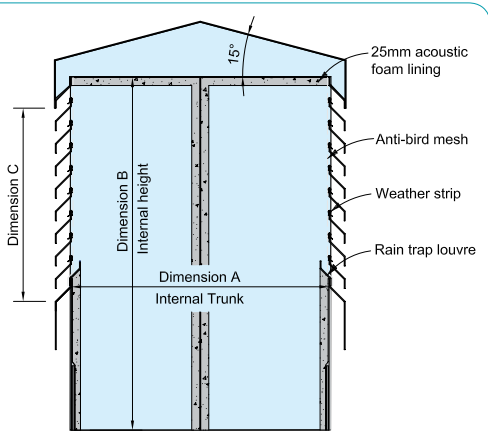
It is considered that by drawing air from above roof level, that in itself avoids the problems of traffic noise as compared to low level windows but the Monodraught design, with the relatively large internal ducts in a cruciform design, lends itself ideally to the application of acoustic material.



In January 2005, Monodraught commissioned the Building Research Establishment (BRE) to carry out a series of airborne acoustic tests on the full range of Windcatcher systems, together with various insulation thicknesses.

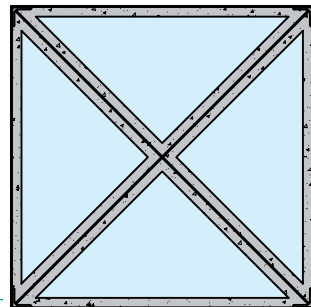
The BRE established that in its standard format, the style of the Windcatcher system has the effect of reducing noise transmission by 15dB as compared to an open window. However, by incorporating 25mm of acoustic lining to the air paths, a further 11dB was achieved. The chart shows that on larger systems, a greater thickness of insulation foam has the effect of greater attenuation.

Acoustic pods or other forms of attenuation can also be suspended below the Monodraught terminals to achieve an even greater impact on sound insulation.



Section

Plan view



System	Dimension A	Dimension B	Dimension C
800	800 x 800	1100	600
1000	1000 x 1000	1240	740
1200	1200 x 1200	1375	880
1500	1500 x 1500	1585	1090

Test Number	$D_{n,e,w}$ ( $C;C_{tr}$ ) (dB)	Construction Details
12	15 (0;-1)	GRP 800 Square system - VCD Open
13	30 (-1;-2)	GRP 800 Square system - VCD Closed
14	26 (-1,3)	GRP 800 Square system 25mm insulation foam - VCD Open
15	47 (-1;-5)	GRP 800 Square system 25mm insulation foam - VCD Closed
16	24 (-1;-4)	GRP 1000 Square system 25mm insulation foam - VCD Open
17	39 (-1;-5)	GRP 1000 Square system 25mm insulation foam - VCD Closed
18	31(-1;-5)	GRP 1000 Square system 50mm insulation foam - VCD Open
19	47 (-2;-7)	GRP 1000 Square system 50mm insulation foam - VCD Closed

\*Key: VCD = Volume Control Dampers  
Foam is as follows: 25mm open cell polyurethane foam (28kg/m<sup>3</sup>) lining the trunk, capping and internal airways  
OR  
50mm open cell polyurethane foam (28kg/m<sup>3</sup>) lining the trunk, capping and internal airways

Full copies of the BRE Acoustic Reports are available on request

## Case Study

### Imperial College, London

Consultant: **Gatehouse Architectural Consultants**

Throughout the summer of 2004, Phil Evans, the newly appointed Facilities Manager at Imperial College, London, was faced with the problem of how to overcome the problems of severe overheating that had plagued the College's Library for the previous 10 years, most particularly in the summer months. The situation was exacerbated by the fact that the whole of the top floor of the building had full height glass curtain walling and the existing mechanical ventilation system seemed unable to cope.

Six GRP 1000 square Windcatcher systems were installed in the autumn of 2004 to overcome the problem and currently, further Windcatcher systems are being considered for other areas.

## Schools and Colleges

# Colleges excel

**W**hen Phil Evans, Imperial College London's new Facilities Manager, visited Monodraught's offices in High Wycombe to discuss their requirements, he was able to witness the Windcatcher installations in a working office environment and he was confident he was making the right decision.

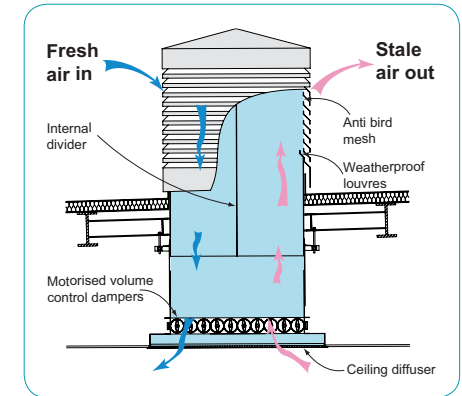
Following the completion of the work in September 2004, "The effect and result was instantaneous", said Phil Evans.

"The hot stuffy atmosphere, which always pervaded the Library, disappeared overnight and we were immediately conscious of the fresh air coming in from the Windcatcher system". Although the system was installed at the tail end of the summer season, the staff and students could see that this was certainly going to provide the answer for forthcoming terms.

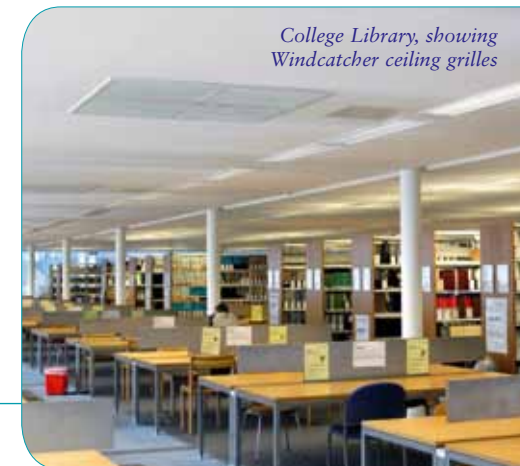
The most frequently asked question about natural ventilation is 'what happens in the winter months?' Might the prevailing cold draughts present a problem? Imperial College has now been using the system for more than two years and during the winter, the ventilation openings have been programmed to remain open just 5% to give background trickle ventilation and there have been no incidents reported of any cold draughts.

In choosing the Monodraught Windcatcher systems, Phil Evans concluded, "We are all aware quite how difficult it is to study and work in a stuffy environment and this was one of the key factors in the College's decision to improve the ventilation in the Library by adding these six Monodraught Windcatchers."

*Further Windcatcher applications at Imperial College are now under consideration*



*View of the Windcatchers from outside*



*College Library, showing Windcatcher ceiling grilles*

## Case Study

**Sutton Arena, Sutton, Surrey**  
Specifier: **William Hogan-O'Neil, Chartered Architect**  
Client: **London Borough of Sutton**

Sutton Arena is just one of a growing number of Stadia supported by Sport England, where natural ventilation systems are used in order to reduce energy costs but also to embrace eco-friendly strategies as a long term goal. Sutton Arena is often used for televised indoor athletics, hence the huge array of powerful floodlights, which in themselves produce particular problems of high heat gains. No mechanical ventilation or air conditioning is used and the Windcatchers provide the perfect environment, providing a constant supply of fresh air to this prestigious London Sports Facility.

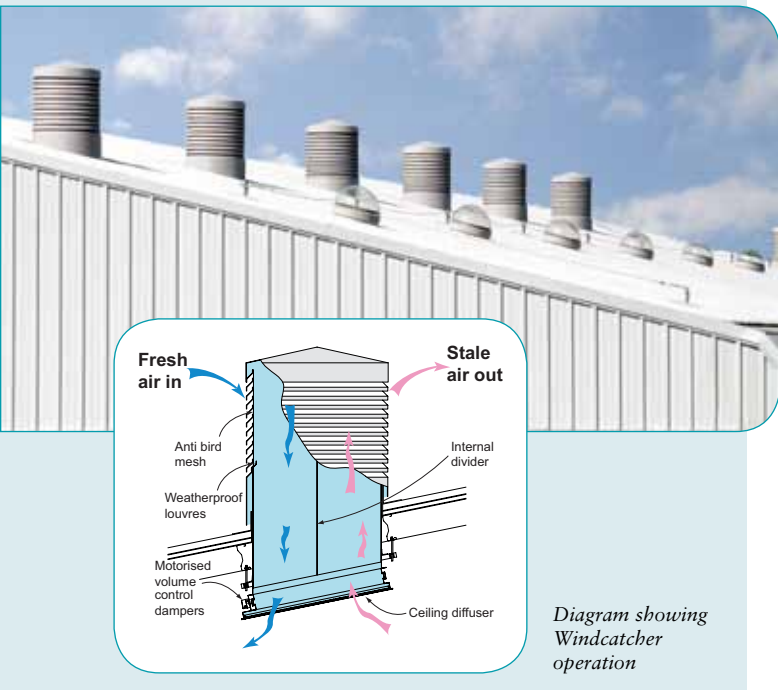


Diagram showing Windcatcher operation

## Schools and Colleges

# Bringing the outside inside

William Hogan-O'Neil, the architect responsible for the London Borough of Sutton's £4.8 million Sutton Arena leisure centre project, had a strong vision in mind.

"My whole idea from the concept stage" said William, "was to bring the outside indoors, with daylighting and fresh air to replicate as much as possible traditional outside field and track facilities in this all-weather Arena. Monodraught Sunpipes and Windcatchers were the ideal solution. I had not specified Windcatchers on a project of this nature before but I am sure I will in future."

A total of eight 1000mm diameter Monodraught Windcatcher natural ventilation systems were used, each fitted with motorised opposed blade

*Above left: External view of the Sutton Arena*

*Right: Indoor running track at Sutton Arena*

dampers for this impressive sports facility which provides outstanding indoor training facilities for International level field and track athletes as well as regional clubs and community groups.

Ten 750mm diameter Sunpipes were also used to provide the natural daylight requirement with the added benefit that they do not contribute to the Projects heat gains.

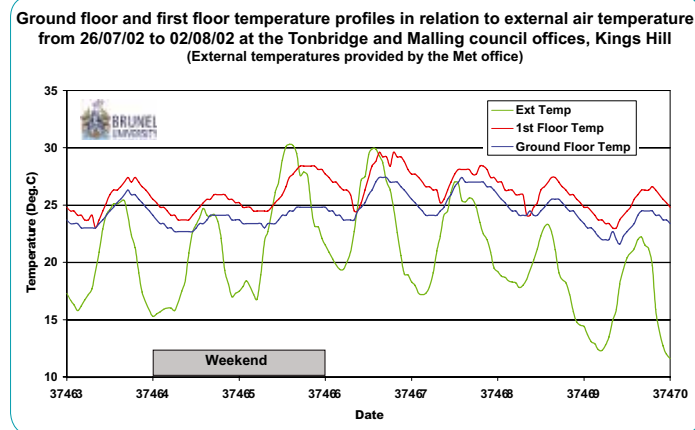
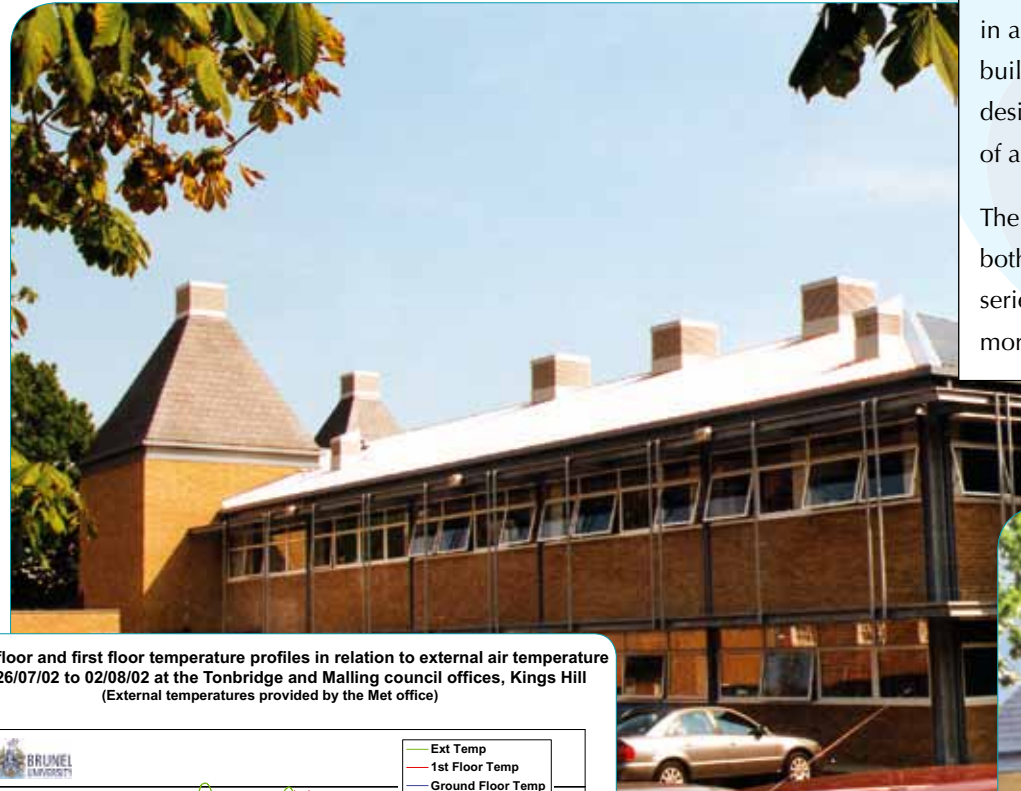


# Civil service

Open plan offices without air conditioning are often prone to overheating and suffer from poor air quality, due to the limited effect of opening windows.

Windcatcher systems provide ventilation to all areas, as the ventilation is provided at ceiling level and is, therefore, ideally suited to deep plan offices.

At Kings Hill offices, Brunel University carried out two in depth monitoring studies during the summer months of 2001 and 2002. Full copies of the Reports are available on request but the graph shows that night time external temperatures typically went down to 15°C but when daytime external temperatures topped 30°C, the internal temperatures were capped at around 28°C. This demonstrates the effectiveness of free night cooling since this reduces the temperature of the fabric and structure of the building, preventing daytime overheating.



*View of the Windcatchers installed at the Kings Hill Council Offices*

*Left: Brunel University findings on internal temperatures*

## Kings Hill offices for Tonbridge and Malling District Council

Consultant: **Bailey & Associates**

Contractor: **Try Accord**

A total of 15N° Windcatcher systems arranged in a variety of sizes were installed at these newly built Council Offices in the year 2000, which were designed to be as green as possible without the use of any mechanical ventilation or air conditioning.

The Windcatchers provide natural ventilation to both first floor and ground floor offices through a series of central ducts and serve a Council staff of more than 250.



# Eliminating air conditioning

**S**BS (Sick Building Syndrome) has been a hot topic of discussion for many years with many people pointing the finger at air conditioned offices, with the possible lack of maintenance to air filters, as being one of the major problems. Some people have complained of soreness of the eyes, dryness of the throat and other forms of discomfort.

It cannot be denied that a constant supply of fresh air is not only beneficial to the staff but can have a significant impact on reducing energy consumption. A combination of Monodraught's Sunpipes and Windcatchers are often chosen for office Projects and indeed, Monodraught's 7,000sq.ft offices at High Wycombe are entirely lit by Sunpipes and ventilated by Windcatcher systems without any need for air conditioning.

**Daimler Chrysler Offices,  
Milton Keynes**  
Client: **Daimler Chrysler**

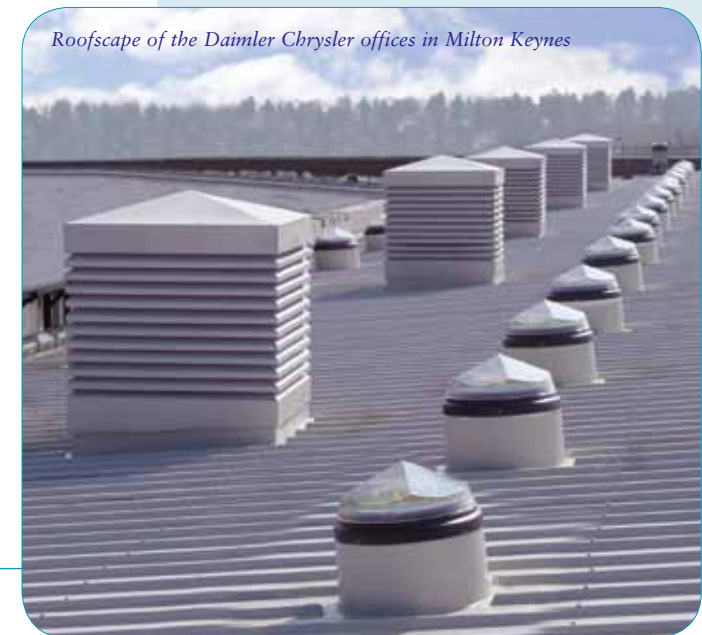
11N° Monodraught GRP 1000 square Windcatchers were installed into two existing open plan offices in central Milton Keynes. In addition, 58N° 450mm diameter Sunpipe systems were installed to provide natural daylighting.

The Windcatcher systems replaced the need for the existing air conditioning system and by utilising Sunpipes, the electrical lighting load has also been reduced, thus reducing the heat gain into the offices.

A far healthier and more eco-friendly office environment has been achieved.



*Above: Internal view of Windcatchers and Sunpipes installed at the Daimler Chrysler offices in Milton Keynes*



*Roofscape of the Daimler Chrysler offices in Milton Keynes*

## Case Study

**Blackberry Hill Hospital Bristol**  
Specifier: **Hurley Palmer Flatt**  
Architect: **Devereux Architects**

The 8,000sq.m PFI Project comprises some 80N° individual single person Wards and forms part of the Fromside medium secure Mental Health Unit in Bristol. A major commitment was required for sustainability and a 20% energy saving over traditional and existing designs was to be provided. This was met in part by the application of the full range of Monodraught systems, which included Windcatchers, Suncatchers, Vertical-Balanced flue systems, Sunpipes, and Monovents.

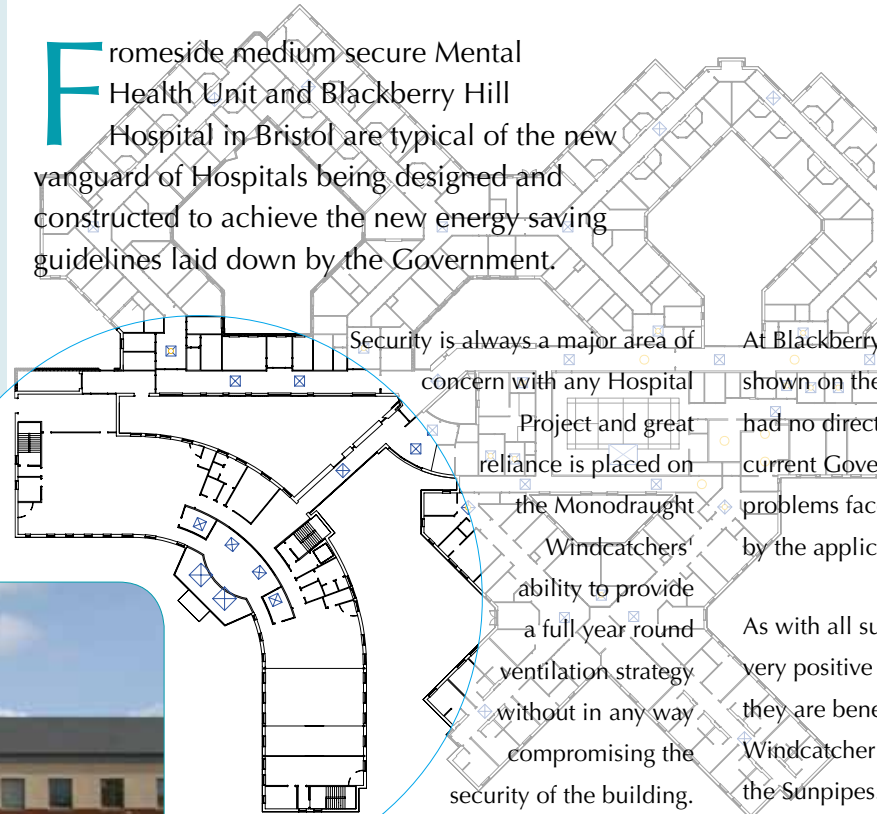
*Below and right: The section of the Blackberry Hill Hospital floor plan featuring the 'Banana Building', showing Windcatcher installation areas*



## Hospitals

# Healthy solutions

**F**romside medium secure Mental Health Unit and Blackberry Hill Hospital in Bristol are typical of the new vanguard of Hospitals being designed and constructed to achieve the new energy saving guidelines laid down by the Government.



Security is always a major area of concern with any Hospital Project and great reliance is placed on the Monodraught Windcatchers' ability to provide a full year round ventilation strategy without in any way compromising the security of the building.

This is achieved since the only ventilation openings are through the louvred intakes of the Monodraught systems at roof level, which in themselves offer a high level of security but additional security bars can also easily be incorporated into the Monodraught design.

At Blackberry Hill Hospital, a labyrinth of internal corridors, as shown on the plan, and a number of land locked ancillary areas had no direct access to natural light or ventilation to comply with current Government guidelines and this is typical of the design problems faced by so many Architects. The problems were solved by the application of Windcatchers.

As with all such Hospital Projects, the feedback from staff has been very positive with both staff and patients stating that they consider they are benefiting from the fresh air ventilation provided by the Windcatcher systems and enjoy the abundance of natural light from the Sunpipes. Hospital Managers whilst acknowledging the saving in energy, say that they also appreciate and enjoy the day-to-day benefits they are achieving for themselves and their staff in the greatly improved working conditions.

Natural daylight from the Sunpipe systems is acknowledged to provide a soothing, calming effect on patients and staff, and the combination of fresh air and sunlight relieves the symptoms of SAD.





## Windcatcher with Sola-boost

# The best just got better!

The potential problems of global warming and a sharp rise in energy costs emphasised the importance to Monodraught to introduce a solar driven system with an internal fan to bring in additional fresh air at an approximate rate of 200l/s, and all this without any energy cost!

The Sola-boost is an extension of the proven Windcatcher design and provides additional solar powered ventilation on hot sunny days while maintaining zero running costs.

The key to the success of this system is the unique newly patented PowerTrack™ control method. The brighter the sun, the greater the input or extract rate but the unique switching also results in two and a half times more power from the solar panel than can otherwise be achieved.

The Windcatcher Sola-boost systems are supplied with polycrystalline photovoltaic panels which are embed into the GRP capping and the complete unit is supplied in any BS or RAL colour.



A 40W polycrystalline solar panel powers the fan.



Normal operation of Windcatcher being wind and buoyancy driven

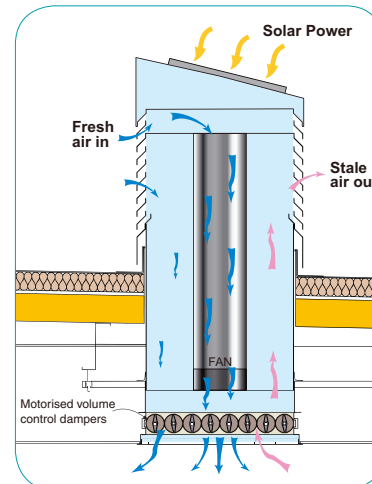


Full power under sunny conditions x 2½ when above 14V output



Control panel

The system is also available as an extract version. The Sola-extract has the fan operating in reverse and is used in areas where cross ventilation is the intended ventilation strategy.



Winner of the 2006 Interbuild Show Award for Best Building Services Product



## Weather conditions ...

### Normal Conditions ☁

Under normal conditions, the Windcatcher technology provides natural ventilation without any moving parts by encapsulating the prevailing wind no matter how light and turning that wind movement down through 90°. Using the compartmentalised vertical vents, fresh air is brought into the room and stale air is expelled using the natural energy of buoyancy and stack effect common to all Windcatcher systems.

### Sunny Conditions ☀

The high efficiency polycrystalline solar panel should be orientated to be facing south and the solar panel activates the fan once the DC electricity generated exceeds 6V. Once the power produced by the panel reaches 14V, the PowerTrack, intelligent power conditioning system, boosts the power transmitted to 25V, which results in a 250% increase in the speed of the fan.

At night time or when there is no sun, the fan is not activated. The control panel has a half power or off switch to provide full control.



## The Monodraught Range

There are a growing number of other products from the Monodraught stable to provide a wide range of eco-friendly products.

**Suncatcher** is the combination of the Windcatcher and Sunpipe system in a simple, composite unit normally used on larger commercial Projects.

**Monovent Windcatcher and Suncatcher** are low cost ABS system also incorporating a range of Sunpipe sizes for smaller commercial and domestic Projects.

**Sola-vent** provides a combined unit with solar driven extract and various sized Sunpipes, normally used for bathroom or toilet installations.

**Sola-boost and Sola-extract** are Monodraught's latest developments using solar power technology for energy free operation.

**GRP Monovents** have the same appearance of the standard Windcatcher system but have a different internal configuration to allow for dedicated intake or exhaust requirements.

**Bespoke systems** - There is virtually no limit to the design or fabrication of a natural ventilation or Monovent system, all manufactured in maintenance free GRP to a high standard of finish and performance.

## Suncatcher

# SunCatcher...it's only natural

**N**atural ventilation and natural light in a single installation The Monodraught Suncatcher combines the principles of the Windcatcher system with Monodraught's natural daylight system, the Sunpipe.

The Sunpipe system maximises the concept of renewable energy by reflecting and intensifying sunlight and even normal daylight, down through a highly reflective, silverised, mirror-finish aluminium tube with a 10 year guarantee against discolouration. The specular aluminium surface is coated with PVD (Physical Vapour Deposition) and the presence of a UV inhibitor provides outstanding UV durability with no decrease in total reflectance. The special surface treatment provides excellent colour rendition of natural light.

A clear polycarbonate patented Diamond top dome seals the light pipe against the ingress of dust, rain and a prismatic polycarbonate ceiling fitting evenly diffuses light into the room or space below. The Sunpipe system is highly effective in both sunny and overcast conditions and even when it is raining.

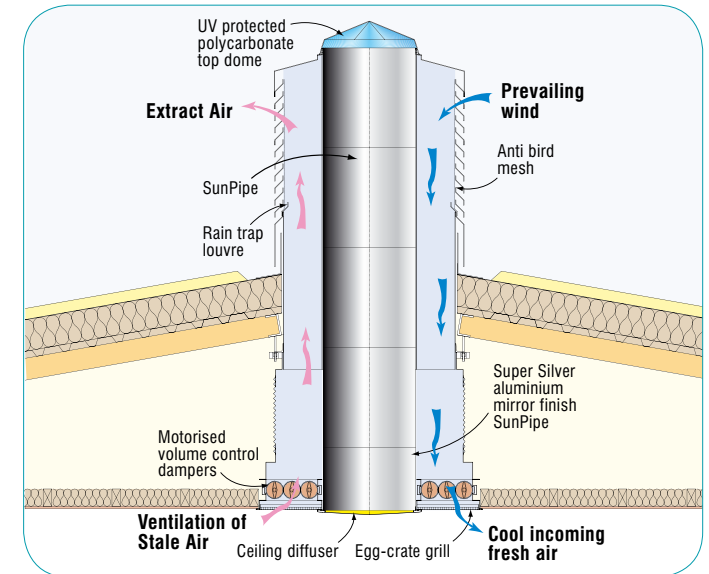
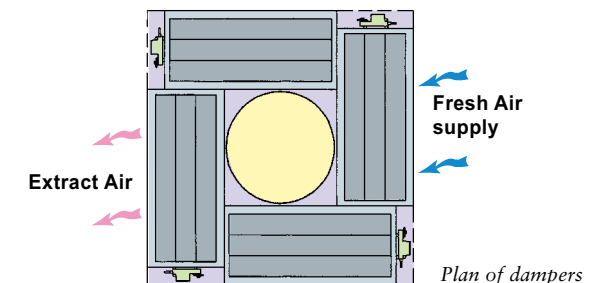


Diagram showing operation of the Suncatcher system

A series of modulating dampers with a combined ceiling diffuser at ceiling level controls the flow rate of fresh air into the building or the extract of stale air and eliminates any excessive heat loss during winter months.



Plan of dampers



## Case Study

**The Priory Neighbourhood Centre**  
Client: **Hastings Borough Council**

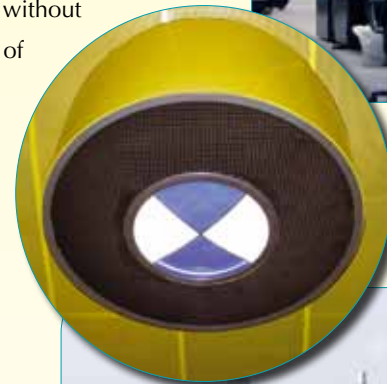
This was a major refurbishment project funded by English Partnership in 2004, whereby the existing building was transformed into a state of the art community centre. The refurbishment was undertaken with a view to using sustainable energy principles wherever possible including a sedum roof and use of photovoltaic panels. The consultants, PJR, contacted Monodraught to design a system that was in keeping to the philosophy of the building. Two GRP 1200 Suncatcher systems with integral 750mm diameter Sunpipes systems were installed to provide natural daylight and ventilation to the cafe and IT areas. These systems were ideal as they met with the design philosophy in one neat package.



*Priory Neighbourhood Centre, Hastings*



*Suncatcher installations at the BMW head offices*



*BMW, Oxford*



## The Advantages

### Night-Time Cooling

As with the Windcatcher, the Suncatcher dampers can be programmed to fully open at night time during summer months to allow the prevailing wind movement to force fresh air down into the room below. This not only provides a cleansing effect, purging and removing stale odours from the room, but achieves all this without compromising the security of the building or using any energy whatsoever.

### Bespoke Systems

Monodraught Suncatchers are manufactured as standard from 400mm – 1500mm sizes in both circular and square formats. However, bespoke shapes and special Suncatchers can be designed to meet the Client's requirements. Each Suncatcher is carefully sized to meet both the ventilation and daylight requirements of the room or space that it serves.



*St Paul's School, Burgess Hill*



*Clifton Road Youth Centre, Birmingham*



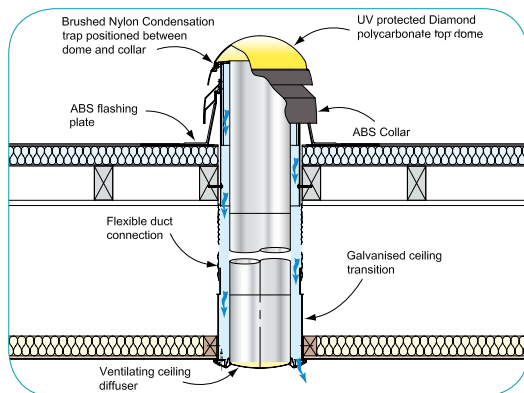
*Blackberry Hill Hospital, Bristol*



## Monovent versatility for smaller installations

Whereas the Monodraught GRP Windcatcher and GRP Suncatcher are aimed at larger scale applications for commerce and industry, it is recognised that there is an increasing demand for smaller low cost installations in Homes, Shops, Offices, Doctors' Surgeries, etc.

ABS systems are ideal to provide natural light and ventilation to bathrooms, kitchens, toilets etc, this low cost ABS system is similar in operation to the Windcatcher and Suncatcher.



### Monovent Windcatcher

Similar in operation to the larger GRP Windcatchers, the ABS Windcatchers offer a low cost option where ventilation is required on a smaller scale. The ABS Windcatchers are available in two sizes, an ABS 550 and ABS 350 system. The ABS Monovent Windcatcher is also available in a Sola-boost version.



### Available in three sizes

**ABS 350 Monovent Suncatcher**  
c/w 230mm (9") Sunpipe to light an area up to 7.5m<sup>2</sup>

Ventilation rate at external wind speed of 4m/s: 16l/s or 0.016m<sup>3</sup>/s

**ABS 550 Monovent Suncatcher**  
c/w 300mm (12") Sunpipe to light an area up to 14m<sup>2</sup>

Ventilation rate at external wind speed of 4m/s: 62l/s or 0.062m<sup>3</sup>/s

**Note:** The ABS 550 system can also be supplied with a 450mm (18") diameter Sunpipe to light an area up to 22m<sup>2</sup>



### Features of Monovent Suncatcher

- Designed to provide natural light and ventilation to bathrooms, kitchens, toilets and similar small areas
- Ideal for any roof profile the ventilation is carried through flexible ducting
- Available in three sizes - ABS 350 with a 230 (9") Sunpipe and ABS 550 with either a 300mm (12") or 450mm (18") Sunpipe
- Expels stale air by the passive stack ventilation principle with the added advantage of bringing in a supply of fresh air on the windward side of the system
- Ventilation can be controlled with the fully adjustable ceiling ventilator
- Complies with Building Regulations for PSV ventilation

## Sola-vent

# Solar powered ventilation and natural daylight

**S**ola-vent is a fully integrated bathroom light and ventilation system, incorporating a Monodraught Sunpipe, two downlighters and a solar powered extractor fan, all in one unit.

The Sola-vent is available in two stylish designs and is the ideal solution for shower and bathrooms, toilets and other areas where natural ventilation is not available.

The system is driven by a photovoltaic panel utilising polycrystalline silicon technology which gives a high performance to size ratio and provides power even under overcast skies.

A little known fact about solar panels is that they actually work more efficiently at lower temperatures, meaning they make the most of the available energy in winter conditions. The built in battery will provide 7 days back up operation, after which the Mains Backup facility will provide power to the fan.

The solar panel is housed in a robust aluminium/ABS frame. The pre-wired units are designed for easy mounting to a variety of roof types, and require only simple connection to the control unit. No maintenance is required !

A separate timer control is connected to a PIR unit to provide fully automatic operation of the extract fan. The timer provides an overrun of 20 minutes as required by building regulations but is adjustable.

The Sola-vent uses very little power from either the solar panel or the battery and the fan runs on a sealed ball bearing assembly ensuring ultra low noise operation.



Available in two sizes with 230mm or 300mm dia Sunpipe and two designs



The Sirroco



The Mistral



**Sola-vent**

Winner of the 2006  
Interbuild Show  
Award for Best Interior  
Product of the Show



A 4-day on site investigation in August 1998 by the Building Research Establishment proved the effectiveness of the Monodraught Windcatcher system under summer load conditions.

The University of Hertfordshire was the test site and used two Lecture Theatres that had been converted from what was originally its old mainframe computer room. There were no openable windows in either Lecture Theatre. G105 was the smaller of the two with a volume of 458m<sup>3</sup>. G111 had a volume of 769m<sup>3</sup>.



Left: Flow visualisation of moderate wind speed with no evidence of any "short circuiting" of the air movement

Below: Windcatcher units installed on flat roof of old central mainframe computer building



## Putting Windcatchers to the test

The detailed monitoring and measurements were carried out over four days in August 1998. The external temperatures were approximately 29°C, for two of the days. On the other two days ranged from 18°C to 22°C.

The ventilation rates of the lecture theatres with the Windcatchers closed and sealed was determined to find a base comparison. Readings were also taken with the dampers closed and fully open and were measured on three days in G105 and four days in G111. The effect of night cooling from the units was also determined over two days. Flow visualisation studies were undertaken on the units using smoke as a tracer. A recording of these tests were made on videotape.

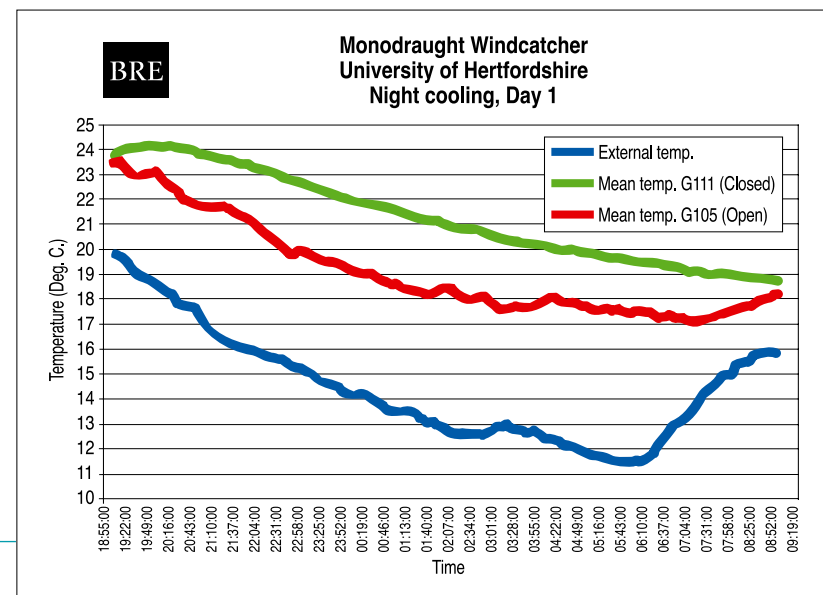
It was determined that the background ventilation of both lecture theatres (i.e. Windcatchers sealed) was relatively low. With the Windcatchers fully open the ventilation rate in G105 ranged from 1.24 ac/hr at 1.7 m/s wind speed to 5.2 ac/hr at 4.5 m/s. For G111 it ranged from 2.13 ac/hr at 2.6 m/s to 4.68 ac/hr at 4.1 m/s.

Ventilation measurements were carried out in both lecture theatres using the tracer gas decay method, Sulphur Hexafluoride (SF<sub>6</sub>).

Three pairs of small mixing fans mounted in opposing directions in stands were placed far apart in both lecture theatres. The purpose of the fans was to mix the incoming fresh air with the tracer gas inside the lecture theatre.

The BRE Tests determined that there was no short circuiting of airflows and the air change rates were measured with the monitoring units being placed in the furthest corners of the Lecture Theatre in each case and recorded air change rates of up to 5.2 ac/hr despite external temperatures of up to 29°C.

Below: The effect of leaving the dampers to the Windcatchers open in one of the lecture theatres overnight demonstrated the night cooling effect of the units. A temperature difference of approximately 8°C was achieved in the lecture theatre overnight.



## Our commitment to R&D

**M**onodraught supports a number of Research Programmes being carried out to ensure that their products maintain a continual development cycle that can be monitored and independently assessed by the Universities. Furthermore, Monodraught considers it has a commitment to supporting and encouraging new Engineers to the industry to engross themselves in these new sustainable developments that may hold the key to so many of our dilemmas for our future energy usage.



Monodraught have two full-time Researchers based at Nottingham University with a permanent Environmental Test Chamber to monitor and assess the performance of Sunpipes and Windcatchers on a continuing development basis.



Professor Mike Wilson is developing a number of systems with Monodraught but specifically a composite lighting unit that incorporates a standard Sunpipe with LEDs embedded into the surround. A solar panel at roof level connects to a solar battery and this will provide 24 hour lighting. A prototype is nearing completion.



A 2-year Study has been spent on developing a computerised prediction model and a number of Papers have been written on their Sunpipe development.



The University of Reading

A number of Projects are currently being assessed to promote the application of natural ventilation systems as part of a 4 year study into solar powered ventilation. A considerable number of both Windcatcher and Suncatcher systems have been installed at the University.



A 4 year programme of research is being carried out into internal environmental conditions of natural ventilation

strategies on a wide range of Projects ranging from Schools, Colleges and Academies to offices and Community Centres.



Considerable research has been carried out into the performance of Sunpipes under varying conditions and continuous assessment has been carried out on the benefits of lightpipes and human responses.

### Other Universities and Test Houses

Work has also been carried out at Loughborough University and UMIST, as well as at BRE and BSRIA on the application of Windcatcher natural ventilation systems. Full copies of all these Reports are available on request from Monodraught.

### Carbon Trust and DTI Awards

Two major funding awards have been made to Monodraught in 2006 to research PCM (Phase Change Materials) and Evaporative & Desiccant cooling in conjunction with Nottingham University and Bill Dunster Architects.



Department of Trade and Industry



## Intelligent window control: In partnership with Monodraught

To extend the success of natural ventilation technologies, Monodraught has teamed up with WindowMaster to add yet a further dimension to controllable ventilation, making the maximum use of programmable window openers. WindowMaster's many International Patents makes it the leading Supplier of product solutions for intelligent façades and the company has over the years developed an extensive knowledge of façade technology and window operators. A comfortable indoor climate can be enhanced by precise control of motorised window openings in conjunction with damper controls of the Monodraught Windcatcher systems. To many Designers, this constitutes the 'Best of Both Worlds' by having a fully controllable ventilation strategy for virtually any Project.



# Energy free. Maintenance free.

**W**ith energy costs set to rise, year on year, the whole concept of a natural healthy 'air conditioning' system being energy free has enormous advantages.

However, it is not just the concept of energy free, wind driven ventilation that is so attractive. With no fans or mechanical parts, there is no noise, no filters to clean, and there is nothing to wear out or replace.

Traditional ventilation system components need regular maintenance and filters constantly need cleaning or replacement, however, Windcatchers require no maintenance other than an annual check. Monodraught provide the first annual check free of charge, which includes a complete clean and check on the programmed damper operation. Thereafter Monodraught provide 10 year clean and maintenance programme for a nominal annual fee.

### W H Smith Headquarters, Swindon

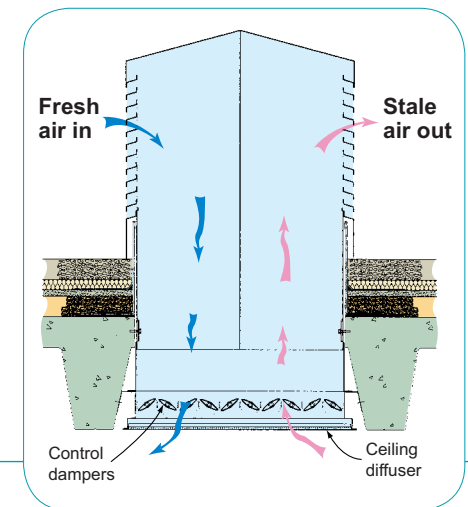
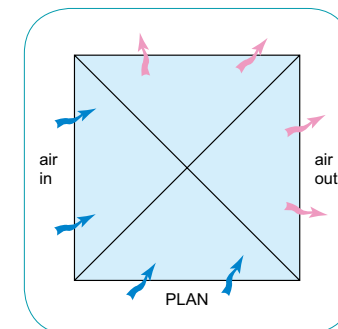
Consultant: **Mr Geoff Peters, Applied Energy**

These Award winning offices were built in 1985 and were designed as a low energy structure without air conditioning or mechanical ventilation. Since then, the increased use of PCs, the increased number of staff, and the effects of higher summertime temperatures has meant that the internal environment had become unbearable by 1999. 27N° Monodraught 1000mm square Windcatchers were installed at approximately 25% of the cost of equivalent air conditioning and the results have been remarkable. All problems of overheating and poor air quality have been eliminated and the 500 staff now enjoy fresh air into their offices throughout the year.

Because the running costs are zero, the Accounts department are the happiest of all!



24 Monodraught Windcatcher



Detail of Windcatcher



# Tailor-made for your environment

Monodraught systems are as versatile as they are innovative. They can also be used on a wide range of conventional discharge or vent arrangements.

Monodraught's emphasis on high quality design means that they can compliment any surroundings and can be manufactured to virtually any shape or design.

Monodraught's Monovent systems mimic the appearance of the Windcatcher systems but have a different internal configuration to allow for dedicated intake or exhaust requirements. The Monovent can also be designed to accommodate multiple intakes or exhausts and can be incorporated in one system.



*Alton Library*



*Tesco Eco-store, Cheetham Hill*



*Blue Water Retail Park*



*Starburst School*



*The National Osteoporosis Society Headquarters at Camerton Nr Bath*



*Press Association Offices, Howden, East Yorks*

## Installation

**M**onodraught employ a total of 12 installation teams, all direct employees of Monodraught and operating from a fleet of Mercedes Benz Sprinter vans, which cover the whole of the UK. In the majority of cases, Monodraught will provide a complete installation service. However, builders work is required in advance of the Monodraught attendance on site or alternatively, Monodraught systems can be supplied for the builder to install themselves.



### Aluminium Roofs

For a standing seam/aluminium profile roof a welded upstand should be provided by the roofing contractor as part of the normal roof coverings. Alternatively Monodraught can include this work as part of their package.

### Slate or Tile Roofs

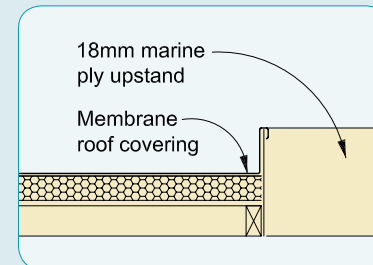
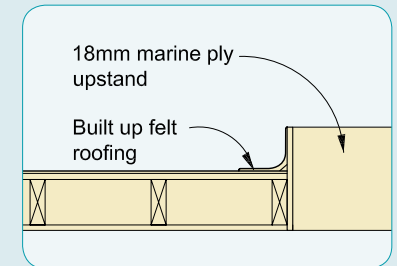
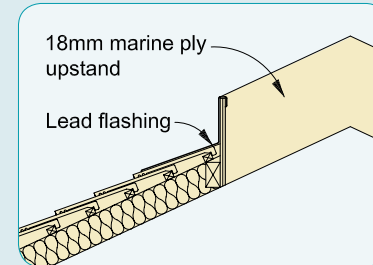
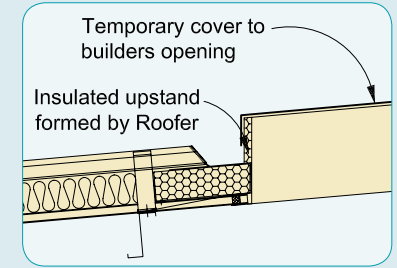
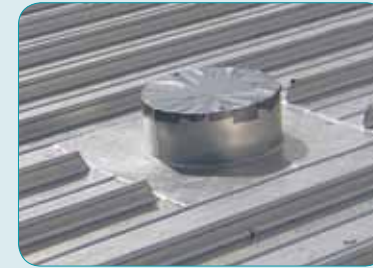
For a slate or tile roof, an 18mm external quality plywood upstand is required, covered with Code 4 lead and this is normally to be provided by the builder.

### Flat Roofs

For a flat roof of asphalt or built-up felt roofing, Monodraught can provide a galvanised or GRP flashing to be built in by the builder. Alternatively, a conventional plywood upstand should be specified.

### Single Ply Membrane

For a single ply membrane roof such as Sarnafil, Monodraught can provide a soaker sheet that is fitted to the roof deck and the single ply membrane is heat sealed in place.



## The Monodraught promise

### After Sales Support

Upon completion of the building and immediately prior to hand-over, Monodraught's Control Specialists will attend site to fully commission the control package to ensure that all control strategies are correctly programmed, to reflect the finite usage of the rooms in question.

Summer/winter setting periods are agreed, together with all time settings. A laminated instruction/ information sheet is included for each room.

Three months after the building has been handed over and occupied, Monodraught's Control Specialists will return to site by appointment and after discussions with the Manager of the building, will 'fine tune' the control strategy to exactly reflect the client's requirements. There is no additional charge for this service.

### Maintenance

A particular feature of Monodraught systems is the emphasis on low maintenance. Manufactured in GRP, all Monodraught systems are covered by a unique 10 year guarantee, but an annual maintenance Contract is provided.

Dampers and controls fitted into the systems will be covered by the normal manufacturer's warranty.

## Specifying a Windcatcher

### 1 Questionnaire

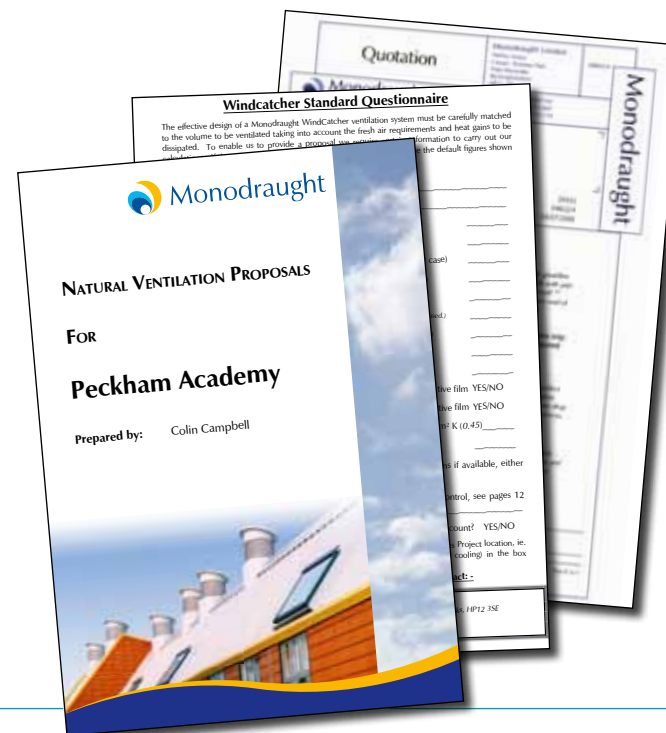
Monodraught provide a simple Questionnaire that outlines the parameters needed for the design. Once the Monodraught Design Team receive this information, they can calculate the correct size of Windcatcher to take into account all necessary heat gains and ventilation requirements.

### 2 Proposals

A minimum 5-page Performance Specification is normally produced for each Project but in any event, a detailed formal Quotation is usually submitted to the Client together with the calculations and proposal drawings depending on the complexity of the project that fully set out the builders work requirements, normally within 5 days of receipt of information.

### 3 NBS Specification

- Manufacturer: Monodraught Ltd, Halifax House, Cressex Business Park, High Wycombe, Bucks HP12 3SE, tel: 01494 897700, fax: 01494 532465
- Type: Monodraught Windcatcher System
- Outer Casing: 5 ply glassfibre construction in Class 1 fire retardant resin
- Louvres: 60% free area, 45° pitch with ABS weather stripping and integral rain trap
- Internal Airways: 5 ply GRP airways protected internally with plastic coated anti-bird mesh
- Kerb: Roofers upstand to suit roof construction
- Volume Control Dampers: 24 volt modulating
- Ceiling Grilles: White powder coated eggcrate grille or linear grilles





# Monodraught

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[www.monodraught.com](http://www.monodraught.com)



Part of the VKR Group

The VKR Group's mission is to bring daylight, fresh air, solar energy and a better environment into people's everyday lives. VKR Holding is the parent company of the VKR Group and owns brands such as VELUX roof windows, VELFAC and Rationel vertical windows as well as WindowMaster and European thermal solar companies.